

A STUDY OF INDIVIDUAL AND INSTITUTIONAL DEMOGRAPHIC FACTORS  
THAT PREDICT CANDIDATE PERFORMANCE ON THE BOARD OF  
CERTIFICATION EXAMINATION

by

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Performance on the Board of Certification Examination

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## **Dedication**

This work is dedicated to my late ancestors, the champions of making a way out of no way, especially my grandparents: Christina W. Parham; Horace B. Parham, Sr.; E. Hermase Tabon; and Fennette J. Tabon.

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## **List of Abbreviations**

Athletic Training Program .....	ATP
Athletic Training Program Director .....	ATPD
Board of Certification for the Athletic Trainer, Incorporated.....	BOC
Commission on the Accreditation of Athletic Training Education .....	CAATE
Demographic Profile of Athletic Training Survey.....	DPAT
Ethnic Diversity Advisory Committee.....	EDAC
National Athletic Trainers' Association .....	NATA
National Council Licensing Examination .....	NCLEX
National Physical Therapy Examination .....	NPTE

## **Abstract**

### **A STUDY OF INDIVIDUAL AND INSTITUTIONAL DEMOGRAPHIC FACTORS THAT PREDICT CANDIDATE PERFORMANCE ON THE BOARD OF CERTIFICATION EXAMINATION**

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The purpose of this study was to determine if individual and institutional factors predict candidates' performance on the Board of Certification for the Athletic Trainer (BOC) examination and to determine if institutions' demographic profiles of athletic training predict pass rates on the BOC examination for people of color (POC). A BOC candidate dataset was obtained with demographic variables for 18,127 candidates from 346 institutions. Race, sex, funding type, institution type, and geographic location were predictive of candidates' performance on the BOC examination. Of the individual variables that were statistically significant, POC and female candidates were more likely to fail the BOC examination than White and male candidates, respectively. Private institutions and historically Black colleges and universities also had higher associations with failure than public and predominantly White institutions. Of the ten geographic locations studied, candidates in Districts 8 and 10 were less likely to fail compared to the

reference group, candidates in District 4. Additionally, demographic profile data was collected from 170 institutions and analyzed to predict pass rates on the BOC examination for POC from the number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color. The seven variables did not predict pass rates for POC. Overall, the recommendation for athletic training education is to increase diversity within programs and identify intervention strategies to help POC succeed on the BOC examination. Future researchers should include experimentation with specific interventions, detection of best practices, and reassessment of the variables of interest from the present study at the master's level.



## **Chapter One**

Athletic trainers are health care professionals for physically active populations. They work with athletes of all skill and activity levels, from recreational exercisers to manual laborers, to prevent injury, provide emergency care, and facilitate rehabilitation and return to play or work (Prentice, 2013). To become eligible for athletic trainer certification, students must learn comprehensive skills in the five domains of athletic training clinical practice: injury/illness prevention and wellness protection; clinical evaluation and diagnosis; immediate and emergency care; treatment and rehabilitation; and organization and professional health and well-being, through a competency-based education program, similar to that of a medical education model (National Athletic Trainers' Association, 2009; National Athletic Trainers' Association, 2010). Credentialing varies across states, but 48 of 50 states require successful completion of the Board of Certification for the Athletic Trainer (BOC) examination to become a certified athletic trainer (Murray, 2014). Since 1994, the earliest year in which examination data was available, more than 49,000 people have become certified as athletic trainers (Board of Certification, Inc., n.d.-d; Board of Certification, Inc., 2016a). Presently, membership of the National Athletic Trainers' Association (NATA) is majority White and is not reflective of the population of physically active people for whom athletic trainers provide

care (National Athletic Trainers' Association Ethnic Diversity Advisory Committee, 2016; Nevarez, Hibbler, & Cleary, 2002; Perrin, 2000).

The purpose of this study was to address the following research questions:

- 1) Do individual (race, age, sex) and institutional (funding type, institution type, geographic location) factors predict candidates' performance on the BOC examination?
- 2) Do institutions' demographic profiles of athletic training (number of years since initial accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color) predict pass rates on the BOC examination for people of color (POC)?

When candidates apply to take the BOC examination, they are asked to identify as one of the following choices: Alaskan Native, American Indian, Asian/Pacific Islander, Black, Hispanic, White, multiethnic, or other. This variable appears on the BOC examination application as ethnicity, which is contrary to the U. S. Census (United States Census Bureau, 2015). Similarly, candidates must specify their gender on the application from the choices male or female. To be consistent with U. S. Census and empirical literature, the terms race and sex are used in this dissertation. In the remainder of this chapter, the general and specific statements of the problem this study was designed to address are discussed. Synopses of previous research are provided as background information, but the studies are described in greater detail in Chapter Two. Early studies

on the BOC examination are also summarized. The research questions are proposed, and the discussion of the gap in the athletic training literature highlights the significance of this study. The proposed methods are introduced, and then, Chapter One concludes with a list of operational definitions.

### **General Statement of Problem**

The year 2012 was the first time that the number of births of (POC) exceeded the number of White births (Nivet & Fair, 2016). The need to address health disparities increases as the population of diverse people in the United States grows (Nivet & Fair, 2016). The country's ethnic composition has little resemblance to the composition of individuals who fill health care occupations (Grumbach & Mendoza, 2008). Cohen, Gabriel, and Terrell (2002) provided a four-part rationale to explain why the field of medicine needs health care workers from more diverse backgrounds: to improve the cultural competence of the health care workforce; to increase access to quality health care service for underserved communities, typically inhabited by Black and Hispanic people; to broaden and empower the health research agenda in the United States to address unresolved health problems impacting POC; and to maximize the pool of health care management executives and policymakers and prepare them to contribute to the governmental efforts aimed at health care issues. The presumption by Cohen et al.'s (2002) reasoning is that these needs extend to other health care professions outside of medicine.

The workforce of health care providers should reflect the country's changing demographics (Nevarez et al., 2002; Nivet & Fair, 2016; Smedley, Butler, & Bristow,

2004; The Sullivan Commission, 2004). This recommendation has been made several times with the most commonly cited reason being to improve health disparities faced by POC. A team of award-winning physicians: Drs. Marcus L. Martin, Sheryl L. Heron, and Lisa Moreno-Walton, compiled *Diversity and Inclusion in Quality of Patient Care* in which Nivet and Fair (2016) concluded chapter one with an even more compelling reason to enhance diversity in health care professions: to improve outcomes for all patients. With a diversified health care work force, providers from a variety of backgrounds are able to offer high quality care for patients from a variety of backgrounds. Also, a diverse workforce is more likely to have the preparation to address racial and ethnic health disparities (Cohen et al., 2002).

Similar to the overall health care system, the membership of the National Athletic Trainers' Association (NATA) does not resemble the diverse population of the country or the physically active people for whom athletic trainers provide care (Nevarez et al., 2002; Perrin, 2000). Furthermore, among athletic training, physical therapy, nursing, and medicine, athletic training has the lowest percentage of people of color in professional practice. The distribution of the profession is slanted toward White athletic trainers who comprise approximately 81% of the membership (National Athletic Trainers' Association Ethnic Diversity Advisory Committee, 2016). As reported in March 2016, POC comprise 14.87% of the NATA membership (National Athletic Trainers' Association Ethnic Diversity Advisory Committee, 2016). In contrast, approximately 17% of the physical therapy, 19% of the registered nursing, 37% of the licensed practical nursing, and 28% of the physician workforces are POC, according to the most recent information for other

health care professions (Budden, Zhong, Moulton, & Cimiotti, 2013; U. S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis, 2013; U. S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis, 2014). Athletic training is behind other health professions in maintaining POC, which will be problematic as the landscape of the United States continues to evolve. The number of ethnic groups living in the United States is expected to change markedly by the year 2020 (Wilson, Sanner, & McAllister, 2010). Further, the population of the United States is anticipated to be “majority-minority” after 2050 (Carnevale & Strohl, 2010, p. 176). The overall health care workforce must adapt to meet the needs of a wide variety of people from different cultural backgrounds (Cohen et al., 2002).

### **Background of the Problem**

Multiple reasons are likely to blame for the lack of POC in athletic training. Possible explanations are the lack of students of color matriculating at institutions of higher education and limited opportunities for mentorship. One possible explanation that was of interest for this study is the BOC examination.

**A shortage of POC in higher education.** Multiple reasons are likely to blame for the lack of POC in athletic training, but foremost is the overall shortage of students of color in higher education. POC are underrepresented in health care professions partly because of the racial and ethnic disparities in higher education persistence and degree completion (Carnevale & Strohl, 2010; Milem, Chang, & Antonio, 2005; Museus, 2014;

Museus & Neville, 2012). Theories on the reasons for the underrepresentation of students of color in higher education vary from financial reasons to racial composition of faculty to legislative representation and their impact on policies (Fryar & Hawes, 2012). Additionally, students of color are more likely to leave college than White students, which can hinder the social mobility of students of color over time (Carter, 2006). Students who drop out of higher education, most likely Black and Hispanic, have less entitlement to public resources and are more likely to acquire financial burdens and familial responsibilities that diminish their chances of accessing higher education even further (Phelps, 2009). Carnevale and Strohl (2010), co-directors of Georgetown University's Center on Education and the Workforce, argued that quality education plays a role in skill development, but access to such quality has become stratified according to race and ethnicity, and class, none of which have they defined. According to them, the American higher education system has become more accessible to the detriment of POC and working class students by tracking them and guiding them into cheaper yet lower-quality two-year programs while wealthier White students are pushed into higher-cost four-year programs with a graduate school option. Without specific goals aimed at "racial, ethnic, and class diversity," (Carnevale & Strohl, 2010, p. 87) higher education reform becomes a catalyst for inequality.

**Barriers to mentorship.** A second possible reason for the shortage of POC in athletic training is the limited opportunities for them to receive adequate mentorship. Mentoring is especially important for athletic training students because of the complex socialization process they must go through in three separate environments: academic,

clinical, and professional (Pitney & Ehlers, 2004). White institutional agents have the potential to shape the experiences of students of color positively or negatively (Museus & Neville, 2012). Faculty and administrators at predominantly White institutions are often unaware of the unique needs of students of color and the challenges they face (Schultz, Colton, & Colton, 2001). Michel (2016) found in his qualitative dissertation study on cross-cultural mentoring with White mentors and Black athletic training students that mentors acknowledged individual differences but still desired to take a colorblind approach to mentoring, thereby possibly rendering the intervention ineffective. In a qualitative study of Black women athletic trainers, participants indicated that the lack of racial diversity among leaders in the athletic training profession may deter Black women from pursuing the profession (Siple, Hopson, Sobehart, & Turocy, 2015). Although diversity includes many different attributes, this study is focused on racial diversity. Hereafter, diversity is used throughout this dissertation to mean racial diversity.

Enrollment for students of color in nursing has been a concern for educators at least since the early 1990s (Alvarez & Abriam-Yago, 1993). The number of students of color in nursing education programs is still insufficient to meet the needs of the health care workforce, but mentoring is one strategy that nursing educators rely on to try to improve their low enrollment and retention (Murray, Pole, Ciarlo, & Holmes, 2016). While students of color may have a greater need for mentoring, they are also the population likely to have difficulty securing it (Jacobi, 1991). So begins an unfortunate cycle of students of color without mentors and low numbers of POC entering the field of athletic training.

**The Board of Certification for the Athletic Trainer examination.** The BOC is an independent non-profit organization and the only accredited certification program for athletic trainers in the United States (Board of Certification, Inc., n.d.-a; Board of Certification, Inc., n.d.-g). The BOC examination has been the subject of a number of research studies (Breitbach, Downey, & Frager, 2013; Bruce, 2014; Colt, 2007; Draper, 1989; Erickson & Martin, 2000; Harrelson, Gallaspy, Knight, & Leaver-Dunn, 1997; Hickman, 2010; Middlemas, Manning, Gazzillo, & Young, 2001; Murray, 2014; Searcy, 2006; Starkey & Henderson, 1995; Turocy, Comfort, Perrin, & Gieck, 2000; Williams, 1998; Williams & Hadfield, 2003). The earliest researchers on the topic explored how different variables influenced BOC examination scores. Draper (1989) studied how scores differed as a function of learning styles but found no significant difference among auditory, visual, or kinesthetic learners. Starkey and Henderson (1995) showed that candidates who completed an accredited curriculum program scored significantly higher than candidates who completed an internship program. Williams (1998) explored the relationships between outcomes on the BOC examination and a number of variables, including the formerly seven athletic training domains as part of an athletic training programs (ATP) curriculum, number of clinical experience sites, a programmatic minimum grade point average, faculty attributes, including a capstone course in the curriculum, and association with an allied health school. Including the athletic training domains in an ATP curriculum, sending students to a variety of clinical experience sites, and having terminally-degreed faculty all had positive significant relationships with institutions' passing rates on the BOC examination. Studies by Harrelson et al. (1997)



and Middlemas et al. (2001) looked at the relationship between grade point average and BOC examination scores. Researchers for both studies found that grade point average is a significant predictor of candidates' scores. The quantity of clinical hours, however, is not a significant predictor of BOC examination outcomes (Middlemas et al., 2001; Turocy et al., 2000).

Clinical education is the component of athletic training preparation involving the development, practice, and evaluation of practical skills required for professional practice (National Athletic Trainers' Association, 2009). Clinical education experiences are a requirement for all athletic training students, but the implementation varies from institution to institution (Turocy et al., 2000). Historically, students were required to obtain a minimum of either 800 or 1500 supervised athletic training clinical education experience hours, depending on the route taken to BOC examination eligibility. Studies by Middlemas et al. (2001) and Turocy et al. (2000) revealed that the number of clinical hours did not predict students' BOC examination scores. The most recent accreditation standards simply require ATPs to have clear written policies denoting the minimum and maximum number of clinical hours students are required to obtain (Commission on Accreditation of Athletic Training Education, 2012).

As athletic training education evolved, researchers studying the BOC examination changed their studies to include different methods and more detailed investigations into the variables influencing candidates' performance. Qualitative researchers utilized the Delphi technique of structuring the collective thoughts of an expert group to survey a panel of athletic training program directors (ATPDs) (Erickson & Martin, 2000). The

panel members reached the consensus that several factors influence candidates' examination performance. They collectively agreed upon five specific areas, including ability to interpret the examination questions, knowledge of therapeutic interventions and anatomy, mentorship, and substantial assessment skills. Searcy (2006) examined the influence of the frequency, number, and types of clinical evaluations, as well as grade point average, number of clinical sites, and earliest semester of clinical experiences on candidates' performance on the BOC examination. The result was that grade point average and the earliest clinical semester of clinical experiences were the only predictors of performance on the BOC examination. Colt's (2007) dissertation revealed that candidates with higher inference and deductive reasoning skills were more likely to pass the BOC examination than candidates whose skills were not as strong. Hickman (2010) published the only study to date that contradicts previous findings that grade point average is a significant predictor of performance on the BOC examination. Her study also indicated no significant relationship between specific ATP characteristics, clinical experience in football, demographics, and performance on the BOC examination. However, with twenty-four participants, the sample may not have been large enough to detect influence. Breitbach et al. (2013) has been the only study to research the relationship between psychological factors and first-time pass rate on the BOC examination. The number of participants in the study who did not pass the BOC examination was minimal, but the findings indicated that candidates who did not pass the examination were influenced by worry and tended to use emotion-focused coping methods. Bruce (2014) and Murray (2014) both looked at predictors of performance on

the BOC examination in graduate ATPs. Both studies found that grade point average predicted performance on the BOC examination. Bruce (2014) concluded that performance on the Graduate Record Examination (GRE) and having taken calculus were also predictors.

The aforementioned studies all have in common the absence of data on race or ethnicity, so there is no capability to explore possible connections between race or ethnicity, the BOC examination, and the shortage of diverse athletic trainers. In a review of athletic training research, Delwiche and Hall (2007) made the notable point that athletic training research was largely drawn from the research of similar health care disciplines. Yet, research in similar health disciplines does often include race or ethnicity and how they might relate to examination outcomes. Utzman, Riddle, and Jewel's (2007) revealed that Black, Asian, or "other" (p. 1186) candidates were 200% more likely than White/non-Hispanic and Hispanic candidates to fail the National Physical Therapy Examination (NPTE). Similarly, Lamm and McDaniel (2000) indicated that race was the only significant demographic predictor that influenced candidate success on the National Council Licensure Examination-Practical Nursing (NCLEX-PN). Black candidates were more likely to fail the examination than White candidates. In addition to race, researchers in other health care fields (e.g., medicine, nursing, physical therapy) have also devoted attention to exploring whether or not other demographic factors, such as sex, age, funding, institution type, and geographic location predict candidates' performance on licensing and other standardized exams in those fields (Alameida, Prive, Davis, Landry, Renwanz-Boyle, & Dunham, 2011; Beeman & Waterhouse, 2001; Briscoe & Anema,

1999; Capers & Way, 2015; Davis, 2015; De Lima, London, & Manieri, 2011; Dillon & Tomaka, 2010; Endres, 1997; Gresham, 2013; Haas, Nugent, & Rule, 2004; Humphreys, 2008; Irigoyen, Kurth, & Schmidt, 1999; Koenig, Sireci, & Wiley, 1998; Kosmahl, 2005; Lamm & McDaniel, 2000; Landry, Davis, Alameida, Prive, Renwanz-Boyle, 2010; Maring & Costello, 2009; Mitchell, 2016; Rolph, Williams, & Lanear, 1978; Shiyko & Pappas, 2009).

### **Significance of the Problem**

Increasing the diversity of the profession of athletic training is not just an issue of addressing a numerical difference. If there is no change to the current state of affairs, existing racial and ethnic health disparities will be exacerbated by the shortage of ethnically diverse health care providers (Barfield, Cobler, Lam, Zhang, & Chitiyo, 2012; Brown, DeCorse-Johnson, Irving-Ray, & Wu, 2005; Degazon & Mancha, 2012; The Sullivan Commission, 2004). Enhancing diversity is a matter of improving the quality of care for all patients, increasing exposure to career options for potential students of color, and enhancing the standing of the profession. An increase in health care patients of color will require health care providers to prioritize culturally competent care (Campinha-Bacote, 2003). Graduates of diverse health education programs will be more equipped to provide care for diverse populations if they have exposure as students to diverse environments and persons who may differ from them with respect to race, religion, and sexual orientation (Perrin, 2000; Whitla, Orfield, Silen, Teperow, Howard, & Reede, 2003). Researchers also acknowledge that health care providers of color tend to work in communities with large underserved populations of color, improving their access to

health care (Alvarez & Abriam-Yago, 1993; Cohen et al., 2002; Haskins & Kirk-Sanchez, 2006; Perrin, 2015; Whitla et al., 2003). As a result of enhancing diversity of athletic trainers, potential students of color can also see athletic training illuminated as a career option since they are likely to pursue careers to which they have already been exposed (Nevarez et al., 2002). When diversity in the profession is encouraged, current and potential students have evidence that POC can succeed as athletic trainers (Perrin, 2000).

### **Specific Statement of the Problem**

Researchers of previous studies have demonstrated in their findings that race is a significant predictor of performance on a variety of health profession examinations, with White examination candidates mostly outperforming other groups. There has also been at least one instance where race was a significant predictor when analyzed as the only independent variable (Haas et al., 2004; Lamm & McDaniel, 2000; Utzman et al., 2007). Findings have varied with respect to differences between age groups or by sex (Alameida et al., 2011; Haas et al., 2004; Lamm & McDaniel, 2000; Utzman et al., 2007). Other demographic factors that have been studied in relationship to professional examination scores are whether an institution attended by a candidate was public or private, whether the institution was a predominantly White institution or historically Black college or university, and the geographic region in which the institution was located (Capers & Way, 2015; Maring & Costello, 2009; Utzman et al., 2007). Yet, research on the impact of demographic factors on the BOC examination is lacking. The gap needs to be addressed, so that the body of knowledge in athletic training can be more comprehensive

with respect to demographic variables. For example, in instances when research has included race or ethnicity, the sample has not been diverse enough to draw conclusions about the impact of race or ethnicity (Kutz, Dyer, Campbell, 2013; McKnight & Juillerat, 2011). Thus, the lack of diversity in the profession also has an impact on the inclusiveness of athletic training research since consumers are sometimes left with incomplete findings. Additionally, and more urgently, athletic training is noticeably absent from the research on racial health disparities. Researchers are currently calling for more studies on race-concordant provider-patient relationships that extend to racial groups beyond the Black population and include other health care professionals besides physicians to understand more about combatting disparities (Smedley, Stith, & Nelson, 2003). At this time, with such a small sample of POC, athletic training researchers would be unlikely to have a significant contribution to this inquiry.

This study was a first step to address the lack of POC in the athletic training profession. Multiple researchers have discussed the need to study nonacademic variables, especially in different racial populations in the contexts of health care licensure examinations and in higher education overall (Arathuzik & Aber, 1998; Dennis, Phinney, & Chuateco, 2005; Kim & Sax, 2009; Thomas et al., 2007; Tracey & Sedlacek, 1982; Webb et al., 1997; Wohlgemuth et al., 2007). Aside from studies on clinical education and the BOC examination, only one other study in athletic training research was focused on nonacademic variables (Breitbach et al., 2013). To date, multiple researchers have discussed the need for increasing diversity in athletic training but not a possible relationship between the BOC examination and the amount of diversity in the profession.

Therefore, this study was designed to investigate whether or not race, age, sex, funding type, institution type, and geographic location predicted performance on the BOC examination to fill this gap. In nursing, for example, educators are concerned with the low first-time passing rates on the National Council Licensure Examination for Registered Nurses (NCLEX-RN); thus, researchers have particularly paid attention to various demographic variables, such as age, race, and sex and have found evidence that these variables do predict nursing candidates' performances on licensing exams (Alameida et al., 2011; Briscoe & Anema, 1999; Endres, 1997; Haas et al., 2004; Humphreys, 2008; Lamm & McDaniel, 2008; Vandenhouten, 2008). Researchers have conducted similar studies in physical therapy and also found that funding type and geographic location predicted performance on the NPTE (Gresham, 2013; Maring & Costello, 2009; Utzman et al., 2007). The proposed study was aimed at investigating whether the same findings were applicable in athletic training.

Nevarez et al. (2002) reported fifteen years ago that the number of certified athletic trainers who were POC was about equal to the number of students of color in college preparing to become certified athletic trainers. However, many of those students of color never entered the workforce to practice as certified athletic trainers, and there were no studies that look at the BOC examination as a possible explanation. In fact, diversity research is seen infrequently in athletic training and usually as an argument for why diversity is important in the field (Perrin, 2000; Perrin, 2015).

The purpose of this study was to address a gap in the athletic training education literature by exploring the relationships between demographic variables at multiple levels

of analysis and candidates' performance on the BOC examination. A similar phenomenon with one or several racial groups underperforming on the BOC examination might be happening in athletic training, but currently, there are no identified studies that include race or ethnicity as a factor, nor are there any studies that look at the combination of race, age, sex, funding type, institution type, and geographic location. The aim of this study was to either highlight underperforming groups or affirm that demographic variables are not predictors of candidates' performance on the BOC examination.

### **Research Questions**

Athletic training research has not yet been focused on a combination of specific demographic variables and how they may relate to candidates' performance on the BOC examination. The purpose of this study was to investigate two research questions:

- 1) Do individual (race, age, sex) and institutional (funding type, institution type, geographic location) factors predict candidates' performance on the BOC examination?
- 2) Do institutions' demographic profiles of athletic training (number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color) predict pass rates on the BOC examination for POC?

### **Proposed Methods**

A more in-depth overview of the methods that were used in this study is included in Chapter Three. Several measures were employed: performance on the BOC



examination, pass rates for POC, and the Demographic Profiles of Athletic Training (DPAT) Survey, which was formulated especially for this study. The BOC candidate dataset was used in a multilevel logistic secondary analysis to determine if any variables predicted candidates' performance on the BOC examination, and the data obtained from the DPAT Survey was used in a multiple linear regression to determine if institutional variables predicted pass rates of POC on the BOC examination.

### **Operational Definitions**

1. Athletic Trainer – an allied health professional who provides health care for physically active people from emergency care to return to play (Delwiche & Hall, 2007; Nevarez et al., 2002)
2. Athletic Training Program (ATP) – an accredited degree-granting program in the area of athletic training that leads to eligibility for the Board of Certification examination and entrance to the profession (Commission on Accreditation of Athletic Training of Education, n.d.-b)
3. Board of Certification for the Athletic Trainer, Incorporated (BOC) – the only accredited certification agency for athletic trainers in the United States which is responsible for establishing and reviewing standards of athletic training practice (Board of Certification, Inc., n.d.-g)
4. BOC examination – a computerized 175-item test that students take upon completion of an accredited athletic training programs to earn the certified athletic trainer credential (Murray, 2014)

5. Candidate – an individual who is eligible to attempt the BOC examination  
(Board of Certification, Inc., 2016b)
6. Commission on Accreditation of Athletic Training Education (CAATE) – a  
501(c)(3) non-profit organization responsible for the establishment of  
standards, measurement, and improvement related to athletic training  
education (Commission on Accreditation of Athletic Training Education, n.d.-  
a)
7. District – a territory in the United States that operates independently in  
matters of its region but integrates with the other territories to form the  
National Athletic Trainers' Association (National Athletic Trainers'  
Association, n.d.-b)
8. Diversity – the inclusion of individuals from different races or cultures in a  
group (Diversity, n.d.)
9. Ethnically diverse – used by the Ethnic Diversity Advisory Committee  
(EDAC) to describe individuals in the athletic training profession that belong  
to one or a combination of the following groups: Black/Non-Hispanic,  
Asian/Pacific Islander, Hispanic, Multiethnic, American Indian/Alaskan  
Native, Other (Brooks, Pinto-Reed, Dukes, & Peart, 2007)
10. Ethnicity – a social construction often spoken of situationally and historically  
belonging to people who share common characteristics, such as ancestral  
origins, traditions, and languages (Bhopal, 2004; Vidal-Ortiz, 2004)

11. Funding type – primary source of institution’s financial resources; public or private (Ro, Terenzini, & Yin, 2013)
12. Gender – a socially constructed system of identity that has historically been binary, as masculine or feminine, but has more recently been argued to lie on a continuum (Oakley, 1972/2015)
13. Geographic location – one of the ten regional districts that when integrated comprise the National Athletic Trainers’ Association (NATA) (National Athletic Trainers’ Association, n.d.-b)
14. Hierarchical linear modeling – a quantitative method of analysis used for handling data when observations are not independent and cross-level causal effects are anticipated (Garson, 2013)
15. Hispanic-Serving Institution (HSI) – a college or university with a population of 25% or greater who self-identify as Hispanic or Latino (Laden, 2004)
16. Historically Black College or University (HBCU) – a nationally accredited institution established before 1964 with the purpose of educating Black Americans (Higher Education Act of 1965, 2013).
17. Institution Type – classification as a predominantly White institution, historically Black college or university (HBCU), or Hispanic-serving institution (HSI) (Volberding, 2011)
18. NATA – the professional organization for certified athletic trainers and those who support the profession with the purpose of uniting individuals engaged in athletic training through promotion of educational programs and development

of athletic training skills (National Athletic Trainers' Association, n.d.-a; O'Shea, 1980).

19. Odds Ratio – a relationship between the probabilities of an event occurring or not occurring (Snijders & Bosker, 2012)
20. POC – a term encompassing individual, institutional, and structural experiences to refer to persons who are Black, Latino, Asian/Pacific Islander, and Native American (Vidal-Ortiz, 2004)
21. Performance – pass or fail status on a health care profession examination (Utzman et al., 2007)
22. Preceptor – a state-credentialed health care professional who supervises, instructs, and assesses athletic training students participating in clinical education (Commission on Accreditation of Athletic Training Education, 2012)
23. Predominantly White Institution (PWI) – a college or university where more than 50% of the student enrollment is White/non-Hispanic (Chen, Ingram, & Davis, 2014).
24. Race – a socially constructed concept that evolves over time to identify the group to which a person belongs based on physical characteristics that reflect ancestral origins (Bhopal, 2004; Vidal-Ortiz, 2004)
25. Sex – the biological distinctions between individuals that designate them as male or female (Oakley, 1972/2015)

## **Chapter Two**

The historical account of the evolution of athletic training education from the 1950s to the current issue with the lack of diversity in the profession is detailed in Chapter Two. Research studies on diversity issues in athletic training and other health care professions are also summarized. Potential barriers that students of color pursuing health care professions may face are also discussed, particularly the Board of Certification for the Athletic Trainer (BOC) examination for students in athletic training. This chapter is also focused on past studies on the BOC examination and studies from athletic training, nursing, physical therapy, and medicine that have explored the same independent variables from this proposed study: ethnicity, age, gender, type of control, student population type, geographic location, and attributes that comprise the institutions' demographic profiles of athletic training.

### **Introduction**

Athletic trainers are essential members of the sports medicine team, which is a group of health care providers including physicians, physical therapists, and other professionals responsible for the health and safety of active people (Delwiche & Hall, 2007). Athletic trainers are recognized by the American Medical Association as allied health professionals (Delforge & Behnke, 1999). "Allied health" (Castro, 2000, p. 5) is a term used to refer to a body of health professionals, not including physicians and nurses, related to identification, prevention, and treatment services of diseases and disorders. To

become certified as an athletic trainer, candidates must graduate from an athletic training program (ATP) accredited by the Commission on Accreditation of Athletic Training Education (CAATE) and pass the BOC examination (Board of Certification, Inc., 2016b). The current examination is computerized and includes a combination of 175 scored and experimental questions that assess candidates' knowledge in the five domains of athletic training (Board of Certification, Inc., n.d.-b; Murray, 2014). Candidates who pass the examination earn the designation of "athletic trainer, certified" (Grace, 1999, p. 287) or certified athletic trainer (Breitbach et al., 2013). Today, athletic trainers are employed in a variety of job settings including secondary schools, colleges and universities, physicians' offices, hospitals, clinics, police and fire departments, and the performing arts (National Athletic Trainers' Association, n.d.-c).

### **History of Athletic Training Education**

Although the profession has existed in some capacity since the late nineteenth century, the time period following the 1950s is really when athletic training, as a profession and an academic program, began to experience marked growth (Prentice, 2011). Athletic training education has evolved significantly since the 1950s when the professional organization was formally established. The catalyst for formalizing athletic training programs was the appointment of William E. Newell to the position of National Secretary of the National Athletic Trainers' Association (NATA), the professional governing organization for athletic training (Delforge & Behnke, 1999). Under Mr. Newell's leadership, the NATA established the Committee on Gaining Recognition, a predecessor to the current Professional Education Committee. The members of this

committee would eventually facilitate the continual development and approval of ATPs around the United States.

The early curriculum model for athletic training was proposed in 1959 to prepare graduates for positions at the secondary school level (Delforge & Behnke, 1999; Schwank & Miller, 1971). A prime feature of this early model was that students could acquire teaching credentials that allowed them to seek employment as health and physical education teachers as well as athletic trainers (Perrin, 2007). Thus, the curriculum was remodeled from physical education departments as a newly packaged program with the most pertinent courses from related fields (Delforge & Behnke, 1999). From this curriculum, future athletic trainers would receive the professional preparation that coaches lacked to look after the well-being of athletes (Schwank & Miller, 1971). In reality, these new ATPs were different from physical education programs by the addition of only two professional athletic training courses along with added laboratory practice (Perrin, 2007). Athletic training educators were not yet commonplace, and students were encouraged to continue their education by pursuing additional study in the area of physical therapy (Delforge & Behnke, 1999).

Noteworthy modifications to athletic training education occurred each decade following the 1950s. Delforge and Behnke (1999) captured the highlights of each decade in their account of athletic training history and evolution. The decade following the creation of the first athletic training programs was fairly quiet. The first undergraduate ATP would not be formally recognized by the NATA until 1969, ten years after the original athletic training curriculum was proposed (Delforge & Behnke, 1999).

Development of graduate athletic training curricula began in the late 1960s, although the first graduate ATPs would not be approved until 1972 (Delforge & Behnke, 1999).

The year 1969 is also when the push for athletic trainer certification began. After an encounter with an athletic trainer who was admittedly unqualified, Mr. J. Lindsay McLean, Jr. penned a letter to his colleague, Mr. Newell, with the title, “Does the Athletic Trainers’ Association Need a Certification Exam?” (McLean, n.d.). Shortly after the letter was received, Mr. Newell informed Mr. McLean that he intended to publish it in the *Journal of Athletic Training*. Mr. McLean’s specific reasons behind the push for certification were qualified athletic trainers were leaving the profession because of financial reasons and athletic trainers were subjected to less than favorable working conditions that superiors did not realize needed to be corrected (McLean, 1969). Furthermore, some athletic trainers had been rejected from job opportunities because employers did not recognize their qualifications. Mr. McLean’s logic was that an examination would give those in hiring positions the basis they needed to make a decision about whether or not a job applicant was qualified; in other words, the certification would be evidence of competence. The NATA’s Board of Directors saw value in Mr. McLean’s recommendation and tapped Professional Examination Service to create a certification examination (National Athletic Trainers’ Association, 1969). Thus, Mr. George Sullivan, a member of the Professional Advancement Committee administered the first athletic training certification examination to 28 candidates in Waco, Texas in August 1970 (Board of Certification, Inc., n.d.-e).



Curricular revisions began in the 1970s that streamlined athletic training education. Courses that were more pertinent to other professions were removed from the curriculum (Delforge & Behnke, 1999). The revisions were made because of the limited employment opportunities for high school physical education and health teachers doubling as athletic trainers and the belief that including prerequisites for physical therapy in an athletic training curriculum was unnecessary (Perrin, 2007). Besides the removal of the physical education courses, the only other change was that laboratory practice or practical experience was required to be supervised by a certified athletic trainer. The implementation of a continuing education reporting period also began in the 1970s, and Title IX became law (Board of Certification, Inc., n.d.-e; King, 2013). As a result of sex-based discrimination now being illegal, women received more opportunities to be involved in high school and collegiate sports (Winterstein, 2009). As women entered athletic competition more frequently, their need for competent care also increased (Winterstein, 2009). Thus, an influx of women entered the profession as opportunities for them in athletic training rose. In 1975, Ms. Iris Kimura, the first Asian woman; Dr. Marsha L. Grant, the first Black woman, and Ms. Kathy Courtney, the first Native American woman all became certified (King, 2013).

In the 1980s, the late Mr. Sayers Miller, chair of the NATA Professional Education Committee, conceived the idea of an athletic training major (Delforge & Behnke, 1999). College and university administrators pledged their support; thus, the Professional Education Committee developed strategic plans for implementation. The NATA also initiated the process of seeking accreditation for ATPs through the American

Medical Association's Committee (AMA) on Allied Health Education and Accreditation (CAHEA) (Perrin, 2007). Meanwhile, the BOC published the first Role Delineation Study, based on the performance domains of athletic training, and the BOC became an incorporated independent non-profit agency in North Carolina (Board of Certification, Inc., n.d.-e; Delforge & Behnke, 1999).

The first mention of any issues with diversity came 36 years after the formulation of the NATA. A trio of athletic trainers, Mr. Ronnie Barnes, Mr. Billy Hill, and Mr. Philip Horton approached the NATA Board of Directors to discuss several concerns they had related to diversity in athletic training. Among their concerns was the low number of POC earning certification and acquiring employment as athletic trainers (Brooks et al., 2007). In response to their meeting, the Minority Athletic Trainers' Committee (MATC) was created to address their concerns. Members of MATC worked diligently at promoting the profession of athletic training and distributing a newsletter featuring issues relevant to athletic training professionals of color until a lack of direction triggered a reevaluation of its purpose.

The 1990s was the decade when the NATA Board of Directors implemented their plan to obtain accreditation for entry-level ATPs (Delforge & Behnke, 1999). Additionally, the AMA formally recognized athletic training as an allied health profession, which played a vital role in achieving accreditation (Delforge & Behnke, 1999; Delwiche & Hall, 2007; Perrin, 2007). Meanwhile, MATC was disbanded in 1991, and the Ethnic Minority Advisory Council (EMAC) was formed in its place with the mission to serve as an advisory group to the NATA Board of Directors and advocate

“sensitivity toward cultural diversity” (Brooks et al., 2007, p. 10). Near the end of the decade, EMAC was changed to Ethnic Diversity Advisory Committee (EDAC) with diversity replacing minority to promote inclusion of a variety of groups (Brooks et al., 2007). The groups they were aiming to include are not specified in the documented history of the EDAC but presumably, minority was replaced with diversity so that athletic trainers of all races would feel welcome to be a part of the committee.

Several other changes happened in the first two decades of the new millennium. Prior to 2004, there were two routes to becoming a certified athletic trainer: graduating from an accredited curriculum model program or graduating from an internship program. Effective January 1, 2004, the internship route was terminated leaving one path to BOC examination eligibility (Kaminski, 2014; Murray, 2014). The EDAC mission was slightly revised in 2005 to include the categories of what they referred to as ethnically diverse people: Alaskan Native, American Indian, Asian/Pacific Islander, Black, mulitiethnic, and other, but the mission largely stayed the same (Brooks et al., 2005). In 2007, the three-part BOC examination with some computerized elements was replaced in favor of a one-part fully computerized version (Murray, 2014). The pass rate for the first year after the examination format became computerized was a low 39% of almost 1,500 candidates. By 2011, the number of candidates and the pass rate were steadily increasing. More than 4,000 candidates attempted the examination for the first time during the 2015-2016 offerings, and approximately 83% passed, an improvement over the years with the earlier format. For comparison, more than 2,000 candidates attempted the examination for the first time in 1996, the earliest year that a public examination report was available (Board

of Certification, Inc., n.d.-d). About 42% passed the written section, 55% of those taking the practical section passed, and 54% of those taking the simulation section passed.

In present day athletic training education, consistent with health care provider professional education trends, the NATA, the CAATE, and the BOC reached a joint decision to transition to a professional master's degree and eventually terminate all undergraduate programs (Richardson et al., 2013). EDAC continues to be the only entity formally tracking concerns and achievements related to ethnically diverse athletic trainers and students. As the profession shifts toward graduate-level education, improving diversity in education programs should be a priority in order to improve diversity in the profession overall (Murray, 2014). However, athletic training is not alone in its challenges with diversity.

### **Diversity in Other Health Care Professions**

Physical therapy, nursing, and medicine are other health care professions experiencing underrepresentation of people of color. Although there has been an increased governmental emphasis on Black and Hispanic people as evidenced by various agency reports, the number of students of color enrolled in health profession education programs has changed little (Baldwin, Woods, & Simmons, 2006; Smedley et al., 2004; The Sullivan Commission, 2004). POC are underrepresented in health care professions, while the population of POC in the United States continues to increase, and racial health care disparities continue to emerge as vestiges from a time period when health care could legally be allocated on the basis of race or socioeconomic status (Brummer, Reyes, Martin, Walker, & Heron, 2016; Castro, 2000; Smedley et al., 2003). Consequently, the

number of people of color practicing as health care providers is insufficient to meet our country's health care needs (Dapremont, 2013; Ramalanjaona & Martin, 2016). Statistics about the physical therapy profession indicated that people of color people make up 17% and 19% of physical therapy professionals and students, respectively (Barfield et al., 2012; United States Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis, 2014). In nursing, about 17% of the nation's three million nurses are POC (Murray et al., 2016). Blacks, Hispanics/Latinos, American Indians, and Alaskan Natives are especially underrepresented among physicians, constituting only 8 percent of physicians in the United States, with Hispanics and Latinos comprising the largest underrepresented group (Smedley et al., 2004).

A lack of health care providers of color can negatively impact the entire health care system (Baldwin et al., 2006). Nurses of color tend to work in communities that are generally underserved; when there is attrition of students of color, the potential patients are disadvantaged because they will not have the opportunity to be treated by nurses with certain language and cultural competence skills (Alvarez & Abriam-Yago, 1993). A landmark study from two decades ago found that Black and Hispanic physicians had an especially important role in caring for ethnically diverse patients. POC were more likely to seek out providers of the same race or ethnicity, but the number of physicians was inversely related to the proportion of Black and Hispanic residents in communities (Komaromy et al., 1996). The implication is that locales with higher numbers of people of color may be in need of certain health care services and do not have access to the

physicians who can provide those services. When the provider and patient population lack resemblance, some patients are left feeling excluded (The Sullivan Commission, 2004). A diverse workforce is better equipped to relate to patients and recognize and respond to health care disparities (Martin, Heron, Moreno-Walton, & Jones, 2016).

**Health care disparities.** A racial or ethnic health care disparity is a difference in a health outcome or determinant between populations that is connected to social or economic disadvantage (Office of Minority Health, n.d.; Meyer, Yoon, & Kaufmann, 2013). Examples are illness and early death that both disproportionately impact specific populations. In a 2009 survey on risk factors, researchers showed that Black, Hispanic, and Native American people, were more likely than the overall population to belong to a lower socioeconomic status, lack health insurance, and avoid seeing a doctor because of the cost (Liao et al., 2011).

Diversity of health care professionals has at least three larger implications for the overall quality of health care as identified by Smedley et al. (2003). POC who work as health care providers have historically had more success recruiting patients of color to participate in research. Knowledge gained from such research can benefit underserved communities. Also, POC who work in health care may also be better positioned to provide preventative care, helping patients in underserved communities save money. Finally, improving diversity in health care professions helps all students to learn cultural competence, which is just as important as scientific knowledge.

Past attempts at eliminating health disparities have failed because of gaps in the knowledge about health disparities (Purnell et al., 2016). In a review of the literature on

racial health disparities, Clarke et al. (2013) saw a pattern of interventions primarily targeting patients' knowledge and behavior to encourage them to change. These efforts are important, but health care providers and organizations have a responsibility as well to change for the goal of reducing disparities. Interventions should be aimed at fulfilling patients' needs, such as communicating with a patient in his or her preferred language. Eliminating health disparities is a great challenge, but the task is not impossible (Clarke et al., 2013; Frieden, 2013).

**Barriers to people of color in health care professions.** A number of barriers have been identified that students of color face when they pursue careers in the health care professions. One explanation is the leaky educational pipeline, which students of color flow in and out of as they pursue careers in the health care professions. The pipeline has been used as a metaphor to explain “when and where students enter and leave the sciences” (Astin & Astin, 1992, p. 1-3). Many factors influence the flow of the pipeline, such as individual achievement, personal experiences, and role models. A common incorrect notion is that health care profession programs have low enrollment of students of color, Black and Hispanic especially, because they cannot meet the academic threshold for admission, when in actuality, about half of Black and Hispanic students are unable to receive admission or attend college for issues unrelated to academic problems (Baldwin et al., 2006). Once they are enrolled, however, students from these groups generally have lower grade point averages than their White counterparts (Alexander, Chen, & Grumbach, 2009). In a study of 15,000 college students, Alexander et al. (2009) confirmed that Black and Latino students were less likely than White students to earn an

A or a B in gateway science courses that were required to progress to health care profession majors. Filipino students also earned lower grades than White students. Black and Filipino students were more likely than White students to persist through health care profession majors by taking four or more gateway courses. Latino students also persisted through the gateway courses; however, the difference between the persistence of Latino students and that of White students was not statistically significant.

***Primary education.*** Primary education, the beginning of the educational pipeline, has been blamed as the single largest detriment to diversity in health care professions, with disparities being evident as early as kindergarten (Grumbach & Mendoza, 2008). Students of color are more likely than White students to receive a lower quality K-12 education, perform worse on standardized tests, and drop out of high school (The Sullivan Commission, 2004). If they do graduate from high school, they are less likely than White students to graduate from a four-year college. When students of color do exhibit promise and advance to college, they often encounter a challenge of getting accepted to an advanced health care professions institution (The Sullivan Commission, 2004). In a study conducted at Stanford University, researchers compared the rates at which White and Asian pre-medical students apply to medical school to the rates at which underrepresented students of color apply (Barr, Gonzalez, & Wanat, 2008). For every 100 White or Asian pre-medical first-year students at the start of their academic career, 110-125 White or Asian students graduated and applied to medical school. In contrast, for every 100 Black, Latino, or Native American pre-medical first-year students,



50% or greater of the qualified Stanford University students from these three groups exited the pre-medical pipeline yearly and opted not to apply to medical school.

***Financial constraints.*** The reasons that students of color flow out of the pipeline are varied. Financial barriers often top the list. On average, underrepresented students of color, in particular, tend to have fewer financial resources than students who are not underrepresented, and the cost of preparing for a health profession presents an obstacle (Smedley et al., 2004). In 2002, there were 400,000 low- to moderate-income graduates who were qualified and prepared to attend college but were unable to because of financial reasons (Baldwin et al., 2006). The financial strains have only escalated in later years (Smedley et al., 2004). A study on Black, Hispanic, Asian, and Pacific Islander medical students revealed that a number of them were expected to provide financial support to their families while they were still students (Odom, Roberts, Johnson, & Cooper, 2007). To add additional strain, students may receive small stipends but are then forbidden from working to supplement their financial aid (Browne, 2012).

***Support.*** Researchers have also identified support systems, or the lack thereof, as a contributor in the maintenance of diversity in health care profession programs. However, when programs are in place to provide such support, they are not always used effectively (Alvarez & Abriam-Yago, 1993). The Alexander et al. (2009) study concluded that while Black, Hispanic, and American Indian students earned lower grades than White students, they were more likely to persist through the health gateway courses and thus, were in need of continued academic support. They recommended that any support interventions should be administered throughout students' pre-health career

journeys and not just as a “single dose” (p. 802) during the first one or two gateway health courses.

Other researchers have endorsed recommendations similar to that of Alexander et al. (2009) that students of color may benefit from support over time, especially in the form of interpersonal interaction. Alvarez and Abriam-Yago (1993) advocated for mentoring as one method of providing nursing students of color with support. They favored mentoring because of the ability for students to receive assistance with academic needs and personal needs. In a qualitative study of Black women athletic training students, participants reported that mentoring had been effective for creating a sense of belonging as students at predominantly White institutions. In turn, the sense of belonging also gave them a feeling of safety to be able to learn and practice their skills (Siple et al., 2015). Focus groups with medical school students of color also revealed that social support was an important factor that contributed to success during students’ college years and time in medical school (Odom et al., 2007). Congruently, participants who experienced a lack of support felt that it inhibited their success.

Students of color can benefit from interpersonal interaction in health care programs along the continuum of the education pipeline. Odom et al.’s (2007) study found that a number of participants had been exposed to and encouraged to enter the medical profession through summer enrichment or pre-enrollment programming. Some of them had also received mentorship from individuals who encouraged them to go to college and medical school.

In health care profession programs, support and interaction often come from faculty members and preceptors. In a grounded theory study, Pitney and Ehlers (2004) revealed that mentoring was important for socializing athletic training students into the various environments they encounter: academic, clinical, and professional. Mentors provided individualized help to students in developing their knowledge and skills as well as introducing them to different perspectives. Overall, mentoring appeared to be an important part of the relationship between students and preceptors during the clinical education that athletic training students must complete. The participants in Siple et al.'s (2015) study generally believed that without positive mentorship, they would have struggled through their programs, quit, transferred, not attempted the BOC examination, or taken the examination but not practiced as certified athletic trainers. Instead, they felt safe and welcome, developed self-confidence, and used their time efficiently as a result of the beneficial interactions they had with mentors as they advanced through their programs.

***Standardized tests.*** Another potential barrier for students of color in health care profession programs which lies near the end of the educational pipeline is a standardized test. Standardized testing is usually a requirement of the accreditation agencies for allied health education programs. Program success is largely illustrated by the pass rates on standardized examinations (Baldwin et al., 2006). The tests are sometimes over-relied upon to make admissions decisions for graduate or professional schools, often putting Black, Hispanic, and Native American candidates at a disadvantage, when they might be used more effectively as diagnostic tools to identify areas where applicants might

improve (Smedley et al., 2004; The Sullivan Commission, 2004). Researchers indicate that the factors influencing performance on standardized tests are different from the factors that influence whether or not a student will earn a degree or attend graduate school (Astin & Astin, 1992). Further, students of color are more likely to earn lower scores on standardized tests than White students (Smedley et al., 2004; The Sullivan Commission, 2004). Participants in Odom et al.'s (2007) study specifically named testing as an inhibitor of medical school success. They felt that the MCAT and further testing they underwent during medical school were not accurate reflections of their college performance since the type of assessments they received in medical school were completely new to them.

***Stereotype threat.*** Stereotype threat is another barrier that is closely associated with tests. Stereotype threat is a situational risk of affirming a fixed negative idea about a group to which one belongs (Steele & Aronson, 1995). The social-psychological threat can generally affect any group that has negative stereotypes associated with it; however, women and Blacks are especially known to have academic repercussions as a result of negative stereotypes (Steele, 1997). An individual need not be exposed for a prolonged period of time or even believe the stereotype; just being aware of its presence and realizing it could apply to oneself is sufficient for him or her to experience the threat (Steele, 1997; Steele & Aronson, 1995; Steele, Spencer, & Aronson, 2002). Over time, the persistence of stereotype threats may result in students activating a defense mechanism that allows them to dissociate with achievement and the related factors (Steele & Aronson, 1995). Additionally, Spencer, Logel, and Davies (2016) reported that

stereotype threat diminishes working memory capacity and leads to conscious attention paid to automatic skills, feelings of uncertainty, and underperformance by self-integrity.

In their original research on the topic, Steele and Aronson (1995) conducted a series of studies on the conditions surrounding stereotype threat in Black and White students. In one of them, Black and White students from Stanford University completed a challenge excerpt from the Graduate Record Examination (GRE) verbal test. Students were divided into diagnostic, non-diagnostic-only, and non-diagnostic-challenge groups. Diagnostic participants were informed prior to the test that it involved their performance in verbal reasoning skills and that they would receive feedback after their completion that would identify their personal strengths and weaknesses. The non-diagnostic groups were not told that it was a test of their verbal ability but just that they would receive feedback at the end. The non-diagnostic challenge group was also asked to put forth their best effort even though they would not be evaluated. The results showed that Black students performed worse than White students when they believed their ability was tested. When they had no indication that the test was reflective of their ability, their performance was equal to that of the White students. The researchers reasoned that participants' thoughts may interfere with their performance during tests. More specifically, stereotype threat is currently believed to account for 17-41% of the difference between non-Asian POC and Whites on the SAT (Spencer et al., 2016).

In a follow-up study, Steele and Aronson (1995) repeated the test from the first study with Black and White female undergraduate students from Stanford. For this version of the study, the participants had less time to complete the test, and it was

computerized. The computer recorded the amount of time participants took to complete test items. Participants were also asked to rate the extent of their guessing, their persistence on items, their time management, how frequently they reread items, how frequently they gave up in frustration, and the extent to which they thought the test was biased. Again, the Black participants in the diagnostic group performed worse than the Black participants in the non-diagnostic groups and White students in either group. Black participants also finished fewer items than White students, but that difference was not statistically significant. No difference appeared in any of the other measures used for the second study.

Their research led Steele and Aronson (1995) to ponder whether or not stereotype threat could significantly impact Black students' performance on the Scholastic Aptitude Test (SAT). They concluded that the answer is dependent upon the level of frustration associated with the SAT. Students who perceive that their skill level is appropriate for the test may be able to negate the stereotype threat on their own. However, students who do not perceive their skill level to be matched with the test may suffer in performance as a result of stereotype threat. The researchers doubted that stereotype threat could greatly reduce students' SAT scores because the students were not likely to be frustrated to that extent over the SAT. Furthermore, even if Black students' SAT scores were much lower than White students, their original study would have controlled for this difference making it irrelevant. However, their question has implications for other standardized tests of cognitive ability and other racial groups.

The original studies were conducted using Black and White students as participants, but no one is exempt from stereotype threat since everyone belongs to some group that has negative stereotypes assigned to it, whether it be based on race, sex, or some other social characteristic (Spencer et al., 2016). For example, Hispanic students have been shown to be affected by stereotype threat also (Rodríguez, 2014). In a study of 62 Hispanic college-bound students in a summer bridge program, Rodríguez (2014) found that students in a high-threat situation scored lower on an SAT excerpt than students in a low-threat situation, and the difference was statistically significant. Students in the high-threat situation read a segment of a news article on the achievement gap just prior to completing the SAT excerpt and were told that the task was measuring their academic ability. Students in the low-threat situation did not read the article and were told that the excerpt was being used as a pilot test to develop an instrument for future students. Rodríguez (2014) concluded that Hispanic students' standardized test performance suffered when they faced negative racial stereotypes.

While standardized tests are often used in admissions procedures in athletic training, a standardized test is also used as a gateway to certification. The BOC is an independently incorporated non-profit organization located in Omaha, Nebraska (Board of Certification, Inc., n.d.-e). The BOC is responsible for the initial credentialing of athletic trainers and establishing the guidelines for maintaining the athletic training certification (Board of Certification, Inc., 2016b). Since the initial administration of the BOC examination in 1970, the agency has credentialed more than 49,000 people as certified athletic trainers (Board of Certification, Inc., n.d.-d).

The BOC makes its national data and examination reports available annually on its website (Board of Certification, Inc., n.d.-c). The reports include the number and percentage of candidates who passed the examination as well as the number of candidates who were taking the examination for the first time as opposed to retake candidates. Previous researchers have provided even further insight on examination performance. In their studies, they have explored how variables such as route to candidacy, academic factors, and number of clinical hours completed have influenced or predicted pass rates on the BOC examination.

### **Variables Impacting Outcomes on the BOC Examination**

The certifying examination has been a subject of exploration almost as long as it has been in existence. The earliest study to examine outcomes on the examination took place when the NATA still had jurisdiction over certification and the BOC was just becoming an incorporated entity. Draper (1989) acknowledged that students had different methods of learning and aimed to determine whether or not the examination, which at the time was referred to as the NATA certification examination, was biased toward any one learning style. With permission from what was then the NATABOC, the researcher made arrangements for the distribution of the Babich and Randol's Learning Styles Inventory (LSI) (as cited in Draper, 1989) at fourteen out of sixteen testing sites just after candidates completed the examination for the January 1988 test date. The LSI was used to measure learning preferences in three areas: personal, social, and examination. Participants' personal learning preference could be one of three options: auditory, visual, or kinesthetic learners. Social learning preference was whether candidates were more



independent learners or group learners. Finally, the examination preference meant whether the candidate performed better on written or oral exams. Candidates were asked to complete the LSI and send the researcher a copy of their examination scores. Using NATA membership numbers, he was able to match candidates' LSI responses with their test scores, so that their confidentiality was maintained. Of the 372 candidates who received the LSI, 165 of them completed it, and 102 actually followed through with mailing their examination scores for a total of 102 participants with useable data.

Draper (1989) revealed that the majority (63%) of participants were independent learners. Additionally, 58% of the participants preferred written over oral exams, and 60% of the participants were classified as kinesthetic learners. The majority of participants (73%) chose reading as their mode of preparation for the examination. In comparing the participants' learning styles to their performances, those who preferred written exams scored significantly higher on the written portion than participants who preferred oral exams. The reverse was not true for the oral section. There was no significant difference on the oral section between participants who preferred written examinations and participants who preferred oral examinations. Participants with grade point averages of 3.5 or above scored significantly higher on the written portion than participants whose grade point averages were below 3.5. There was no relationship between grade point average and scores on the other sections of the examination, but this study was an early indication of a relationship between academic variables and outcomes on the certification examination.

Overall, there was no relationship between learning styles or number of clinical hours. The absence of a relationship between learning styles and outcomes was beneficial since no candidate would have any bias against him or her (Draper, 1989). This early study was also impactful for athletic training research as it set a precedent of comparing athletic training students to those in physical therapy and nursing. Later researchers in athletic training would follow Draper's lead and compare athletic training to other health care professions (Delwiche & Hall, 2007). Although, not a lot of emphasis was placed on it in the article, this was one of the earlier articles to acknowledge that the quantity of clinical experience hours did not influence outcomes on the examination. Ultimately, the route to certification was more influential over students' level of preparation than the number of hours. The discussion was timely since in the same year and month the study was conducted, the hour requirement for the NATA internship route was decreased from 1,800 to 1,500.

Historically, potential athletic trainers had the option to pursue athletic training certification via an internship route. If students were not enrolled in an athletic training programs with an approved curriculum, they could still become eligible to take the BOC examination by attending a four-year accredited institution and accruing a minimum of 1,800 internship hours, prior to 1988, under the supervision of a certified athletic trainer (Draper, 1989; Grace, 1999). Using BOC examination records from 1992 and 1993, Starkey and Henderson (1995) explored performance differences on the examination based on which route candidates took to eligibility. The examination had been administered nine times during the period for which they had records, and they looked at

the average scores for the examination's three sections. The written section of the examination was further analyzed into six performance domains. Of the 8,451 candidates in the dataset, approximately 39% had completed an approved program, and approximately 61% had completed an internship program. They excluded from the analyses any internship candidates who had had additional health care education geared toward another profession. The results revealed that the candidates who completed approved programs outperformed the internship route candidates on each section of the examination and in all six domains of the written section. These differences were statistically significant.

Although the study clearly showed a difference between curriculum and internship candidates' performance on the BOC examination, the researchers discussed the importance of considering other variables impacting the scores. At the time of the study, programs for both routes were differing requirements (Starkey & Henderson, 1995). For example, curriculum programs may have had athletic training as an individual major or in combination with another field of study, such as health or physical education. Variety among internship program attributes was even more prevalent because no agency had the responsibility of oversight for the internship route. Additionally, candidates who took the internship route may have had licensure or experience in other health care professions before seeking athletic training certification. With respect to academic requirements, approved curriculum programs were required to show evidence that they were addressing fourteen content areas with fewer required clinical experience hours, while internship candidates had more hands-on opportunities but were only required to

show evidence that they had completed seven specific courses (Searcy, 2006; Starkey & Henderson, 1995). Starkey and Henderson (1995) concluded that their findings raised even more questions, such as what the impact would be of specific academic models, department structures, other allied health education, and the percentage of clinical hours spent with certain types of activity. Ultimately, an NATA Education Task Force would make the decision to eliminate the internship route in favor of a more strategic and consistent model of clinical education (Kaminski, 2014; Weidner & Henning, 2002).

Shortly after the aforementioned study, Harrelson et al. (1997) investigated whether or not a combination of academic variables would predict candidates' performance on the BOC examination. They reasoned that with the knowledge to predict which candidates would be at risk of failing, interventions could be put in place to address specific issues. The participants were fifty-two athletic training students, mostly male, who were enrolled in the University of Southern Mississippi ATP from 1978 to 1992. All participants had taken the BOC examination and maintained a minimum grade point average of 2.5. Overall grade point average, athletic training grade point average, minor, minor grade point average, membership in a fraternity or sorority, ACT score, teaching or nonteaching degree, and number of semesters enrolled at the institution were the variables included for analyses. In addition to reviewing student records, the researchers surveyed participants via telephone when necessary.

Using multiple linear regression, the researchers ascertained that no one variable independently predicted success on the entire examination or the multiple sections of it (Harrelson et al., 1997). There were, however, statistically significant interrelationships

between overall grade point average, athletic training grade point average, minor grade point average, sex, membership in fraternity or sorority, ACT score, teaching or nonteaching degree, number of semesters enrolled, and the criterion variable, which was number of attempts on the BOC examination. They also used multiple discriminant analysis to identify a composite set of variables that would predict the criterion. In other words, the composite variables were relevant enough that the absence of any one of them would have changed the prediction outcome. The final group included overall grade point average, athletic training grade point average, minor grade point average, ACT score, and number of semesters enrolled at the institution. They surmised that none of the independent variables related individually to the criterion variable because the criterion used was the number of attempts as opposed to the examination score. Another possibility was that the independent variables did, in fact, not have a relationship to the examination or its sections. Of the variables that had interrelationships with the number of attempts on the examination, three of the five were grade point average variables, indicating that grade point average is a vital factor in candidates' performance on the BOC examination.

Harrelson et al. (1997) highlighted the important relationship that grade point average and other academic variables have to candidates' number of attempts on the BOC examination. Turocy et al. (2000) followed up with one of the earlier studies to explore the relationship between clinical experiences, the number of clinical hours, and outcomes on the BOC examination. Clinical education is a required element of athletic training education. At the time of their study, there was significant variation between how

programs assessed their students' clinical education. Two requirements that were consistent were the number of clinical hours and supervision by a certified athletic trainer. The researchers examined whether or not these requirements in combination with certain student variables would predict outcomes for first-time candidates on the BOC examination.

The dataset used for the Turocy et al. (2000) study included examination information for 269 first-time candidates who were tested in either June or November 1993. The numbers of candidates for the curriculum or internship routes were approximately equal. Candidates reported a range of clinical experience hours completed, with the maximum number being 4,500. The mean hours reported was 1,759 with most candidates reporting somewhere between 1,400 and 2,000 hours. After an in-depth look, the researchers determined that candidates who reported approximately 400 hours above the minimum requirement, regardless of candidacy route, had a higher passing rate than candidates who met the minimum number of hours or exceeded the minimum by more than 400 hours. However, the total number of clinical hours did not predict scores on the BOC examination or any of its individual sections. The researchers also included exposure to individual high-risk sports in their analyses, and none of the sports investigated were predictive of outcomes. Wrestling and field hockey had significant findings for the written section and oral/practical section, respectively, but the percentages of variance were too small for the sports to be considered predictive. Age also had a relationship to candidates' scores on the oral/practical section of the

examination, but again, the variance in scores was too small to indicate that age was actually predictive.

Overall, neither the number of clinical experience hours nor the specific high-risk sports were able to predict candidates' outcomes on the BOC examination. This finding seemed to be somewhat surprising as football had traditionally been considered a prime opportunity for students to gain clinical experience, but football had no relationship to candidates' outcomes. A possible explanation is that football programs are likely to have full-time athletic trainers providing health care and making decisions. The availability of professional staff would limit students' opportunities to engage in critical thinking, decision-making, and implementing their skills on actual patients. Although age was also not found to be predictive, the researchers did note that older candidates tended to perform better on the oral/practical section of the examination. The researchers inferred that older candidates were probably able to apply concrete information more effectively and rely on past real-life stressful situations to manage their stress better on that portion of the examination (Turocy et al. 2000).

Continuing the trend of researching academic and clinical education variables, Middlemas et al. (2001), requested access to the examination records for 1,360 first time BOC examination candidates attempting the examination during April and June 1998. Consent forms were received from 270 candidates. Of the 270 participants, approximately 53% had taken the curriculum route, and approximately 47% had taken the internship route. Prior to attempting the examination, each participant completed a personal data form that included information on sex, overall grade point average, number

of clinical education hours, and route to candidacy. After the examination, the researchers received the scores of each participant and whether or not the individual passed or failed. For this study, participants were scored as passing if they passed all three parts. If participants did not pass all three parts, their score was considered failing.

The researchers used a two-way analysis of variance (ANOVA) to investigate a possible significant difference between candidates' mean scores by route to candidacy and sex and whether or not an interaction was present between the two variables. In addition, they used multiple regression analyses to determine if the outcome on the three sections of the examination could be predicted from grade point average and number of completed clinical hours. No statistically significant differences were present between candidates' mean scores based on route to eligibility or sex. Also, no statistically significant difference was present between curriculum and internship candidates in the regression analysis. However, a statistically significant interaction was present, indicating that there was a difference in predictive ability of curriculum or internship candidates' passing status using grade point average and number of clinical hours as predictors.

The findings of this study were indicative that candidates who became eligible for the BOC examination via the curriculum route scored higher on the written and practical portions than candidates who took the internship route. Middlemas et al. (2001)'s findings were consistent with those of Starkey and Henderson (1995) and Turocy et al. (2000). Also, grade point average and scores on all three sections of the examination were positively correlated. In other words, students with higher grades were more likely to pass the examination than candidates with lower grades. There was no statistically



significant difference based on the number of clinical hours completed, which led the researchers to support the NATA Education Council's stand to adopt a competency-based model of clinical education in lieu of a count of the number of hours completed. The researchers advocated for using information about students' strengths and weaknesses to provide early intervention and improve the likelihood that students could pass the examination.

Searcy (2006) took a more detailed look at elements of athletic training clinical education experiences. The study had multiple purposes, including determining what clinical experience factors are related to BOC examination performance. He randomly surveyed 752 certified athletic trainers who passed the entire examination, either on the first attempt or in a subsequent attempt, in 2005. A total of 212 participants responded. Nearly 80% of participants had engaged in some type of clinical experience prior to formal admission in the ATP. Participants also reported being involved in clinical experiences for a range of semesters. The minimum number of semesters reported was four, and the maximum number was seven. Most participants, approximately 68%, reported receiving course credit associated with one course for the clinical experience hours. Out of all the participants, only one had never experienced the intercollegiate setting as part of the clinical experience. Approximately 93% of participants used oral or practical simulations as their primary method for practicing clinical skills. Half of the participants reported having a 3.5 or higher grade point average, and approximately 34 percent reported having a grade point average between 3.2 and 3.4.

The analyses included descriptive statistics, multiple analysis of variance (MANOVA), and logistic regression in this study. One finding was that athletic trainers who passed the entire examination on the first attempt were enrolled in clinical experiences for slightly fewer terms and had slightly fewer clinical experiences, on average, than athletic trainers who did not pass all parts of the examination on the first attempt. The researcher also examined a number of variables in relationship to passing the written simulation and practical parts of the examination, including number of pre-admission clinical hours, number of skill evaluations per semester, starting point of clinical experiences, and grade point average. Only grade point average was statistically significant. Additionally, as a result of the logistic regression analyses, the researcher decided that only two predictors, overall grade point average and the starting point for clinical experiences, should be retained in the model to achieve the highest accurate prediction of passing outcomes on the written simulation and practical examination sections. Specifically, likelihood of passing those two sections increased by 1.403 times for each one-unit increase in grade point average, and students who began their clinical experiences later were 0.781 times more likely to fail the two sections on the first attempt. The researcher concluded that having more than two clinical settings, a higher grade point average, and an early starting point for clinical experiences were all positively associated with outcomes on the written simulation and practical portions of the BOC examination.

Hickman (2010) studied characteristics of ATPs and students to see if they had relationships to passing outcomes on the BOC examination. She surveyed twenty-four

graduates who completed six different ATPs between 2007 and 2010. Ten of the participants had passed the BOC examination on their initial attempts. She completed three separate analyses to find relationships between passing outcomes on the BOC examination and ATP demographics, characteristics specific to football clinical experiences, and student demographics. For the ATP and football variables, there were no relationships with passing the BOC examination, which was consistent with Searcy's (2006) research. Similar to Turocy et al.'s (2000) findings, there was also no statistically significant relationship between age and passing the BOC examination.

### **Predictors of Passing Outcomes on Health Care Professions' Certification**

#### **Examinations**

The present study included a combination of demographic variables at individual and institutional levels that has not been seen in previously published athletic training research. Studies focused on the BOC examination have not included the demographic variables race, sex, or geographic location as predictors of candidates' performance on the BOC examination. In the instance where demographic variables have been included, they were used merely for descriptive purposes (Turocy et al., 2000). Other health care professions have surpassed athletic training in that they have already begun to explore how race, ethnicity, and other demographic variables may influence outcomes on their certification examinations.

Past research has supported the notion that nonacademic variables may have greater importance in certain populations. For example, academic variables have been shown to be worse predictors of performance for Black students than White students.

Webb et al. (1997) studied the influence of nonacademic variables on students' performance at two medical schools. School A was a predominantly White institution (PWI) that was historically geared toward women. School B was a historically black college or university (HBCU). Study participants from School A totaled 104, and participants from School B totaled 102. In the fall 1992 semester, the students completed the Revised Nonacademic Variables Questionnaire. The researchers also collected data on students' undergraduate grade point average, MCAT score, competitiveness of their undergraduate institutions as rated by The Gourman Report, and scores on the US Medical Licensure Examination Step I (USMLE I). The racial compositions of the two schools differed, and students from School A were, on average, slightly older than students at School B. There was no significant difference between the mean undergraduate grade point averages of the participants for the two schools. However, there were significant differences between their MCAT scores and current grade point averages. School A had the higher mean of the two schools for both variables.

Sex and race differences were prominent among the nonacademic variables used in the Webb et al. (1997) study. At School A, leadership/decisiveness had a significant correlation to scores on the medical school board examinations and with students' grades in all except one semester. Because School A was historically a women's medical school, the researchers suspected that the culture was one that promoted women's development of leadership qualities and that female students who were successful had been able to thrive in that environment. There was also the interesting finding that at School A, neither academic nor nonacademic variables had any bearing on Black students' grades or

examination scores. The opposite was true for School B with both types of variables impacting Black students' grades and performance on board scores.

Because of the inconsistent findings from study to study, first-time examination success cannot be ascribed to one particular set of predictor variables (Alameida et al., 2011). However, educators are interested in identifying what factors put students at-risk, so that proper interventions can be implemented early. Research findings can aid in decision-making about what interventions are appropriate and how policies might be influenced (Alexander et al., 2009; Webb et al., 1997). Thus, new research must examine nonacademic variables and how they impact professional licensing or board exams. The following studies provide precedent for how ethnicity, age, gender, type of control, student population type, and geographic location have been previously studied.

**Race.** Race and ethnicity are somewhat controversial variables in that there is no standard for how to use them in scientific study (Bhopal, 2004). According to Bhopal (2004), the terms are different, yet often used interchangeably as part of an unfortunate trend, especially in the United States. A number of researchers in health care fields outside of athletic training have looked at race or ethnicity and their impact on the overall diversity of those professions as well as how they might influence candidates' performance on standardized tests. Previous researchers have found that race or ethnicity could be related to passing outcomes on licensure exams. Physical therapy is one example of a health care profession where race is a factor.

Utzman et al. (2007) conducted a study to determine if admissions information data on physical therapy students would identify students at risk for failing the National

Physical Therapy Examination (NPTE). The sample included data on 3,585 students from 20 different physical therapy education programs. Each student was coded as pass or fail for the dependent variable. Independent variables included information on the students' grade point averages, verbal and quantitative GRE scores, and demographics about the students and institutions, provided by the program directors. The researchers discovered that race or ethnicity made a significant contribution to the model. In fact, Blacks, Asian/Pacific Islanders, and candidates who identified as other were 200% more likely to fail the NPTE than White/non-Hispanic or Hispanic candidates. Of all the student demographic variables included in this study, race or ethnicity was the only significant predictor in the final model. The researchers offered that perhaps the increased likelihood of failure for some groups was related to other factors that were not measured in the study.

Shiyko and Pappas (2009) encountered contradictory findings in a study exploring which variables were predictors of academic performance in a Doctor of Physical Therapy (DPT) program. The study was conducted in a program that had a large ethnically diverse population of students who had all entered the program between 2003 and 2006. The two dependent variables were first-year grade point average in the graduate program and academic status, which referred to whether or not the student had been placed on probation or dismissed from the program entirely. A number of independent variables were included for analysis, such as GRE scores for each section, graduate school grade point average, undergraduate overall grade point average, undergraduate science grade point average, admission scores for the DPT program, age,

gender, and minority status. The researchers detected no significant difference among ethnic groups, which was in contrast to previous literature (Utzman et al., 2007). Shiyko and Pappas (2009) surmised that the lack of difference between groups may have been the consequence of studying a diverse student population in a program which also reflected its institution's diversity (Shiyko & Pappas, 2009). Additionally, the population was in a doctoral program compared to undergraduate or master's programs in other health care professions.

Mixed findings have also appeared in nursing research with some researchers finding that race or ethnicity may predict success on the National Council Licensing Examination for Registered Nurses (NCLEX-RN) and others finding no indication. Haas et al. (2004) investigated whether or not a number of variables, including race, would predict success on the NCLEX-RN. They found that pass rates differed significantly based on racial groups. Hispanic candidates passed at the highest rate, but their limited presence, with only two participants in the sample, is important to note. White candidates had the next highest pass rate, followed by Black and Asian candidates. The Asian population was also small, so generalizability was limited with respect to Hispanic and Asian students. Black candidates failed the NCLEX-RN at a significantly higher rate than White candidates.

Similar findings resulted from a study on predictors of success on the National Council Licensing Examination for Practical Nurses (NCLEX-PN), which is a different version of the nursing licensure examination. Lamm and McDaniel (2000) investigated demographic, academic, and aptitude variables to determine if they would predict

candidates' performance on the NCLEX-PN. Their data included academic records for 667 nursing students who graduated between 1992 and 1996. Using logistic regression analysis, the researchers determined that race was the only demographic variable that predicted success on the NCLEX-PN. Specifically, Black candidates failed at a rate significantly higher than that of the White candidates. No other ethnic groups were included in the analysis since there were too few students from other groups in the sample.

Endres (1997) conducted one of few earlier studies that compared differences in predictors on the NCLEX-RN between ethnically diverse groups born in the United States and those born internationally. The researcher looked at students' grade point averages at different points in their nursing programs, rank on the Mosby Assess Test, age, number of semesters it took to complete the curriculum, any prior nursing licensure, and the number of Ds or Fs earned in nursing courses. She observed no significant differences in pass or fail rates based on membership in the Black, internationally born, or White group. However, there was the noteworthy discovery that Black students had the lowest grade point averages at every point in the program of all three groups. Students born internationally had significantly lower grade point averages than Whites, but still higher than Blacks, for the medical-surgical nursing checkpoint only. The study may not have revealed different findings because other variables were acting as moderators between ethnicity and performance on licensing examinations. Moderating variables are likely to be responsible for mixed findings in reference to other nonacademic factors as well.



**Age.** Age has appeared in athletic training research as a variable to predict success, but difference among groups has usually not been significant (Hickman et al., 2010; Turocy et al., 2000). In a DPT program, however, age was a significant predictor of students' success (Shiyko & Pappas, 2009). Age and academic performance were inversely related, meaning the older students performed more poorly than younger students. This finding is also consistent with the research from Utzman et al. (2007) but contradictory to a study by Kosmahl (2005). Kosmahl (2005) ascertained that age was not a predictor of students' success on the NPTE. The difference among the studies is important to note. Shiyko and Pappas (2009) were studying overall academic performance in a DPT program, while Utzman et al. (2007) and Kosmahl (2005) were studying performance on the NPTE.

The national trend seems to be that physical therapy education programs have fallen short of creating an environment where students of varying ages can succeed (Shiyko & Pappas, 2009). In athletic training, however, for the one study that found age-based differences, albeit non-significant, older students performed better on one particular section (Turocy et al., 2000). Yet, there is no update on how these findings may have changed since the examination has transitioned to be fully computerized. Researchers should continue to explore age as a predictor of performance for identification of at-risk groups to aid them throughout their programs, and assist them in obtaining licensure.

**Sex.** As with other demographic variables, sex has been inconsistent as a predictor on health care certification examinations. In athletic training research, sex has predicted

performance in some research but not in others (Harrelson et al., 1997; Middlemas et al., 2001). The results in nursing research have been equally conflicting. In a study of the University of Delaware's nursing program, sex was included among twenty other variables to predict students' success on the NCLEX-RN (Beeman & Waterhouse, 2001). The researchers examined the computerized academic records of 538 students who graduated between 1995 and 1998. Other predictor variables included graduation year and age, whether the program was traditional or accelerated, SAT scores, science course grades, and nursing course grades. Using discriminant function analysis, the researchers classified participants into groups based on whether they passed or failed the NCLEX-RN. Sex was not among the significant predictors in making accurate classifications.

On the contrary, Haas et al. (2004) also used discriminant function analysis and had a unique finding that sex was a significant predictor of which students passed and which students failed the NCLEX-RN. The rate at which males failed the examination was significantly higher than the rate at which females failed. Research on male nursing students' experiences is fairly new, so more studies are needed before making generalizations about gender.

Additionally, with respect to athletic training, the composition of the profession has changed significantly over the last decade and a half. In 2000, males made up the majority of the athletic training profession at 56%; by 2013, females made up the majority at 52% (Board of Certification, n.d.-d). The profession and preparation for it have changed since Middlemas et al. (2001) found no difference between males and females on the BOC examination, including how the examination is administered. The

only route to certification is through an accredited program. An implication is that more attention should be directed toward nonacademic variables, especially since the examination format has changed.

**Funding type.** Individual variables are not the only factors to consider when looking at what influenced examination outcomes. Whether an institution is public or private has some impact on the quality of overall experience that students receive, and that impact may carry over into a health care profession standardized examination. Funding type is often used as a variable in higher education research because of its availability (Ro et al., 2013). To date, funding type has only been used in athletic training research to describe a sample, but other health care researchers have examined it as a potential predictor of outcomes (Turocy et al., 2000). In physical therapy and physical therapy assistant programs, however, funding type is negatively related to an institution's private status (Gresham, 2013). Also, Maring and Costello (2009) studied physical therapist assistant (PTA) programs to see how student and institutional factors would influence pass rates on the NPTE PTA. They surveyed the directors of the 233 programs that were accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE) in 2006 on variables commonly researched in nursing and physical therapy and reviewed annual program data sent to CAPTE. Funding type, which they referred to as program setting, was one of the variables of interest. Of the 233 programs that were contacted, 55 surveys were returned. Several programs were located in states where the NPTE was not a requirement in 2006; thus, the final total of useable surveys was 50. Of the institutions participating, 90 percent of them were public, and 10 percent were

private. The type of institution and the first-time pass rate were significantly correlated. The private institutions that participated had lower first-time and overall pass rates. Their class sizes were larger, their students received fewer credits for completing clinical education, and general education credits made up a larger portion of the overall curriculum.

Maring and Costello (2009) reasoned that the institution's funding type likely had such a significant impact because the participating programs housed in public schools placed more emphasis on technical education than general education compared to private institutions. Also, the larger class sizes in the private institutions may have been indicative of "a less competitive selection process" (p. 8). The small number of private institutions may have also been a limitation. The researchers felt that their sample was largely representative of the population of PTA programs, but there is still a possibility that the sample programs and population programs differed on certain variables.

In a study of 200 physical therapy programs, Gresham (2013) conducted a post-hoc secondary analysis to determine how institutional and programmatic variables impacted pass rates on the NPTE and NPTE PTA and graduation rates. She received data from the CAPTE on program pass rates for the years 2011 and 2012 individually and the overall pass rate for the three-year period 2009-2011. Independent variables included characteristics of the programs and institutions, such as the length of program, number of weeks of clinical experience, cost of the program per student, laboratory space per student, student-to-faculty ratio, and faculty turnover.

The researcher used regression analyses to determine a prediction model for the pass rates and graduation rates. Faculty turnover was the only significant predictor of all outcomes. The number of weeks spent in clinical education was a predictor for graduation rates, overall pass rate, and the 2012 pass rate, but not the 2011 rate. Institutional status was the strongest predictor that had relationships with all three types of pass rates in this study. Private-for-profit institutions had significantly lower pass rates than those of private institutions not-for-profit or public institutions. The relationship between private for-profit status and pass rates was small, but it was consistent across all three pass rates. A small inverse relationship was also present between the program cost per student and the ultimate pass rate. In addition to providing insight about nonacademic variables and their impact on performance, this finding would also benefit potential students and their families as they evaluate programs. A higher cost does not always indicate a better experience (Gresham, 2013).

**Institution type.** Institutional type has frequently been included in research on diversity. College was originally an endeavor restricted to White males, but eventually historically Black colleges and universities (HBCUs), Hispanic-serving institutions (HSIs), normal schools, community colleges, and tribal colleges would increase access to higher education for underrepresented minority populations (Allen, 1992; Laden, 2004; Thelin, 2011; Volberding, 2011). PWIs are institutions with an enrollment of 50 percent or greater of White students (Chen et al., 2014). HBCUs were defined by the Higher Education Act of 1965 (2013) as accredited institutions existing primarily to educate Black Americans. A point of pride for HBCUs is that they largely enroll students who

may not have gone to college otherwise (Allen, 1992). They have also been responsible for the education and preparation of a number of Blacks in science and health fields, which makes them allies in the struggle against health care disparities (Akinmoladun, 2009). Seven years ago, Hinton et al. (2010) reported that Black students who attended HBCUs were more likely to enter health professions than Black students who attended non-HBCUs. HSIs are colleges or universities that serve a population of 25% or greater who self-identify as Hispanic or Latino (Laden, 2004). Unlike HBCUs, HSIs were not created specifically to serve the population of Hispanic and Latino students in higher education. Instead, they emerged over the last few decades as institutions that served these populations because of their geographic proximity (Laden, 2001).

None of the available research on the BOC examination addresses how the institution type may impact candidates' performance. One notable study by Allen (1992) reported that Black students attending HBCUs had higher academic achievement than Black students attending PWIs. The study involved students from sixteen institutions, and the participants represented a variety of academic majors. The expectation at the time of the study was that Black students at HBCUs had fewer financial resources, lower grade point averages, and lower standardized test scores compared to their Black and White counterparts at PWIs. The void in the health care professions research on student population type is indication that more research is necessary on the type of environment most conducive to the success of students of color; the assumption that a PWI is a universally poor fit is inaccurate (Hurtado, 2007). Reversely, research should include exploration of how "special-purpose" (Volberding, 2011, p. 44) institutions impact

performance outcomes as well. In one instance, students at an HSI were negatively impacted on the NPTE.

A study of physical therapy students enrolled in a program at the University of Texas El Paso revealed that speaking English as a second language (ESL) was a significant predictor of failure on the NPTE (Dillon & Tomaka, 2010). This study was the first research of physical therapy education programs conducted at an institution specifically for a Hispanic population. The sample was comprised of 72 students who had graduated from the physical therapy education master's program during 2004-2007. The students' admission records and physical therapy program records were reviewed for information on their age, gender, GRE scores, pre-admission grade point average, physical therapy grade point average, ESL status, and NPTE score. The variables under investigation also included the institution's overall NPTE pass rate and first-time pass rate.

Dillon and Tomaka's (2010) identified positive correlations between many of the variables. However, ESL status and GRE verbal scores had a negative correlation. With respect to examination outcomes, the ESL variable was a significant predictor of success on the NPTE, but the relationship was negative. The ESL predictor also approached significance for NPTE scores, but again, the impact was a negative one. Anecdotally, the researchers learned that students who had not passed the NPTE on the initial attempt and primarily spoke Spanish reported not having enough time to complete the examination. Additionally, since the ESL status and GRE verbal scores were inversely related, the pattern suggests that a command of English verbal skills is necessary to succeed on

standardized exams. Further research on spanning across multiple varieties of student populations may provide additional insight on whether or not the type of institution predicts performance. This type of study is especially important for ethnically diverse populations since they are known to have poorer predictions with nonacademic variables (Webb et al., 1997).

**Geographic location.** Geographic location is another nonacademic variable that appears repeatedly in literature on health care preparation programs and standardized examinations, especially in medicine. Geographic information is vital to generalizability in studies that focus on predicting or improving examination outcomes (Pennington & Spurlock, 2010). Further, health care research includes discussion about how geographic location plays a role in perpetuating health disparities (Adler & Rehkopf, 2008; Komaromy et al., 1996; Smedley et al., 2003). Additional research on how geographic location impacts certification examination outcomes could potentially add more insight to that discussion.

Although the focus was not on a certification or licensure examination, one study did note that geographic location made a difference to medical school students. Over the course of two years, 294 medical school students were assigned by lottery to one of 17 teaching sites for a five-week primary care experience through the Columbia University College of Physicians and Surgeons (Irigoyen et al., 1999). Of the 17 sites, 11 were classified as urban, four as suburban, and two as rural. The participants completed a student satisfaction survey at the end of the five-week experience, called a clerkship. Preceptors who supervised the clerkship also scored their students' performance on a



standardized patient examination. There was no significant relationship between geographic location and student performance; however, students rated rural sites the most favorable of all, followed by urban sites. Students who were placed at rural sites reported seeing more patients than students at urban or suburban sites. Geographic location also had a significant relationship with the overall experience, faculty attitude and supervision, and the diversity of patients seen. In the Utzman et al. (2007) study, NPTE candidates who attended southern institutions were 1.8 times more likely to fail the examination than their counterparts at northeastern institutions. These findings are relevant to athletic training education because athletic training students are also assigned to clinical education experiences in various locales. If geographic location is able to predict performance on the BOC examination, the implication for educators would be a more conscious decision about making sure that students are not disadvantaged by being repeatedly assigned to the type of site inversely related to BOC performance.

Predicting the outcome of any licensure examination is difficult because of all the psychosocial variables that researchers cannot control or measure, such as amount of rest, stress level, or amount of preparation (Dillon & Tomaka, 2010). Additionally, there is not an abundance of research that addresses how the relationship between individual-level independent variables and examination outcomes differ when the institution-level variables are considered. However, predicting performance on these types of examinations is important for stakeholders, such as administrators and potential students, who will use passing rates to evaluate program effectiveness. More importantly, prediction studies also help identify at-risk students. Knowledge of who is at-risk is

useful in implementing early intervention (Alameida et al., 2011; Alexander et al., 2009; Barr et al., 2008); De Lima et al., 2011; Grumbach & Mendoza, 2008; Haas et al., 2004).

### **Demographic Profiles of Athletic Training (DPAT)**

Having demographic profiles of ATPs is convenient for comparing and contrasting multiple programs. Institutional profiles were gathered previously, just after the BOC examination moved to a computerized format (Rich, Kedrowski, & Richter, 2008). The purpose at that time was to collect and organize information that was not readily available via CAATE. A secondary purpose was to enumerate the number of institutions with athletic training majors. Building demographic profiles of athletic training reveals patterns beyond the basic institutional characteristics, such as funding type or institution type. Knowing a program's minimum required grade point average along with whether a secondary admissions process is required, the ratio of POC accepted as students to POC applying, and whether or not there is a maximum enrollment allowed can provide insight about how or why these students do not progress to BOC examination eligibility. In the present study, the purpose of the DPAT Survey was to gather information that could identify means of filtering students of color out of ATPs before they reach eligibility for the BOC examination.

In a qualitative study of the perceptions of secondary admissions processes, some program directors favored such a process because it gave potential ATP students and faculty time to get to know each other (Bowman, Mazerolle, & Dodge, 2016). They also perceived that students had time to decide if the program was a fit for them. Initially, the

period of becoming acquainted seems like a good idea. However, students of color may be at a disadvantage because of racial and ethnic stratification of social capital.

Inequality of social capital is present when individuals in one group are socially located in disadvantaged positions (Lin, 2000). People tend to affiliate with others who have similar attributes. When these two phenomena work together, social capital is differentially accessible to certain groups. If students of color in ATPs are among the socially disadvantaged at their institutions, they could have a more difficult time forming relationships with faculty and staff who possess social capital. To compound inequality of social capital even further, faculty and staff may have unfair perceptions of students of color as was the case in one physical therapy education study. In a survey of 216 physical therapy clinical instructors, some participants revealed that they expected students of color to perform worse than White students (Clouten, Homma, & Shimada, 2006). Although only four percent admitted these lower expectations, the result was statistically significant. Furthermore, students of color were not reported to have more weaknesses, but they were reported to have different types of weaknesses. White students were more likely to have weaknesses with time or stress management than students of color. Students of color were more likely than White students to be reported as having issues with communication. In a study of frustrations held by graduates of ATPs, participants named stressful interactions with faculty and preceptors as one of their frustrations with lack of communication as the underlying complaint (Bowman & Dodge, 2013). Based on the findings from Clouten, Homma, and Shimada (2006), students of color are doubly impeded since in addition to the lack of communication, their preceptors likely perceive

the students' communication as the cause of the problem. If ATP faculty and staff hold these perceptions, the lower expectations could impact students and faculty getting to know each other prior to a secondary admissions process and ultimately harm students of color' chances of being accepted into the ATP.

Mentorship from one's own ethnic community is not a requirement, but students do find value in it. Researchers conducted a qualitative study to explore the experiences of students of color at predominantly White institutions and found that students considered sharing racial background or similar experiences with institutional agents important (Museus & Neville, 2012). As discussed by Siple et al. (2015), Black female athletic trainers placed so much importance on the mentorship component that without it, several believed they may not have continued in the profession. Akinmoladun (2009) advocated for the aggressive recruitment and hiring of ethnically diverse faculty, so they will be available to students of color for mentorship.

This chapter contained relevant literature from athletic training and other health care professions, including barriers students of color face and what variables have been researched as predictors. In Chapter Three, the methods employed for this study are described thoroughly.

## **Chapter Three**

In Chapter Three, the methods that were used in this study are described. The purpose was to address the following questions:

- 1) Do individual (race, age, sex) and institutional (funding type, institution type, geographic location) factors predict candidates' performance on the Board of Certification for the Athletic Trainer (BOC) examination?
- 2) Do institutions' demographic profiles of athletic training (number of years since initial accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color) predict pass rates on the BOC examination for people of color (POC)?

The first research question was addressed using a secondary analysis of data from BOC examination candidates. The second research question was addressed via survey data collection from athletic training program directors (ATPDs) and other associated faculty of professional athletic training programs (ATPs).

### **Research Design**

A two-part design was required to address the two research questions, and each part is described individually. A secondary analysis of a quantitative dataset was used to

address research question #1. The quantitative dataset contained 24,045 records of demographic information about candidates who attempted the BOC examination to become certified athletic trainers between February 2012 and June 2016. The secondary dataset contained individual- and institutional-level data for the investigation of the influence of demographic variables on candidates' performance on the BOC examination from 346 athletic training programs.

A non-experimental cross-sectional survey was used to gather data from ATPDs, clinical education coordinators, and other faculty members from 170 athletic training programs to address research question #2. The responses collected were used to create demographic profiles of athletic training programs, which were used to try to predict the 2015-2016 pass rates for people of color on the BOC examination. The survey was focused only on academic year 2015-2016 in an attempt to gather the most accurate information since it was the most recent year for which data on pass rates was available in the secondary dataset.

### **Secondary Data Analysis**

This section includes a description of the sample and measure that were used to address research question #1. The BOC candidate dataset is described first, followed by a summary of the BOC examination and the variables used in this study.

**BOC candidate dataset.** The BOC candidate dataset was acquired directly from the BOC and contained demographic information for every individual who attempted the examination between February 2012 and June 2016 in the United States. Candidates are individuals who have graduated from or are in their final semester of an athletic training

program accredited by the Commission on Accreditation of Athletic Training Education (CAATE) and have registered to take the examination. The information collected included candidate identification numbers, sex, dates of birth, dates of examination attempts, whether an attempt was the first or a subsequent one, and the candidates' examination results. Although the BOC examination application uses the terms 'gender' and 'ethnicity,' the options to choose from are consistent with options on the United States Census (United States Census Bureau, 2015). To be consistent with the census database, the present study uses the terminology sex and race as variables in lieu of gender and ethnicity. Aside from the results and candidate identification numbers which were assigned by the BOC, all information contained in the dataset was provided by candidates at the time of their electronic examination registration on the BOC website.

The original dataset was in the form of a Microsoft Excel spreadsheet but was later converted to a Statistical Packages for the Social Sciences (SPSS) file. The sample was drawn from a population that included two types of examination candidates. The first type consisted of individuals from the United States, Canada, and Ireland who were attempting the examination to obtain initial certification as an athletic trainer. The second type consisted of reinstatement candidates who had previously been certified but were retaking the examination after a lapse in certification. Reinstatement candidates and candidates from Canada or Ireland taking the examination as part of a mutual recognition arrangement between the BOC and their national organizations were excluded from the sample. Employees in the information technology department of the BOC who handle data requests were responsible for assembling the dataset and confirmed that

reinstatement candidates and those from Canada or Ireland had not been included in the dataset before it was mailed electronically as a Microsoft Excel file.

The dataset that was used for this study contained 24,045 cases of national BOC examination data for the period between February 2012 and June 2016. Of this total, 18,483 cases were candidates attempting the BOC examination for the first time, while 5,562 of the cases were subsequent attempts. Only the first time attempts were selected for analyses in order to avoid the variation in number of subsequent attempts among candidates and to be consistent with previous athletic training literature (Hickman, 2010; Middlemas et al., 2001; Murray, 2014). Additionally, candidates were only included if they attended an institution with an average of five candidates attempting the examination per year; thus, 356 candidates were removed leaving a total of 346 institutions represented in the dataset. On average, 3,625.4 ( $SD = 191.68$ ; median = 3,579) first-time candidates attempted the examination yearly between February 2012 and June 2016. Five was chosen as the cut-off for several reasons. First, all of the institutions that had an average of five or more candidates had multiple candidates attempting the examination during each calendar year. The institutions that did not make the cut-off sometimes had several years in which no candidates attempted. Additionally, institutions that had fewer than five candidates were generally new programs, programs that were in the process of voluntarily withdrawing accreditation, or programs that had already voluntarily withdrawn accreditation. The final  $N$  was reduced to 18,127 after three outliers were removed during data cleaning. The data cleaning procedures are described in detail later in this chapter.



**Measure.** The dependent measure used for research question #1 was students' performance on the BOC examination. Demographic information of students and ATPs was also obtained from the BOC dataset.

***Board of Certification examination.*** Candidates' first time performance on the BOC examination was the dependent variable for the first research question of the present study. Performance was a dichotomous variable originally with string responses written as pass or fail. Candidates who failed were the reference group. Candidates who passed ( $n = 14,976$ ) were recoded as 0, and candidates who failed ( $n = 3,151$ ) were recoded as 1. The examination is offered five times per year. With partial data from 2016, this sample covered 23 examination administrations. The BOC examination transitioned in 2007 to a fully computerized version, so the sample for this study is only generalizable to the population who attempted the examination in 2007 or later.

The BOC examination assesses candidates on their knowledge of the five domains of athletic training: injury/illness prevention and wellness protection; clinical evaluation and diagnosis; immediate and emergency care; treatment and rehabilitation; and organizational and professional health and well-being (National Athletic Trainers' Association, 2010). The BOC works in conjunction with the certification and licensing examination administration company, Castle Worldwide, Incorporated, to ensure that the examination adheres to standards and guidelines set forth by the American Educational Research Association's *Standards for Educational and Psychological Testing* (Board of Certification, 2010). The process for examination validation takes place periodically and includes a review of the tasks and domains associated with athletic training. The most

recent review took place in October 2008 and was the foundation for the sixth role delineation and practice analysis study.

First, BOC examination writers and Castle developers reviewed the previous role delineation study along with candidate feedback to identify problematic examination items (Johnson, 2010). Then, they formulated a panel of twenty-three subject matter experts from different regions of the United States to review those items over a three-day period. The experts were male and female and represented a variety of ages, work settings, and years of experience. Their races were not specified. They created a list of tasks that athletic trainers regularly do and developed the list into a 33-item validation survey that was sent to a random sample of eligible certified athletic trainers. To be deemed eligible, an athletic trainer had to have been certified for three to seven years, as this was believed to be the time period in which athletic trainers would be most likely to be familiar with the requirements and demands of the profession. Of the 20,342 people who were certified athletic trainers at the time of the survey, 7,255 had been certified for three to seven years, and 5,000 (69%) were randomly selected to participate. The respondents were compared to the overall pool of certified athletic trainers on geographic location, years of certification, and practice setting. Overall, the respondents were representative of the eligible population in geographic location and years certified, but there was under and over representation of various practice settings. The overall response rate for the survey was 23%, and the respondents indicated that the majority of tasks and domains were “appropriate for inclusion on a competency test for entry-level athletic trainers” (Johnson, 2010, p. 3).

Using the most recent role delineation study, volunteer examination writers comprised of athletic trainers from a variety of practice settings developed the items that ultimately constitute the BOC examination (Board of Certification, n.d.-f). Each item includes a stem, the correct response, and multiple distractors. Items must meet several guidelines, as prescribed by the BOC style guide, to maintain standardization of the overall examination (Board of Certification, 2012). For example, all items are written as questions, and only one concept may be tested at a time. Items are written in third-person active voice including all information that is relevant to answering the question. The style guide also addresses cultural sensitivity, requiring that examination writers strive for inclusion of all sex and racial groups and avoid bias and stereotyping. Items should avoid characteristics that may result in varying responses from people of different groups and may not contain material that offends, demeans, or elicits an emotional response from candidates.

Candidates have four hours to complete 175 items on the BOC examination (Board of Certification, n.d.-b). The examination includes a combination of multiple choice, drag-and-drop, simulation, and multi-select questions, as well as focused scenarios with five associated questions. The passing point of the examination is determined using a criterion-referenced approach known as the Angoff Modified Technique. The original Angoff technique was used to identify cultural differences by analyzing test by racial group interactions. The method was not formulated to detect test bias, but has been useful in building comparisons among varying racial, ethnic, and regional groups (Angoff, 1972). The Angoff technique requires that an individual acting

as judge reviews an entire examination with a hypothetical minimally competent person in mind and assigns a score of 1 to each question this hypothetical person would answer correctly and a score of 0 to each item the person would answer incorrectly (Angoff, 1971). After adding all the ones, the total equates to that examination's minimally acceptable score. In the modified version of the technique, the judge would indicate the probability that the minimally competent person would answer the question correctly.

The BOC implements the Angoff Modified Technique using a panel of subject matter experts. The experts decide on the probability of a hypothetical minimally competent candidate that will answer each item correctly. The average probability is multiplied by the number of questions on the examination, which results in the minimum accepted score. This minimum accepted score and the standard error of the mean determine the final passing point of the examination. Each examination item is also analyzed to verify that the difficulty is not too high or too low, the discriminating power exceeds 0.15, each possible answer was chosen 3% of the time or greater, the majority of candidates answered correctly, and the effectiveness of the distractor is positive (Board of Certification, 2009).

Castle Worldwide, Inc. completes the scoring of the examination (Board of Certification, n.d.-b). Scores lie on a scale between 200 and 800, and candidates must earn at least 500 to pass. Results are available to candidates within two to four weeks following the conclusion of the examination window. Candidates must log into their BOC application profile in order to check their status. Candidates who have passed are deemed certified or eligible for certification if they have not yet submitted their official

transcript or proof of emergency cardiac care certification. A candidate who has failed will be deemed eligible for the examination indicating that a retake is required to earn the credential. BOC Executive Director, Ms. Denise Fandel, confirmed that candidates may retake the examination as many times as they wish provided they meet the eligibility requirements each time (personal communication, February 3, 2017). Scores are confidential and only disclosed upon written request from a candidate or a court order.

Examination reports are available on the BOC website beginning with the 1996-1997 examination year and ending with the 2015-2016 year. The report for 1997-1998 is the first appearance of information of examination reliability information, given as Kudner-Richardson 20 (KR-20) and standard error of measurement (SEM) estimates (Henderson, 1998). The present study used examination data for the period between February 2012 and June 2016. The 2012-2013 report provided Cronbach's alpha reliability estimates for each of the six forms of the examination administered in that examination year. The form of the examination that a candidate receives is determined by the month of the examination administration (D. Fandel, personal communication, September 7, 2016). The 2012-2013 estimates ranged from 0.84 to 0.90, with the average reliability estimate being 0.87 (Johnson, 2013). The reports pertaining to the remainder of the years covered in this study do not include the values of reliability estimates but instead state that they were strong (Board of Certification, 2014; Board of Certification, 2015; Board of Certification, 2016c).

BOC Executive Director, Ms. Fandel explained that the reliability estimates for 2013-2016 were consistent with 2012-2013 and previous years, but are no longer

included in the report since the values are probably more than the general public would like to know (D. Fandel, personal communication, September 7, 2016). She also confirmed that the BOC examination has undergone two studies to detect cultural bias with no significant findings for either (D. Fandel, personal communication, September 6, 2016). The most recent study entailed a cross-sectional panel of subject matter experts representing various ages and ethnicities who were trained on specific parameters to search for and then divided into groups to review the entire examination. Each group reviewed each item and then provided feedback to be incorporated into the style guide for future item writers. For example, a recommendation might be to use ecchymosis as the preferred terminology over redness since redness would be difficult to detect on a person with a dark skin complexion. The process to detect cultural bias on the BOC examination is similar to a sensitivity review, where panelists appraise an examination to ensure that multiple cultural backgrounds are represented and that no language appears that would potentially offend any group (Ramsey, 1993/2009; Woo & Dragan, 2012).

Candidates were de-identified in the dataset prior to receipt to maintain their anonymity and assigned a unique identification number. The dependent variable was performance. The independent variables that were included were the candidates' responses to demographic questions asked on the BOC examination application: race, birthdate, sex, and CAATE-accredited institution. Race, age, and sex were used in the analyses as level 1 variables. The institution names were used to look up the funding type and institution type on the Carnegie Classifications of Institutions of Higher Education

website and the geographic location of each institution on the National Athletic Trainers' Association (NATA) website.

*Performance.* Performance was present in the original dataset as one of two possible string responses, pass or fail. The variable was recoded as a dichotomous variable, using the failing candidates as the reference group. A 0 was entered in the variable column for candidates who passed, and a 1 was entered for candidates who failed. Of the 18,127 first-time candidates, 14,976 passed, and 3,151 failed. For the independent variables, the category with the largest number of candidates was the reference group (i.e., White, female, public, predominantly White institution [PWI], District 4).

*Race.* Race was initially a categorical variable with string responses. Candidates had a choice of eight options: Alaskan Native, American Indian, Asian/Pacific Islander, Black, Hispanic, multiethnic, other, or White. The variable was recoded into a new numerical variable named POC. White ( $n = 12,730$ ) was the reference group for this new variable. All candidates who indicated their race as White were coded as 0. Candidates who indicated their race was Alaskan Native ( $n = 6$ ); American Indian ( $n = 78$ ); Asian/Pacific Islander ( $n = 500$ ); Black ( $n = 771$ ); Hispanic ( $n = 978$ ); multiethnic ( $n = 386$ ); or other ( $n = 207$ ) were coded as 1 for a total of 2,926 POC. The analyses were conducted using POC as one large group as opposed to one group for each racial category since multiple groups had such few candidates.

*Age.* The original age variable was a text variable based on the birthdate that candidates entered when they completed their BOC examination applications. Using the

formula feature in Microsoft Excel, birthdate was converted to a continuous variable for age in years reflecting how old candidates were at the time they attempted the examination. The new age variable was grand mean centered for the interpretability of the intercept. The range of ages was from 19 years old to 60 years old with a mean age of 22.86 years ( $SD = 2.458$ ; median = 22.00) after removing three outliers aged 14, 82, and 83 years old.

*Sex.* Sex was a dichotomous variable. Candidates had a choice of male or female. The variable was converted to a dichotomous numerical variable, with female as the reference group since there were more females in the dataset than male. Female candidates ( $n = 10,371$ ) were coded as 0, and male candidates ( $n = 7,016$ ) were coded as 1.

*Institution.* The options for CAATE-accredited institution were spelled out in the original dataset along with a notation about whether the program was a bachelor's level or master's level program. When candidates filled out the application for the examination, they could type in part of their institution's name, and the search function would populate the blank for CAATE-accredited institution or provide a list from which to choose if multiple schools had similar words in the name. Candidates could also choose their state from a dropdown menu, and select their institution from all those listed in a particular state. The variable was recoded, so that each institution was assigned a number from 1 through 382 in alphabetical order. Ultimately, only 346 institutions were represented in the analyses because they had an average of five or more candidates



attempt the examination yearly. Institution was used as the grouping variable in the multilevel analysis.

*Funding type.* Options for funding type were public and private. Public was used as the reference category and was entered as 0. Private was entered as 1. Of the 346 institutions included, 190 were public, and 156 were private.

*Institution type.* Institutions were categorized as PWIs, historically Black colleges and universities (HBCUs), or Hispanic-serving institutions (HSIs). HBCUs and HSIs were identified from listings provided by the United States Department of Education's White House Initiative on HBCUs and the Hispanic Association of Colleges and Universities, respectively (Hispanic Association of Colleges & Universities, n.d.; United States Department of Education, n.d.). Institution type was a categorical variable. Dummy variables were created for HBCU and HSI. For both dummy variables, institutions that fit that description were coded as 1, and institutions that did not fit the description were coded as 0. For example, an institution that was an HBCU would receive a 1 for the HBCU variable and a 0 for the HSI variable.

*Geographic location.* The NATA is divided into ten districts based on geographical regions of the United States and territories of the United States (National Athletic Trainers' Association, n.d.-b). Each district has at least two states, with the largest number of states in a district being seven. Each accredited athletic training program is searchable on the CAATE's website along with the state where it is located and the institution's website (Commission on Accreditation of Athletic Training Education, n.d.-b). The CAATE website was used to identify the states where the 382

athletic training programs were located, and then, the NATA website was used to identify the districts that housed those states (National Athletic Trainers' Association, n.d.-b).

District 4 was the reference group. Nine dummy variables were created for the remaining districts. Institutions received a 1 for the dummy variable that represented the district in which they were located. For example, a District 1 institution would receive a 1 for the District 1 variable and a 0 for the remaining dummy variables.

### **Survey Data**

This section includes a description of the measures and participants that were used to address research question #2. The data that answered research question #2 came from a researcher-developed survey that was referred to as the Demographic Profile of Athletic Training (DPAT) Survey. The survey was available on paper and distributed to ATPDs and Clinical Education Coordinators at the annual Commission on Accreditation of Athletic Training Education (CAATE) conference that was held in October 2016 as well as electronically via the Qualtrics (Qualtrics, LLC, 2015) website for invited participants who did not attend the conference. As respondents completed the survey, the data was entered into an SPSS dataset for analysis.

**Participants.** The BOC candidate dataset contained information on candidates from 382 professional athletic training programs. The DPAT survey was originally sent to program directors of all 382 institutions with a return of 188 responses. Of the 188 responses, 138 were ATPDs, 41 were Clinical Education Coordinators, two were athletic training faculty in non-administrative positions, and one was an athletic training faculty member in a department administrative position. For six institutions, both the ATPD and

the Clinical Education Coordinator completed the survey causing duplicate responses. Of those six duplicate pairs, three of the pairs had completing matching responses from the ATPD and Clinical Education Coordinator. In the three duplicate pairs where there was discrepancy, ultimately, the responses related to the numbers of preceptors were accepted from the Clinical Education Coordinator since this person would be directly responsible for a program's preceptors. All other responses were accepted from the ATPD. Additionally, two ATPDs completed the survey twice reporting the same responses both times. With the duplicate responses resolved, the total number of usable surveys was 176. Of the 382 programs represented in the BOC candidate dataset, 36 of them had fewer than an average of five candidates per year attempt the BOC examination leaving 346 institutions eligible to be included in this study. Six of the respondents on the DPAT Survey were from institutions that had fewer than five candidates, so their responses were not included in the analyses. Finally, four individuals began the survey but left it incomplete resulting in a final total of 170 respondents for a response rate of approximately 49%. Nearly half of the professional ATPs were represented.

**Measures.** Two measures were used to address research question #2. Pass rate for POC was a measure that was calculated from data collected in the BOC candidate dataset. The DPAT Survey was used to collect data on institutions with athletic training programs.

*Pass rate for POC.* The pass rate for POC was a measure calculated using the BOC candidate dataset. The performance variable was isolated to include just the POC who attempted the examination in the academic year 2015-2016, which covered

examination administrations in October 2015 and February, April, and June of 2016. For institutions in the BOC candidate dataset, the number of POC who passed the examination from each was divided by the total number of POC who attempted the examination during this time period. The resulting percentage was each institution's pass rate for POC. Of the 346 institutions, 120 of them did not have POC who attempted the examination in the 2015-2016 academic year. Pass rates for people of color were calculated for 226 institutions.

***Demographic Profile of Athletic Training (DPAT) Survey.*** The DPAT is a set of independent variables that was used in a researcher-developed survey to create a profile about each institution represented in the BOC candidate dataset. Profiles were only created for institutions with a responding official on the DPAT Survey and with an average of five candidates or more attempting the examination between February 2012 and June 2016 ( $n = 170$ ). The DPAT Survey consisted of the following variables: number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of POC accepted, percentage of faculty of color, and percentage of preceptors of color.

***Number of years since accreditation.*** The number of years since accreditation was a continuous variable that was calculated as the difference between 2016, which was the end of the academic year for which they were asked to provide data, and the year of an athletic training program's initial CAATE accreditation date. The initial CAATE accreditation date was used because it represented the first time the program was recognized by the CAATE. Prior to CAATE accreditation, programs were either not

accredited or accredited through another agency. This variable was coded numerically in years. For example, an institution that received initial CAATE accreditation in 1996 was coded as 20. The variable was grand mean centered for the analysis.

*Minimum required grade point average to remain in the program.* The minimum required grade point average to remain in the program was a dichotomous variable with no as the reference group. For example, an institution that did not have a minimum required grade point average to remain in the program was coded as 0 and an institution that did have a minimum was coded as 1. Every institution for which there was a survey response utilized a 4.0 grade point average scale.

*Secondary admissions process.* The secondary admissions process was a dichotomous categorical variable indicating whether or not institutions had an additional admissions requirement students must complete in order to be accepted into the ATP. An example of a secondary admissions process is an interview. This variable was coded dichotomously with no as the reference group. Institutions that did not have secondary admissions process were coded as 0, and institutions that did have them were coded as 1.

*Maximum enrollment.* Maximum enrollment was a dichotomous variable indicating whether or not there was a numerical cap for students in the ATP. The entries were coded so that institutions without a maximum enrollment were represented with 0, and institutions with maximum enrollments were represented with 1.

*Percentage of students of color accepted.* Participants were asked on the survey to include the number of students of color who applied to the program and the number of students of color who were accepted. The responses were used to calculate a percentage

of students of color accepted that was entered in the SPSS dataset as a continuous variable, which was grand mean centered.

*Percentage of faculty of color.* Participants were asked to include the number of faculty members of color associated with their ATP, whether full-time or part-time, and the total number of faculty members overall, whether full-time or part-time. The responses were used to calculate the percentage of faculty members of color that was entered as a continuous variable, which was grand mean centered.

*Percentage of preceptors of color.* Participants were asked to include the number of preceptors of color associated with their ATP, and the total number of preceptors. The responses were used to calculate the percentage of preceptors of color that was entered as a continuous variable, which was grand mean centered.

### **Data Collection Procedures**

Data was collected using multiple procedures. For research question #1, a proposal was submitted in June 2016 to the Executive Director of the BOC, Ms. Denise Fandel, along with a copy of the Institutional Review Board approval letter. The proposal detailed the data requested. After several correspondences with a developer employed by the BOC for clarifications, the BOC candidate dataset was sent via email in August 2016.

The BOC candidate dataset included candidate records from 382 athletic training programs in the United States. This list of 382 institutions was used to determine which institution websites to review and which program personnel to contact for research question #2. Using the links provided by the CAATE search page, websites of the 369 ATPs that were still functional were identified. Each site was reviewed to determine

whether or not a minimum grade point average was required to stay in the program, if a secondary admissions process was in place, and if there was a maximum enrollment.

In the midst of reviewing websites, a proposal was also sent to Dr. Micki Cuppett, Executive Director of the CAATE to request the names and email addresses of ATPDs who would be attending the annual CAATE conference in October 2016. She responded with the entire list of attendees. The DPAT Survey was made available electronically through Qualtrics (Qualtrics, LLC, 2015) and through printed copies. During the week of the conference, all registered ATPDs received an email from me asking them to either complete the survey electronically or schedule a time to meet me during registration hours to complete the survey for the present study. I stood at the registration table on two of the three days that registration was open to pass out surveys as conference attendees arrived. I distributed the surveys to conference attendees who were ATPDs, Clinical Education Coordinators, or ATP faculty. With permission from Dr. Cuppett, clearly labeled manila envelopes were placed on the registration table and on the job postings board where attendees could return their completed surveys at their leisure. At the CAATE conference, 87 printed copies of the survey were distributed, and 27 completed surveys were returned.

A separate email was sent to ATPDs who were not registered for the conference asking them to complete the survey electronically or schedule a time with me to complete the survey by phone. The paper survey distribution and the first round of completed electronic surveys yielded a 10% response rate. Non-respondents received two follow-ups by email, whether they had attended the conference or not, bringing the response rate

to 30%. After three total requests to ATPDs, a follow-up was sent to Clinical Education Coordinators inviting them to complete the survey electronically or to schedule a time to complete it by phone. In January 2017, non-respondents received a follow-up phone call, bringing the final response rate to 49%, with 147 respondents having completed the survey online. The online survey was closed to new respondents on January 31, 2017.

When all survey data was compiled in SPSS, the results available on the programs' websites were compared to what respondents said in the surveys. The website findings and the survey responses matched completely approximately 54% of the time. However, worthy of note is that any of the websites could have changed between academic year 2015-2016, which was the year of interest, and 2016-2017, which was the time of the website review. Additionally, many websites had already begun to publicize that they were no longer accepting undergraduate students; thus, that information was no longer needed on the website.

### **Data Analysis Procedures**

This study used a multilevel logistic analysis and a multiple linear regression analysis. The procedures for both are described below individually.

**Multilevel logistic regression for secondary data analysis.** The following sections describe the data analysis procedures for the secondary data analysis associated with the BOC candidate dataset.

**Models.** Multilevel modeling, also known as hierarchical linear modeling, is a statistical procedure used to investigate the differences between groups as they relate to differences within groups to explain a dependent variable (Garson, 2013). Linear



multilevel modeling is used when the assumption is that the independent and dependent variable are linearly related to each other. An alternative to linear multilevel modeling is multilevel logistic regression, which is used when the dependent variable is binomially distributed. This study included a series of mixed effects logistic models containing nested data. The data was considered nested because variables can be defined at multiple levels (Snijders & Bosker, 2012). In this case, the candidate was the micro-level unit, and the institution was the macro-level unit. Multilevel data presents a challenge because of its data structure. Other types of statistical analyses require an assumption of independence. However, when the data structure is nested, such as students in schools, the assumption of independence is violated. Performances of students in the same school will most likely be more highly correlated than students' performances across various schools (Peugh, 2010). Violations of independence would typically lead to Type I errors, but multilevel modeling can help avoid them.

***Unconditional model.*** The first step in this multilevel model was to run an unconditional model to determine the intra-class correlation coefficient (ICC). The ICC is an important indication of whether or not multilevel modeling is appropriate, as it provides evidence of how homogenous cases are inside clusters (McCoach & Adelson, 2010). The ICC is similar to the concept of an  $R^2$  value of effect size in regression analyses (Peugh, 2010). A large ICC signals that there is a large amount of similarity within clusters or a large amount of difference across clusters, but an ICC of zero suggests that traditional regression analyses are more suitable (McCoach & Adelson, 2010; Peugh, 2010). In an unconditional model, only the dependent variable is present at

level 1, and the grouping variable is present at level 2 (Garson, 2013). For the present study, the dependent variable was performance, and the grouping variable was institution. The equation for the null model would read as

Equation 1

$$\text{Log odds} = \log \{p_i / (1 - p_i)\} \quad (1)$$

where  $p_i$  represents the probability of an individual,  $i$ , passing the BOC examination. Thus, the first equation transforms the ratio of probabilities into log odds (Merlo et al., 2006; Snijders & Bosker, 2012).

The ICC for the unconditional model provides a ratio of between institution variance to the total variance, or the percentage of variability accounted for based on the grouping variable (McCoach, 2010). Total variance is the sum of the between institution variance and the within institution variance. In a multilevel logistic regression model, however, variance at the candidate level is on a probability scale and variance at the institutional level is on a logistic scale (Merlo et al., 2006). This study relied on the “latent variable method” (p. 292), which involves converting the candidate-level variance to a logistic scale to match the institution-level variance. Thus, the ICC calculation =  $\rho = \sigma^2_{\text{between}} / (\sigma^2_{\text{between}} + 3.29)$ , where  $\rho$  represents the ICC value,  $\sigma^2_{\text{between}}$  represents the variance of the random intercept, and 3.29 represents the within-group variance, also written as  $\pi^2 / 3$  (Wu, Crespi, & Wong, 2012). The ICC needs to be high enough to indicate multilevel modeling; otherwise, multilevel logistic regression is not appropriate

(Garson, 2013). For this study, the ICC of the unconditional model was 0.25, which is common in education research (Snijders & Bosker, 2012). The ICC value means that 25% of the variance in BOC examination performance was between institutions, and 75% of the variance was within institutions.

***Level 1 model.*** Since the level 1 ICC was high enough to warrant multilevel logistic modeling, the level one predictors, race, sex, and age, were added. Race was a categorical variable, using White as the reference category. Candidates who were White were coded as 0, and candidates who fit into one of the NATA EDAC's categories of ethnically diverse were coded as 1 for POC. Sex, also a categorical variable, used male as the reference category. Since age was a continuous variable, all values were centered around the grand mean ( $M = 22.86$  years) to improve "the interpretability of coefficients" (Garson, 2013, p. 38). The following statement is the equation for the level 1 model:

Equation 2

$$\text{Level 1: logit } (p_i) = B_{0j} + B_{1\text{race}} + B_{2\text{age}} + B_{3\text{sex}}, \quad (2)$$

$$B_0 = \gamma_{00},$$

$$B_{1\text{race}} = \gamma_1,$$

$$B_{2\text{age}} = \gamma_2,$$

$$B_{3\text{sex}} = \gamma_3,$$

where  $B_{0j}$  is the mean probability;  $B_1$ ,  $B_2$ , and  $B_3$  are the coefficients or slopes, for the level 1 predictors; and  $\gamma_{00}$  is the average intercept. The beta values, or standardized coefficients, were examined to see if any predictors were statistically significant, meaning  $p < .05$  at level 1 and which of the variables was the strongest predictor.

**Level 2 model.** At level 2, the institutional variables were added. All the institutional predictors were categorical with multiple levels. Funding type was entered as one dichotomous variable. Candidates who attended a public institution were coded as 0 for funding type, and candidates who attended private institutions were coded as 1. Institution type was coded as two dummy variables. HBCU and HSI were coded as 0 when the condition was not met and 1 when the condition was met. Finally, geographic location was coded as nine dummy variables. Each district was coded chronologically with District 1 as 1, and so on. Candidates were coded as 1 for the district in which their institution was located, and 0 for all other geographic location dummy variables. The following statement is the equation for the level 2 model:

Equation 3

$$\text{Level 2: } B_{0j} = \gamma_{00} + \gamma_{01}\text{race}(\varpi_{01}) + \gamma_{02}\text{age}(\varpi_{02}) + \gamma_{03}\text{sex}(\varpi_{03}) \quad (3)$$

$$+ \gamma_{10}\text{funding}(\varpi_{10}) + \gamma_{20}\text{institution}(\varpi_{20}) + \gamma_{30}\text{geographiclocation}(\varpi_{30}) + \mu_{0j}.$$

where  $\gamma_{10}$ ,  $\gamma_{20}$ , and  $\gamma_{30}$  are the coefficients for the level 2 variables. All predictor slopes were fixed since the variables in use were discrete independent variables and a dichotomous dependent variable (Snijders & Bosker, 2012). Statistically significant predictors were determined by noting which beta coefficients had an alpha level of  $p < .05$ . beta coefficients to determine which predictors were statistically significant and which predictor was the strongest. Also, the odds ratios for each predictor were evident from the exponentiation of the B coefficients.

**Multiple linear regression for survey data.** This section summarizes the data analysis procedures for the survey data associated with the demographic profiles of athletic training. The DPAT Survey was used to collect information about ATPs' institutional attributes to determine if these characteristics predicted institutions' pass rates on the BOC examination for POC. The dataset was analyzed using multiple linear regression to determine if the number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color would predict pass rates for POC on the BOC examination. Some violations of assumptions were present; thus, the analyses should be interpreted with caution.

## **Chapter Four**

The results of the statistical analyses are presented in Chapter Four. The Board of Certification for the Athletic Trainer (BOC) Candidate dataset and the Demographic Profile of Athletic Training (DPAT) Survey were used to investigate the research questions:

- 1) Do individual (race, age, sex) and institutional (funding type, institution type, geographic location) factors predict candidates' performance on the BOC examination?
- 2) Do institutions' demographic profiles of athletic training (number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color) predict pass rates on the BOC examination for people of color (POC)?

The first research question was addressing using multilevel logistic modeling, and the second question was addressed using multiple linear regression analyses. The results for each question are discussed individually.

## Multilevel Logistic Modeling

The BOC candidate dataset was analyzed using multilevel logistic modeling to investigate research question #1. The dataset initially contained 24,045 cases, including BOC candidates attempting the examination for the first time ( $n = 18,483$ ) and candidates who were retaking the examination after not passing on an earlier attempt ( $n = 5,562$ ). Candidates retaking the BOC examination were removed, so that only the first-time candidates were used in the remainder of the analyses. Additionally, candidates were removed if they did not attend an institution with an average of five or more attempting the examination per year. Institutions that had fewer than an average of five or more candidates attempting the examination tended to have several years in which no candidates attempted the examination, or their programs were fairly new. The total  $N$  was 18,127 after outliers ( $n = 3$ ) and candidates who did not meet the criteria ( $n = 353$ ) were excluded.

**Data cleaning procedures.** For the BOC candidate dataset, variables were coded so that the new value of missing data was -99. Descriptive statistics were run on all categorical variables to identify possible data entry errors, and none were found. Since age was the only continuous variable in the BOC candidate dataset, all age values were transformed to  $z$  scores to determine if any values exceeded  $\pm 3.29$ . Cases that did exceed  $\pm 3.29$  were examined to determine if the response was logical or entered erroneously. In one instance, a candidate's year of birth was 1999, which indicated that person was 14 years old. The BOC examination has no required age range. However, a 14-year-old candidate seemed unlikely, so this case was removed from the dataset. Additionally, two

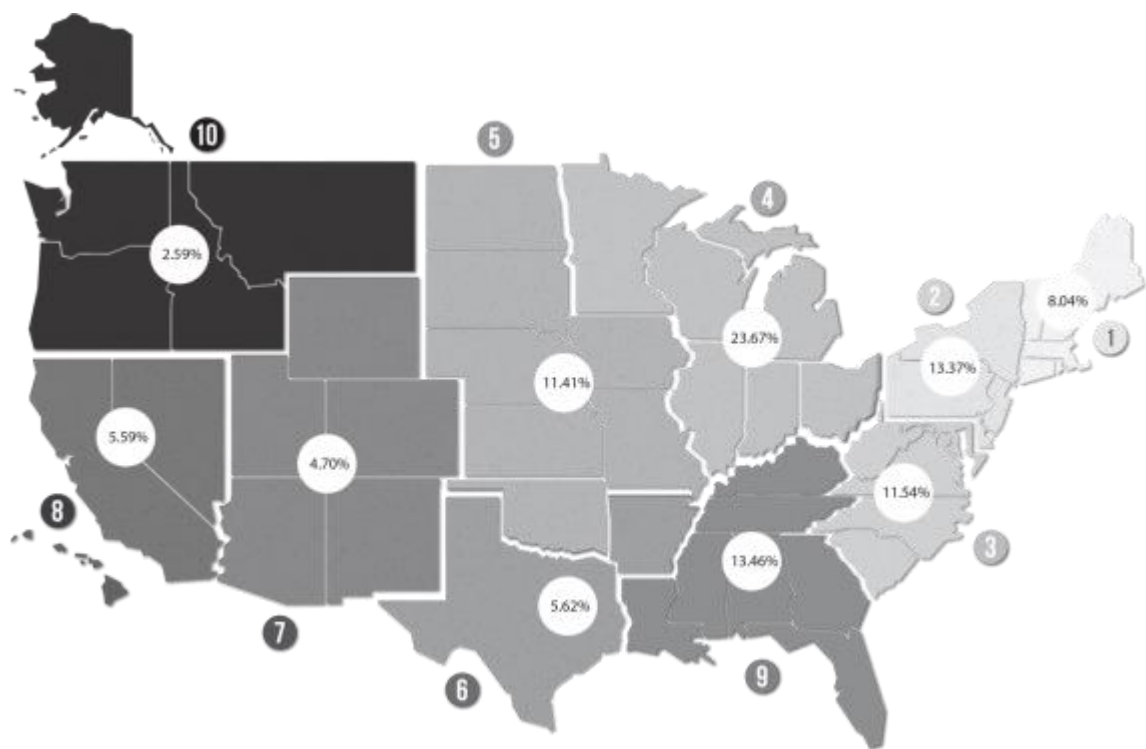
candidates were 82 and 83 years old. Since there was a significant gap between these candidates' age  $z$  scores and the next closest candidate to them at 63 years old, they were also removed from the dataset. An additional 370 candidates had age  $z$  scores that exceeded 3.29. However, they were not removed because there was not a significant gap among their ages. After the data cleaning, a histogram was produced and examined for normality. Positive skewing for age was present as shown in Figure 1.

**Testing assumptions.** For multilevel logistic regression analysis, assumptions are typically that the dependent variable is distributed binomially, that covariates are literature-based, and that observations are independent. Because this type of analysis involves nested data, the assumption of independent observations is unlikely to be met; however, the hierarchical structure will account for the lack of independence within groups (Khan & Shaw, 2011). In this study, the dependent variable was distributed binomially, and the independent variables were based on other studies on certification examinations for health care professions.

**Descriptive statistics.** Candidates and institutions represented all 47 states that have accredited ATPs and all ten districts of the National Athletic Trainers' Association (NATA). Alaska, Rhode Island, and Wyoming are the three states that do not have accredited ATPs. NATA districts are organized geographically, and each district has its own governance, elected officials, and individual programming (National Athletic Trainers' Association, n.d.-b). Figure 1 illustrates how the United States and its territories are divided into districts. The percentages superimposed on the map express the percentages of candidates in the dataset hailing from each district. Table 1 displays the



number and percentage of candidates and the mean age from each district. The number of candidates in a district ranged from 469 in District 10 to 4,290 in District 4. The mean age of candidates in all districts was 22.86 years. The mean ages ranged from 22.32 years in District 1 to 24.06 years in District 7.



#### **DISTRICT 1**

Eastern Athletic Trainers' Association (01)

Connecticut New Hampshire  
Maine Rhode Island  
Massachusetts Vermont

#### **DISTRICT 2**

Eastern Athletic Trainers' Association (02)

Delaware New York  
New Jersey Pennsylvania

#### **DISTRICT 3**

Mid-Atlantic Athletic Trainers' Association

District of Columbia South Carolina  
Maryland Virginia  
North Carolina West Virginia

#### **DISTRICT 4**

Great Lakes Athletic Trainers' Association

Illinois Minnesota  
Indiana Ohio  
Michigan Wisconsin

#### **DISTRICT 5**

Mid America Athletic Trainers' Association

Iowa Nebraska  
Kansas North Dakota  
Missouri Oklahoma  
South Dakota

#### **DISTRICT 6**

Southwest Athletic Trainers' Association

Arkansas Texas

#### **DISTRICT 7**

Rocky Mountain Athletic Trainers' Association

Arizona New Mexico  
Colorado Utah  
Wyoming

#### **DISTRICT 8**

Far West Athletic Trainers' Association

California Hawaii  
Guam Nevada  
American Samoa

#### **DISTRICT 9**

Southeast Athletic Trainers' Association

Alabama Kentucky  
Florida Louisiana  
Georgia Mississippi  
Tennessee

#### **DISTRICT 10**

Northwest Athletic Trainers' Association

Alaska Oregon  
Idaho Washington  
Montana

Figure 1. Districts of the NATA

Table 1

*Number and Percentage of Candidates and Mean Age by NATA District*

District	Total Number of Candidates	Percentage of Candidates	Mean Age of Candidates in Years
1	1,458	8.04	22.32 (1.977)
2	2,424	13.37	22.55 (2.227)
3	2,092	11.54	22.59 (2.509)
4	4,290	23.67	22.62 (2.077)
5	2,069	11.41	22.74 (1.977)
6	1,019	5.62	23.63 (2.733)
7	852	4.70	24.06 (3.442)
8	1,014	5.59	23.73 (3.166)
9	2,440	13.46	23.08 (2.634)
10	469	2.59	23.28 (2.691)
All	18,127	100	22.86 (2.458)

*Note.* Standard deviation appears in parentheses.

Since the NATA's districts are organized geographically, the district representation means that all parts of the United States are represented as well. The districts, in numerical order, are Eastern, Mid-Atlantic, Great Lakes, Mid America, Southwest, Rocky Mountain, Far West, Southeast, and Northwest (National Athletic Trainers' Association, n.d.-b). The Eastern region of the United States accounts for two districts. Table 2 displays the number of institutions housing professional ATPs in each district and the number included in the analyses. The smallest number of institutions hailed from District 10, and the largest number of institutions hailed from District 4.

Table 2

*Number and Percentage of Institutions by NATA District*

District	Total Number of Institutions	Percentage of Institutions	Number of Institutions Included in Analyses	Percentage of Institutions Included in Analyses
1	26	6.81	25	7.23
2	40	10.47	37	10.69
3	52	13.61	47	13.58
4	83	21.73	79	22.83
5	60	15.71	48	13.87
6	28	7.33	25	7.23
7	13	3.40	13	3.76
8	19	4.97	17	4.91
9	49	12.83	44	12.72
10	12	3.14	11	3.18
Total	382	100	346	100

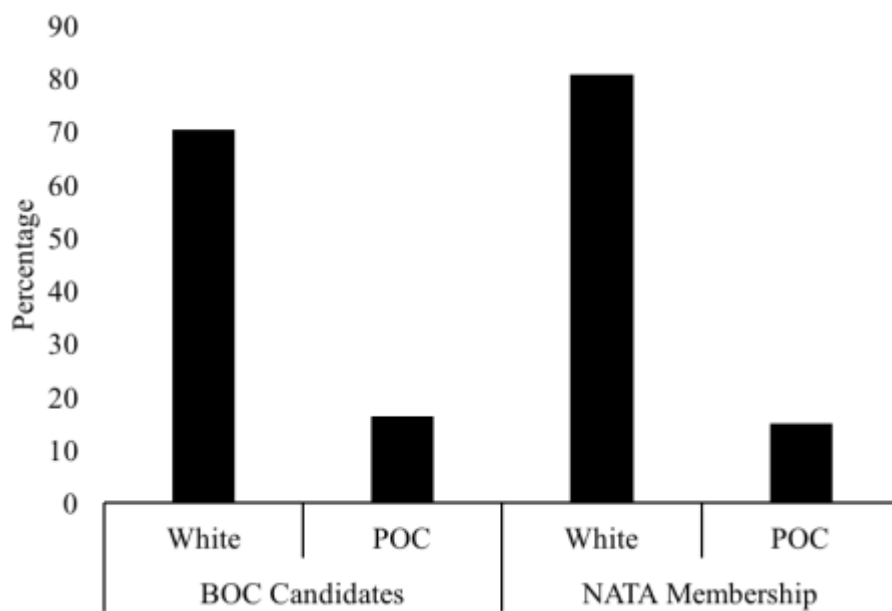
Candidates in the dataset were similar to the overall membership of the National Athletic Trainers' Association for the race and sex variables, as evidenced by level 1 demographic data. White candidates comprised 70% of the BOC candidate dataset. Table 3 displays the number and percentage of White and POC candidates in each district. The percentage of White candidates ranged from 2.51% in District 10 to 25.92% in District 4. The percentage of POC candidates, as denoted by the NATA Ethnic Diversity Advisory Committee (EDAC) ranged from 2.77% in District 10 to 17.74% in District 9. The dataset consisted of 10,156 female candidates (56%) and 6,897 (38%) male candidates. The sex was unknown for the remaining 6% of candidates. Figures 2 and 3 illustrate how

the candidate pool compared to the demographics of the NATA membership with respect to race and sex.

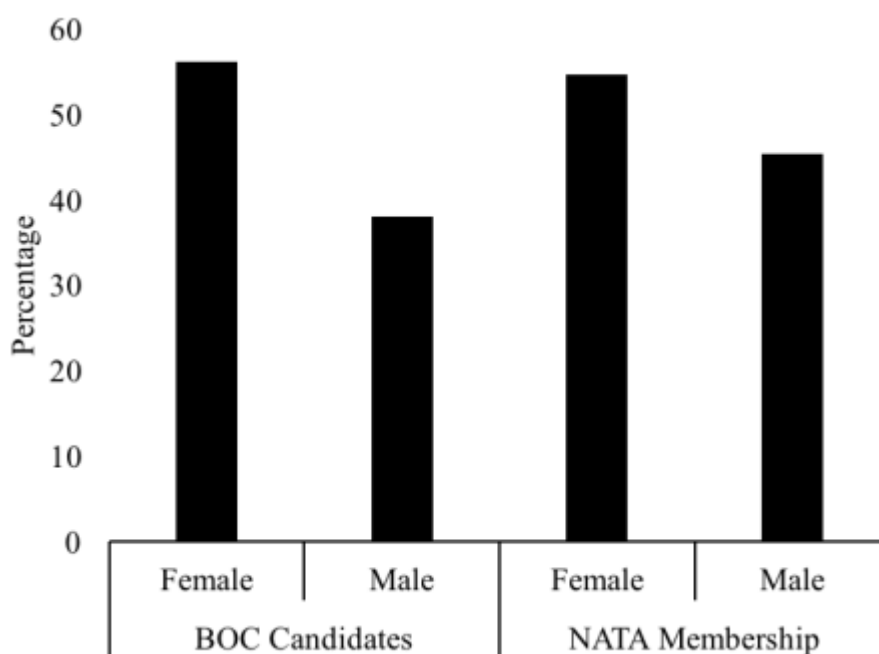
Table 3

*Number and Percentage of White and POC Candidates by NATA District*

District	Number of White Candidates	Percentage of White Candidates	Number of POC Candidates	Percentage of POC Candidates
1	1,049	8.24	125	4.27
2	1,737	13.64	333	11.38
3	1,476	11.59	332	11.35
4	3,300	25.92	377	12.88
5	1,589	12.48	192	6.56
6	595	4.67	332	11.35
7	592	4.65	171	5.84
8	411	3.23	464	15.86
9	1,661	13.05	519	17.74
10	320	2.51	81	2.77
All	12,730	100	2,926	100



*Figure 2.* Comparison in percentages between White candidates and POC in the BOC candidate dataset from February 2012 to June 2016 and NATA membership in 2016.



*Figure 3.* Comparison in percentages between male and female candidates in the BOC candidate dataset from February 2012 to June 2016 and NATA membership in 2016.

Of the 18,127 candidates in the dataset, 3,151 failed the BOC examination.

Overall, the percentage of candidates failing the examination ranged from 1.40% in District 10 to 23.68% in District 4. With respect to White candidates, the percentage of candidates failing the examination ranged from 1.39% in District 10 to 28.94% in District 4. With respect to POC, the percentage of candidates failing the examination ranged from 1.00% in District 10 to 10.83% in District 9. The percentage of female candidates who failed ranged from 1.39% in District 10 to 23.33% in District 4. The percentage of male candidates who failed ranged from 1.09% in District 10 to 23.11% in District 4. Tables 4, 5, and 6 display the numbers and percentages of candidates who failed the examination

overall by district, White and POC candidates who failed by district, and female and male candidates who failed by district, respectively.

Table 4

*Number and Percentage of Candidates Who Failed by NATA District*

District	Number of Candidates Who Failed	Percentage of Candidates Who Failed
1	203	6.44
2	389	12.35
3	373	11.84
4	746	23.68
5	454	14.41
6	198	6.28
7	136	4.32
8	140	4.44
9	468	14.85
10	44	1.40
All	3,151	100



Table 5

*Number and Percentage of White and POC Candidates Who Failed by NATA District*

District	Number of White Candidates Who Failed	Percentage of White Candidates Who Failed	Number of POC Candidates Who Failed	Percentage of POC Candidates Who Failed
1	140	7.47	22	2.00
2	254	13.56	78	7.10
3	221	11.80	109	9.92
4	542	28.94	102	9.28
5	321	17.14	73	6.64
6	93	4.97	89	8.10
7	89	4.75	40	3.64
8	39	2.08	80	7.28
9	309	16.50	119	10.83
10	26	1.39	11	1.00
All	2,034	100	723	100

Table 6

*Number and Percentage of Female and Male Candidates Who Failed by NATA District*

District	Number of Female Candidates Who Failed	Percentage of Female Candidates Who Failed	Number of Male Candidates Who Failed	Percentage of Male Candidates Who Failed
1	116	6.19	75	6.82
2	230	12.28	139	12.65
3	232	12.39	118	10.74
4	437	23.33	254	23.11
5	280	14.95	145	13.19
6	119	6.35	74	6.73
7	90	4.81	40	3.64
8	77	4.11	56	5.10
9	266	14.20	186	16.92
10	26	1.39	12	1.09
All	1,873	100	1,099	100

Level 2 data was available for 382 institutions, which represented 105 percent of programs that were accredited in academic year 2012-2013, 99 percent of programs that were accredited in academic year 2013-2014, 96 percent of programs that were accredited or seeking accreditation in academic year 2014-2015, and 92 percent of programs accredited or seeking accreditation in academic year 2015-2016 (Commission on Accreditation of Athletic Training Education, 2014; Commission on Accreditation of Athletic Training Education, 2015; Cuppett & Cavallario, 2016; M. Cuppett, personal communication, February 3, 2017). The ratio of athletic training programs (ATPs) in the BOC candidate dataset in existence in 2012-2013 is greater than 100 percent because there were more programs in the dataset than there were in existence that academic year. Once candidates from institutions with fewer than an average of five candidates per year were removed from the dataset, the resulting number of institutions was 346.

The 346 institutions were categorized as one of two types of funding: public ( $n = 190$ ) or private-not-for-profit ( $n = 156$ ). The majority of institutions were predominantly White institutions (PWIs) ( $n = 320$ ), but the pool also included Hispanic-serving institutions (HSIs) ( $n = 24$ ) and historically Black colleges and universities (HBCUs) ( $n = 2$ ). Table 7 displays the number and percentage of public and private institution candidates who failed by NATA district. Table 8 displays the number and percentage of PWI, HBCU, and HSI candidates who failed by NATA district.

Table 7

*Number and Percentage of Public and Private Institution Candidates Who Failed by NATA District*

District	Number of Public Institution Candidates Who Failed	Percentage of Public Institution Candidates Who Failed	Number of Private Institution Candidates Who Failed	Percentage of Private Institution Candidates Who Failed
1	120	6.66	83	6.16
2	253	14.03	136	10.09
3	172	9.54	201	14.91
4	415	23.02	331	24.55
5	212	11.76	242	17.95
6	132	7.32	66	4.90
7	92	5.10	44	3.26
8	90	4.99	50	3.71
9	283	15.70	185	13.72
10	34	1.89	10	0.74
All	1,803	100	1,348	100

Table 8

*Number and Percentage of PWI, HBCU, and HSI Candidates Who Failed by NATA District*

District	Number Who Failed from PWI	Percentage Who Failed from PWIs	Number Who Failed from HBCUs	Percentage Who Failed from HBCUs	Number Who Failed from HSIs	Percentage Who Failed from HSIs
1	203	7.17	—	—	—	—
2	360	12.71	—	—	29	10.18
3	340	12.00	33	100	—	—
4	719	25.38	—	—	27	9.47
5	454	16.03	—	—	—	—
6	130	4.59	—	—	68	23.86
7	113	3.99	—	—	23	8.07
8	38	1.34	—	—	102	35.79
9	432	15.25	—	—	36	12.63
10	44	1.55	—	—	—	—
All	2,833	100	33	100	285	100

**Level 1 model.** The ICC of the unconditional model ( $\rho = .25$ ) confirmed multilevel modeling was appropriate for the BOC candidate dataset. Starting with the level 1 variables, predictors were added to the model in two groups. Race, age, and sex were entered simultaneously. The ICC ( $\rho = .26$ ) increased from the unconditional model to the level 1 model. Both the fixed and random intercepts were statistically significant. Race and sex were both statistically significant predictors of performance ( $p < .001$ ). The POC level of the race variable had a negative coefficient, and the male level of the sex variable had a positive coefficient. Age was not a significant predictor.

**Full model.** For the full level 2 model, funding type, institution type, and geographic location were added simultaneously to the existing independent variables. The ICC decreased slightly ( $\rho = .235$ ) between the level 1 and full model. The expectation was that the ICC would decrease as predictors were added (Hedges & Hedberg, 2007). However, the minimal change in ICC from one model to the next indicated that the predictors did not explain much additional variance between institutions in BOC examination performance. Race and sex were again significant predictors ( $p < .001$ ). Several of the macro-level predictors were also significant. Funding type was a significant predictor ( $p < .001$ ). Private had a negative coefficient. Institution type was also a significant predictor. The HBCU and HSI variables both had negative coefficients. However, the HBCU level was statistically significant ( $p < .001$ ), while the HSI level was not. Districts 5, 8, and 10 were all statistically significant ( $p < .05$ ) for the geographic level variable. District 5 had a negative coefficient, and Districts 8 and 10 had positive coefficients. Age was not a significant predictor in the full level 2 model.

Table 9 displays the coefficients for fixed and random effects of all parameters in the level 1 and level 2 models, the odds ratios, and the 95% confidence intervals. The parameter estimate is the value of the coefficient. Since the candidates' performance was coded as 0 for passing and 1 for failure, the coefficients of the fixed effects reveal the log odds of passing based upon group membership (Snijders & Bosker, 2012). For example, the log of the odds of passing for a White candidate is 1.698 based on the intercept, while the log of the odds for a candidate who is a person of color is -.745, which means they are

less likely to pass as compared to a White candidate. The standard error appears in the next column, followed by the odds ratio.

Odds ratios improve the interpretability of the log odds. An odds ratio is a more natural mechanism for interpreting the fixed effect coefficient (Anderson, Kim, & Keller, 2014). An odds ratio is a measurement used to define the relationship between two dichotomous variables and permits the examination of how other variables influence the relationship using logistic regression (Bland & Altman, 2000). Odds ratios provide estimates of how likely or unlikely an outcome is to occur and are used frequently in medical reports (Bland & Altman, 2000; Hosmer, Lemeshow, & Sturdivant, 2013).

The odds ratios for each predictor are displayed as an exponentiation coefficient of the B values. An odds ratio tells the likelihood that an outcome will occur relative to that same outcome occurring in a different population. Another way to interpret odds ratios is that values less than one indicate a decreased probability of passing (Zhang & Yu, 1998). Ratios greater than one indicate an increased probability in comparison to the reference group. An odds ratio of one indicates that there is no difference between two groups.

The odds ratios for POC in both the level 1 (.475) and level 2 (.473) models were less than 1, indicating that POC are less likely to pass the BOC examination than White candidates. The odds ratios for male candidates in both level 1 (1.219) and level 2 (1.215) models were slightly greater than 1, indicating that male candidates are slightly more likely to pass than female candidates. The odds ratio for private institutions (.600) indicated that candidates from private institutions are less likely to pass the examination

as compared to candidates from public institutions. The odds ratio for HBCU was .127, indicating that candidates who attended HBCUs are less likely to pass than candidates who attended PWIs. Finally, the odds ratios for the statistically significant geographic location variables indicated that candidates from District 5 (.620) are less likely to pass, and candidates from Districts 8 (2.479) and 10 (1.874) are more likely to pass as compared to candidates in District 4. Age, attending an HSI, or attending institutions in Districts 1-3, 6, 7, and 9 were not significant predictors of BOC examination performance. The final column under each model displays the confidence intervals. The confidence intervals indicate that there is 95% confidence that the odds ratio of each population is between the upper and lower limits provided in relation to the reference category.

Table 9

*Logistic Mixed Modeling Predicting Performance on the BOC Examination from  
Individual and Institutional Factors*

Parameter	Model 1			Model 2		
	Parameter Estimate	SE	Exp(B)	Parameter Estimate	SE	Exp(B)
Fixed effects						
Intercept	1.698**	.066	5.465 [4.803, 6.219]	1.980**	.149	7.244 [5.414, 9.693]
POC	-.745**	.0057	.475 [.424, .531]	-.748**	.058	.473 [.423, .530]
Age	-.002	.011	.998 [.977, 1.020]	-.003	.011	.997 [.976, 1.018]
Male	.198**	.049	1.219 [1.108, 1.341]	.195**	.0049	1.215 [1.104, 1.338]
Private	—	—		-.510**	.122	.600 [.472, .763]
HBCU	—	—		-2.062**	.236	.127 [.080, .202]
HSI	—	—		-.357	.253	.700 [.426, 1.149]
District 1	—	—		.258	.299	1.294 [.720, 2.327]
District 2	—	—		.197	.219	1.218 [.793, 1.869]
District 3	—	—		.027	.213	1.027 [.677, 1.560]
District 5	—	—		-.478*	.176	.620 [.439, .876]
District 6	—	—		-.083	.304	.920 [.507, 1.671]
District 7	—	—		-.017	.248	.983



						[.605, 1.597] 2.479
District 8	–	–	.908*	.316		[1.334, 4.607]
District 9	–	–	-.399	.220	.671	[.436, 1.032]
District 10	–	–	.628*	.260		1.874 [1.125, 3.121]
Random effects						
Level 2 Variance	1.141**	(.113)	1.009**	(.103)		

*Note.* Numbers in brackets represent 95% confidence interval.

\* $p < .05$ . \*\* $p < .001$ .

**Goodness of fit measures.** Aikake Information Criterion (AIC) and Schwarz's Bayesian Information Criterion (BIC) are measures that quantify how good a model's fit is and are used to compare multiple models to each other (Burnham & Anderson, 2004; Hox, 2010). The value decreases as deviance of a model decreases; therefore, the model with the lowest goodness of fit values is generally the preferred model (Hox, 2010). Both the AIC and BIC indicate that model 1 had the best fit. Table 10 displays the values of both criterion measures for all models.

Table 10

*Goodness of Fit Measures for Models 0, 1, and 2*

Criterion Measure	Model 0	Model 1	Model 2
AIC	90,435.427	78,054.981	78,177.303
BIC	90,443.232	78,062.638	78,184.959

### Multiple Linear Regression

The DPAT Survey dataset was analyzed using multiple linear regression to investigate research question #2. The dependent variable, pass rate for POC on the BOC examination was institutional, as opposed to the individual level dependent variable investigated for research question #1. The dataset initially contained 188 responses. The total  $N$  was 170 after duplicate responses ( $n = 8$ ), institutions with fewer than an average of five or more candidates per year ( $n = 6$ ), and surveys that were completely blank ( $n = 4$ ) were excluded.

**Data cleaning procedures.** For cleaning of the DPAT Survey dataset, all missing data was coded as -99. An initial frequency analysis was conducted to search for univariate outliers of all categorical variables. Three errors were present where dichotomous variables had been coded as a number other than 0 or 1. The correct answers were confirmed, and the errors were corrected. An initial frequency analysis of continuous variables was also conducted to search for univariate outliers. The continuous

variables were transformed to  $z$  scores to look for outliers. There were two outliers based on the number of students of color applied, two outliers based on the number of faculty of color, and three outliers based on preceptors of color. However, they were not removed since there were only 170 usable respondents. Additionally, the Mahalanobis distance and Cook's statistic were calculated to search for multivariate outliers. A critical values of chi-square ( $\chi^2$ ) table was used to determine the cut-off value. No multivariate outliers were present based on the  $\chi^2(7)$  cut-value of 18.47.

**Testing assumptions.** For standard multiple linear regression, the assumptions are normal distribution of variables, a linear relationship between the independent and dependent variables, reliability of variable measurement, and homoscedasticity (Osborne & Waters, 2002). These assumptions were tested by looking at histograms of each of the continuous independent variables, which were number of years of accreditation, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color. The histograms for the number of years since initial accreditation and percentage of students of color accepted were indicative of normality, while the histograms for percentage of faculty of color and percentage of preceptors of color indicated minor positive skewing but not severe violations. The variables for percentage of faculty of color and percentage of preceptors of color were transformed using the square root, natural log, and log-10 functions in SPSS; however, the histograms showed no improvement. Additionally, the continuous variables for students of color accepted, faculty of color, and preceptors of color were converted to categorical variables and used in lieu of the continuous variables in a second analysis described later in this chapter. For

example, if an institution had one faculty member of color, the variable was coded as a 1. If the institution had no faculty members of color, the variable was coded as a 0.

Bivariate scatterplots between each of the continuous independent variables and the dependent variable were created. All of the bivariate scatterplots showed some nonlinearity between the independent continuous variables and the dependent variable, but the violation was not severe. Additionally, a scatterplot of the regression standardized predicted value and the regression standardized residuals was created, which resulted in a minor heteroscedastic pattern. Box and whisker plots were also created for the dependent variable and the categorical independent variables, minimum required grade point average to remain in the program, secondary admissions process, and maximum enrollment and the dependent variable. All three plots were slightly skewed because of the overwhelming number of yes responses.

**Descriptive statistics.** The number of years since initial accreditation for institutions ranged from 1 year to 22 years with a mean number of 14.18 years. The percentage of students of color accepted at an institution ranged from 0% to 100%, with a mean of 52.01%. The percentage of faculty of color ranged from 0% to 66.70% with a mean of 9.17%, indicating that most institutions (71%) had no faculty of color. Finally, the percentage of preceptors of color ranged from 0% to 100% with a mean of 9.55%. About 38% of institutions had no preceptors of color. Table 11 displays the minimum, maximum, mean, and standard deviation for each continuous variable.

Table 11

*Descriptive Statistics for DPAT Survey*

Variable	Minimum	Maximum	Mean	Standard Deviation
Number of years since initial accreditation	1	22	14.18	4.243
Percentage of students of color accepted	0	100	52.01	41.85
Percentage of faculty of color	0	66.70	9.17	16.68
Percentage of preceptors of color	0	100	9.55	13.52

**Model.** The block of independent variables was entered simultaneously. Minimum grade point average to remain in the program, secondary admissions process, and maximum enrollment were binary variables, and number of years of accreditation, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color were continuous variables. Overall, the model was not statistically significant. A multiple linear regression model is significant when its  $F$  value is significant (Warner, 2013). The  $F$  value for this analysis was .947, and it was not statistically significant. Even if the model had been statistically significant, the  $R$  value, or effect size, was .239 which is considered small (Cohen, 1992). Table 12 displays the coefficients, their standard errors, and beta values for each of the predictors in the multiple linear regression analysis.

Table 12

*B Coefficients and Beta Values for Demographic Profiles of Athletic Training as Predictors of Pass Rates on the BOC examination for POC*

Variable Name	B	SE B	$\beta$
Intercept	28.882	35.236	
Number of years since accreditation	-.118	.933	-.013
Minimum required grade point average	22.036	26.831	.087
Secondary admissions process	11.510	18.926	.063
Maximum enrollment	11.789	7.864	.156
Percentage of students of color accepted	-.039	.094	-.043
Percentage of faculty of color	.476	.258	.224
Percentage of preceptors of color	-.282	.366	-.094

*Note.* SE B represents standard error of the B coefficients.

\* $p < .05$ . \*\* $p < .001$ .

In an attempt to correct the violations of the normality assumption, the three continuous variables percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color were converted to categorical variables. If an institution had one person of color accepted as a student, the students of color variable was coded as 1, and likewise for the faculty and preceptor of color variables. If the institution had 0, the variables were coded as 0. The dataset was analyzed again using standard multiple linear regression with all independent variables entered simultaneously.

The *F* value for the model with all categorical variables was 1.002 and was not statistically significant. The *R* value was .242. None of the predictors were statistically significant. Table 13 displays the B coefficients, standard errors, and beta values when all predictors were categorical.

Table 13

*B Coefficients and Beta Values for Demographic Profiles of Athletic Training as Predictors of Pass Rates on the BOC examination for POC with All Categorical Variables*

Variable Name	B	SE B	β
Intercept	38.575	30.988	
Number of years since accreditation	-.427	.760	-.052
Minimum required grade point average	20.989	25.515	.078
Secondary admissions process	.761	17.631	.004
Maximum enrollment	12.654	6.877	.170
Percentage of students of color accepted	-4.736	6.714	-.066
Percentage of faculty of color	4.361	6.960	.059
Percentage of preceptors of color	6.770	6.766	.095

*Note.* SE B represents standard error of the B coefficients.

\**p* < .05. \*\**p* < .001.

## Summary of Results

The results of the statistical analyses for this study were presented in Chapter Four. Of the independent variables investigated for research question #1, race, sex,

funding type, institution type, and geographic location were statistically significant predictors of performance on the BOC examination. Specifically, POC, candidates from private institutions, candidates from HBCUs, and candidates from District 5 were less likely to pass as compared to candidates who were White, attending public institutions, attended PWIs, and were from District 4, respectively. Male candidates and candidates from Districts 8 and 10 were more likely to pass as compared to female candidates and candidates from District 5. Age did not predict BOC examination performance. Analyses for research question #2 investigated whether or not number of years since initial accreditation, minimum required grade point average to remain in the program, secondary admissions process, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color predicted pass rates for POC on the BOC examination. None of the independent variables were statistically significant predictors. These results are discussed in Chapter Five.



## **Chapter Five**

A summary of the overall study and a discussion of the results are presented in Chapter Five. This chapter also includes conclusions and recommendations for athletic training education and for future research.

### **Summary of the Study**

This study emerged in response to research on the shortage of people of color (POC) in the profession of athletic training and the importance of having a diverse health care workforce to meet the needs of the country's diverse population (Nivet & Fair, 2016; Perrin, 2015). A diverse workforce of health care professionals equates to greater cultural competence, increased access to health care services for people living in underserved communities, a broader research agenda addressing issues that affect POC, a larger pool of individuals who are prepared to effect change in governmental policy, and most importantly, better outcomes for patients seeking health care services (Cohen et al., 2002; Nivet & Fair, 2016). The specific aim of this study was to address two research questions:

- 1) Do individual (race, age, sex) and institutional (funding type, institution type, geographic location) factors predict candidates' performance on the Board of Certification (BOC) examination?

- 2) Do institutions' demographic profiles of athletic training (number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color) predict pass rates on the BOC examination for POC?

Drawing from previous literature in athletic training and similar health care fields such as nursing, physical therapy and medicine, this study was aimed at addressing the research questions using two types of research design and quantitative methods. Specifically, a secondary data analysis was used to address research question #1, and a non-experimental cross-sectional survey was used to address research question #2.

### **Summary of Research Question #1 Results**

Race, age, sex, funding type, institution type, and geographic location were used to predict performance on the BOC examination. POC candidates were less likely to pass the BOC examination than White candidates. Male candidates were slightly more likely to pass the BOC examination than female candidates. Candidates from private institutions and historically Black colleges and universities (HBCUs) were less likely to pass than candidates from public institutions and predominantly White institutions (PWIs,) respectively. Attending a Hispanic-serving institution (HSI) was not a statistically significant predictor. Geographic location was a statistically significant predictor but only for Districts 5, 8, and 10. Compared to the District 4, the reference category, candidates in District 5 were less likely to pass, and candidates in Districts 8 and 10 were more likely to pass. Age was not a significant predictor of BOC examination performance.

## **Discussion and Conclusions for Research Question #1 Results**

Collectively, the findings indicate that some individual and institutional factors contribute to candidates' performance on the BOC examination. However, the direction of these relationships between the significant predictors and performance varied. Findings related to specific demographics are discussed in the following section, beginning with individual variables.

**Race.** Race was a predictor of performance on the BOC examination in the present study. POC candidates, as a whole, demonstrated a greater likelihood of failure compared to White candidates. Race as a predictor is a new finding in athletic training education literature but not in other health care literature. Race was a significant predictor of performance in studies on the nursing and physical therapy licensing examinations (Haas et al., 2004; Lockie, Van Lanen, & Mc Gannon, 2013; Utzman et al., 2007). Specifically, Black candidates had greater odds of failing both the nursing and physical therapy licensing examinations than all other racial groups. The current study's finding on race is inconsistent with older research by Endres (1997) who found no difference among racial groups on nursing licensure exams.

One possible explanation for the greater likelihood that POC candidates had of failure in the present study is stereotype threat, the risk of validating a negative stereotype associated with a group to which one belongs (Steele & Aronson, 1997). Societal perceptions of certain groups may provoke apprehension for members of targeted groups that they reflect the negative stereotype and that people will perceive them as stereotypical. Specifically, Black and Hispanic students have been shown to be affected

by stereotype threat on high stake tests (Nadler & Clark, 2011; Rodríguez, 2014; Steele, 1997; Steele & Aronson, 1995; Steele et al., 2002). Additionally, researchers have indicated that Black students more frequently use ineffective test-taking strategies than White students (Ellis & Ryan, 2003).

The evidence on race is useful for athletic training educators who can observe students' weaknesses over time and facilitate or recommend interventions for students who have a higher likelihood of failing the BOC examination (Middlemas et al., 2001). Specific examples of interventions that could potentially benefit students of color in combatting stereotype threat are role model interventions and study strategies.

Role models are individuals whom others can emulate (Marx & Roman, 2002). Role models have been shown to have a positive effect on students' self-enhancement when the models' success was relevant and attainable to those emulating them (Lockwood & Kunda, 1997; Lockwood & Kunda, 2000). Role model interventions are thought to alleviate stereotype threat since group members can observe someone from the stereotyped group succeeding and acting as a positive reflection of the group (Shapiro, Williams, & Hambarchyan, 2013).

Study strategies can lessen the impact of stereotype threat due to the change in beliefs about intelligence being malleable as opposed to fixed (Aronson, Fried, & Good, 2002). Interventions focused on study strategies reinforce the notion that intelligence can expand. Group study has also been shown to be effective for students of color. In a groundbreaking study, Treisman (1992) compared Black and Chinese students in a college mathematics class on a number of variables to determine why Black students

were consistently among the weakest in the class and Chinese students were among the strongest. The researcher discovered that Black students studied for several hours a day in isolation, while Chinese students studied alone but also regularly as a group. In response to this finding, an adjunct course was created where group study was strongly encouraged. Black and Latino participants from the adjunct course outperformed their Black, Latino, White, and Asian peers who were not enrolled in the course. Athletic training educators should encourage group study outside of class. However, they will need to provide guidance in order for students to use study groups effectively (Rybczynski & Schussler, 2011).

**Age.** Age was not a significant predictor of BOC performance in the present study, which upholds findings of previous studies in athletic training and physical therapy. Hickman (2010) concluded that there was no relationship between age and performance on the BOC examination. Similarly, Kosmahl (2005) reported that age was not related to scores on the National Physical Therapy Examination (NPTE). On the contrary, Turocy et al. (2000) noted that while age was not predictive of overall BOC examination performance, older candidates performed better on the oral and practical sections of the examination than younger candidates did. However, that finding may no longer be relevant since it was discovered prior to the transition to a computerized examination format and eliminated the oral and practical sections. The present study was also contradictory to the observation of Utzman et al. (2007) that older students performed worse than younger students on the NPTE.

The finding of the present study suggests that candidates of varied ages can succeed on the BOC examination. This information is especially timely as education programs begin to transition to the graduate level. Potential students of varied ages can feel confident that age is not a factor in candidates' performance on the BOC examination.

**Sex.** Sex was a predictor of performance on the BOC examination. The likelihood of males passing the examination was slightly greater than the likelihood of females passing. The present study's finding was inconsistent with that of one other study in nursing. Specifically, Haas et al. (2004) observed that male candidates failed the National Council Licensing Examination for Registered Nurses (NCLEX-RN) at a higher rate than female candidates. The discrepancy between the present study's findings and the findings of Haas et al. is noteworthy considering that both athletic training and nursing are female-dominated professions. The present study's finding is divergent from studies in athletic training and nursing from the early 2000s and more recently in 2013 that showed no significant difference between male and female candidates on the BOC examination or the NCLEX-RN (Beeman & Waterhouse, 2001; Lockie et al., 2013; Middlemas et al., 2001). Again, the findings of Middlemas et al. (2001) are no longer current for the profession of athletic training since the BOC examination has been updated to a fully computerized version.

Based on the present study's finding on sex, athletic training educators should note that female students may have greater likelihood of failure on the BOC examination than female candidates and be prepared to assist them in identifying appropriate resources

and interventions. Similar to the finding above on race, female students may benefit from participation in role model interventions. In a qualitative study of female athletic training students' perceptions of retention and motherhood, one participant remarked that daily role modeling was absent from her experience, so the occasional case study of a woman who was a mother in athletic training seemed less conceivable (Mazerolle & Gavin, 2013). Having access to a role model may help female athletic training students feel more confident and independent (Siple et al., 2015). The need for role modeling should be kept in the forefront of professional discussion as female students have a greater likelihood of BOC examination of failure in this female-dominated profession.

In addition to the individual-level variables, the three institutional-level variables were also statistically significant predictors of performance on the BOC examination. Results for the institutional variables are discussed below.

**Funding type.** Funding type was predictive of performance on the BOC examination. Candidates who attended private institutions were more likely to fail than candidates who attended public institutions. The finding of the present study is new in athletic training research but similar to findings in a study in physical therapy education by Maring and Costello (2009). They determined that funding type was significantly correlated with the first-time pass rate on the NPTE for Physical Therapist Assistants (PTA). Additionally, private institutions had lower first-time and ultimate pass rates than public institutions. One possible explanation that Maring and Costello (2009) deduced for the difference was that students attending public institutions spent more time in technical education coursework and less time in general education coursework than students at

private institutions. They indicated in their results that private institutions had a higher mean value for general education credit hours, while public institutions had a higher mean value for clinical education credit hours.

In undergraduate athletic training education, the focus of coursework is divided between general education and professional education. Although the present study had a difference between public and private institutions, there is no confirmation that the difference could be attributed to general education and clinical education credit hours. The transition to master's level education in athletic training will position the focus of coursework solely on professional education and eradicate any competition with general education (Richardson et al., 2013). Possible differences or the lack of differences in performance between candidates from public and private institutions will be intriguing to note as undergraduate programs are terminated.

**Institution type.** Institution type was also predictive of performance on the BOC examination. Candidates from HBCUs were less likely to pass than candidates from PWIs. HSIs were not predictive of performance. The present study's finding is new for athletic training but should be interpreted with caution. Only two HBCUs in the United States have ATPs, so the number of candidates in the dataset from HBCUs is smaller compared to the numbers of candidates from PWIs and HSIs. Additionally, HBCUs are contending with dwindling financial resources, fewer resources, and weaker infrastructures compared to PWIs (White, 2016). This finding could change over time as ATPs are created at more HBCUs and adequately funded and supported.



Researchers have shown that graduates of health professional programs at HBCUs perform equally to graduates of programs at PWIs (Noonan, Lindong, & Jaitley, 2013). Schlueter (2006) recommended funding for students of color to attend review programs in preparation for the Medical College Admission Test (MCAT). The objective was that these review programs would diminish the barrier that the MCAT presents for students pursuing medicine. Additionally, he suggested that a standardized review program be created that could be made available for HBCUs to administer to students. Similar programs could be made available for athletic training students at HBCUs to increase their likelihood of passing the BOC examination.

In addition to review programs, athletic training students at HBCUs may benefit from mentorship as a number of studies have shown. In Siple et al.'s (2015) qualitative study on black women and mentoring in athletic training, participants felt that receiving mentorship helped them navigate college and afforded them a safe learning environment. A collaborative mentoring effort between public health students and faculty from seven HBCUs and seven PWIs resulted in students improving their communication skills through the five-year preparation and delivery of a public health presentation (Belcher & McFadden, 2014). More than one-third of the participants earned master's degrees, and another one-third earned doctoral degrees. Ninety-five percent of the participants in the mentoring program continued to public health or other health professions. Currently, only two HBCUs host ATPs, and both are in the process of voluntary accreditation withdrawal. Establishing mentoring opportunities will be important for educators who introduce new ATPs at HBCUs.

**Geographic location.** Geographic location was a significant predictor of BOC performance for three levels. Districts 5, 8, and 10 were statistically significant. Candidates in District 5 were less likely to pass the BOC examination, compared to the candidates in the reference category, District 4. Candidates in Districts 8 and 10 were more likely to pass the examination than candidates in District 4. Geographic location has not been identified in athletic training research as a predictor of BOC examination performance, so this finding is new to the existing body of literature. In the medical profession, geographic location influenced student satisfaction with faculty attitude, supervision, patient diversity, and the overall clerkship experience but had no relationship to student performance on the overall clerkship or on a standardized patient examination (Irigoyen et al., 1999).

A more detailed investigation of factors that made Districts 5, 8, and 10 unique extended beyond the variables of interest in this study. Districts 8 and 10 are both comprised of western states where candidates were more likely to pass the BOC examination in comparison to District 4, as opposed to District 5, which is located in the Midwestern region of the United States where candidates were less likely to pass. While no state was safe from the recession of 2007, the industries most affected were located in the Midwestern states (Carnevale & Smith, 2011). Post-recession financial support from states dwindled and is unlikely to return to the level it once was (Perrin, 2015). The loss of state resources could have had an impact on higher education, including health care professions in District 5. The consolation, however, is that health care professions are now among the fastest growing in the Midwestern region, and health care services are

the top employer in three of the seven states that comprise District 5 – Missouri, Nebraska, and North Dakota (Carnevale & Smith, 2011). Graduates of ATPs who wish to secure employment in District 5 have a unique opportunity because of the recent growth of health care professions in those states.

### **Summary of Research Question #2 Results**

The Demographic Profile of Athletic Training (DPAT) Survey included seven independent variables. Four of them were continuous variables: number of years since accreditation, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color. The remaining three were dichotomous variables: minimum required grade point average to remain in the program, secondary admissions process, and maximum enrollment. All seven variables were entered simultaneously in a standard multiple linear regression analysis.

### **Discussion and Conclusions for Research Question #2 Results**

Number of years since accreditation, minimum required grade point average to remain in the program, secondary admissions process, maximum enrollment, percentage of students of color accepted, percentage of faculty of color, and percentage of preceptors of color did not predict pass rates for people of color on the BOC examination. Results for individual variables are discussed below.

**Number of years since accreditation.** A program's number of years since accreditation was not predictive of the BOC examination pass rate for POC. The finding of the present study is new to athletic training research. Moore (2014) conducted a mixed methods study in which certified athletic trainers perceived that candidates from

accredited programs were prepared to take the BOC examination. Participants in Moore's study commented that new curricular requirements based on accreditation standards were responsible for candidates' success and that candidates attempting the examination at the time of the study were probably more prepared than those who were participating in the study. In contrast candidates from newer physical therapy programs had greater likelihood of success on the NPTE than candidates from older programs (Maring & Costello, 2009). As was demonstrated in the present study, the number of years of accreditation was not a predictor in pass rates for POC, which means that as potential students of color pursue professional ATPs, they do not have to consider the number of years of accreditation to distinguish between programs but can focus on other characteristics instead.

**Minimum required grade point average to remain in the program.** The presence of a minimum required grade point average to remain in the program was not a predictor of pass rates for POC on the BOC examination. Since no studies were identified that were focused on pass rates for POC, this finding is new to athletic training literature, and a thorough review yielded no studies in other health care professions where the presence or absence of a programmatic minimum required grade point average predicted candidate performance. Although minimum required grade point average was not shown to be a significant factor in POC pass rates, there is a possibility that grade point average has an impact on whether or not POC are even accepted or allowed to continue in ATPs. In fact, pass rates for POC could not even be calculated for 26% of the institutions in the DPAT Survey dataset.

In a study on how to increase freshman applications to ATPs, Herzog, Anderson, and Starkey (2008) learned that students of color had lower academic performance than White students. Though the result may not be intentional, when grade point average is considered a primary benchmark of success, students of color may be overlooked during the admissions process or prevented from advancing in an academic program (Menser, 2015). Furthermore, grade point average is the most frequently used and most heavily weighted variable in admissions decisions, but little evidence supports that grade point average is critical to clinical success in allied health care professions (Swift, 2012). Athletic training educators may need to consider supplementing the current indicators of success that they use for admission and retention in ATPs.

Nursing researchers have begun to study how nonacademic variables that are relevant to professional practice, such as emotional intelligence, might be effective in predicting which students will be successful (Jones-Schenk & Harper, 2014). Another nonacademic variable that might be helpful is grit. Grit is the “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). A gritty individual is one who can overcome failure, boredom, or lack of progress through his/her stamina. In a 2007 quantitative study, Duckworth et al. found that grit was associated with higher grade point averages and lower SAT scores. Strayhorn (2014) also discovered that grit was a better predictor of college grade point average than high school grade point average and college entrance examinations for Black males. These findings might be indications that students who are less bright than their peers will compensate

with hard work (Duckworth et al., 2007). Thus, decisions makers for ATP admission and retention should not restrict the basis for their decisions to just academic variables.

**Secondary admissions process.** The presence of a secondary admissions process was not a predictor of pass rates for POC on the BOC examination. This finding is new in athletic training research. Also, the finding appears to be new for licensing examinations in other health care professions.

In an athletic training study, Bowman et al. (2016) determined that 92% of the study's participants used a secondary admissions process to select students for ATPs. The three most frequently cited reasons for employing a secondary admissions process were socialization, quality control, and general education. The secondary admissions process allowed students opportunities to learn more about the profession of athletic training and decide if it was a fit for them. The period prior to acceptance also allowed students to focus on general education requirements, so that they could concentrate primarily on professional education once they were admitted. Quality control meant that faculty members would have an opportunity to get to know students personally and evaluate them on their academic performance. This particular reason for using a secondary admissions process could potentially be another barrier that students of color must overcome in order to pursue careers in athletic training.

On one hand, a secondary admissions process could be beneficial for students of color who may rank lower than their White peers in academic performance. As faculty become better acquainted with them, students may be able to compensate for what they lack in academic performance with other characteristics, such as work ethic or maturity.

On the other hand, respondents to the study by Bowman et al. (2016) appreciated the secondary admissions process for the level of perceived objectivity it provides meaning little latitude for other deciding factors. The capacity to consider other factors may not be a possibility, but athletic training faculty should decide what the desired level of diversity is for their programs and establish their level of commitment toward achieving that diversity. For example, if the faculty in a program agree that they need to increase diversity, they may want to consider including nonacademic variables as part of the secondary admissions process. Another option is to eliminate the secondary admissions process altogether.

**Maximum enrollment.** The presence of a maximum enrollment to remain in a program was not predictive of pass rates for POC on the BOC examination. The present study's finding is new to athletic training literature but similar to a finding in physical therapy research. Maring and Costello (2009) learned that private institutions had larger class sizes, and NPTE candidates from private institutions were more likely to fail the examination. The association between these variables in physical therapy may be purely correlational; however, the relationship is worthy of investigation in athletic training. If larger class sizes are found to be associated with failure on the BOC examination, then potential students may want to scrutinize class size as they begin the application process to various institutions.

**Percentage of students of color accepted.** The percentage of students of color accepted was not a predictor of pass rates for POC on the BOC examination. The present study's finding is new in athletic training and for licensing examinations in other health

care professions. Previously, researchers identified that peer networks are important for students of color in higher education, particularly in programs related to science (Johnson & Bozeman, 2012). For example, Black nursing students have reported that they rely on peer support to navigate their academic programs (Dapremont, 2013). While Black nursing students also desired to interact with peers of other races, they considered being able to relate and interact with other Black nursing students a requirement (Dapremont, 2011). Similarly, students of color in medical school needed to avoid “cultural isolation” (Afghani, Santos, Angulo, & Muratori, 2013, p. 1232). Afghani et al. concluded that medical students of color participating in a mentoring program with peers and faculty of color were not likely to fail in school because they were empowered and not alienated from their cultural values.

While having students of color in an ATP may not predict their BOC examination performance, the students of color benefit from having peers of similar racial background. White students reap benefits from their presence as well. White medical students who attended schools with greater numbers of students of color had higher self-reported cultural competence levels than White students at schools with lower numbers of students of color (Saha, Guiton, Wimmers, & Wilkerson, 2008). Individuals who are responsible for admission in ATPs should consider how their programs’ policies and practices may influence the percentage of students of color accepted and intervene in an appropriate manner. For example, educators in ATPs that have historically had no students of color to apply need to evaluate their recruitment efforts and identify strategies to attract students of color in the application process.



**Percentage of faculty of color.** The percentage of faculty of color was not predictive of BOC examination pass rates for POC. The finding is new for athletic training and other health professions research. Although it does not predict BOC examination performance, academic diversity is essential to students' success because it enables them to learn from individuals of varied backgrounds and prepares them to serve a diverse population (Roberts, Maldonado, Coverdale, Balon, Louie, & Beresin, 2014). Medical students of color and college students of color in the Afghani et al. (2013) study gained confidence and increased self-esteem from interacting with faculty of color in their mentoring program. Students should be encouraged to develop relationships with faculty of color (Johnson & Bozeman, 2012). In the athletic training profession, faculty of color should be "aggressively pursued" (Akinmoladun, 2009, p. 968). The benefits of having a diverse faculty extend to recipients of health care services as students will ultimately be diverse thinkers and able to provide care for people whose backgrounds are different from their own.

**Percentage of preceptors of color.** The percentage of preceptors of color did not predict pass rates for POC on the BOC examination. This finding is new to athletic training research and research on licensing examinations for other health care professions. While the percentage of preceptors of color was not predictive of BOC examination performance, the relationship between preceptor and student is an important one and has significant impact on students' ATP experience. Preceptors have the task of mentoring students in the clinical setting (Clouten et al., 2006). In the Siple et al. (2015) study on Black female athletic training students, one participant attributed her being able

to stay on track to the mentorship she received from her preceptor. A diverse pool of athletic training preceptors would have a similar impact as a diverse pool of faculty members. Students would be taught and mentored by individuals from various life experiences and be able to apply that knowledge to patient care in a diverse population (Roberts et al., 2014). Clinical Education Coordinators and other personnel who have input on the selection of preceptors should make concerted efforts to recruit preceptors of color and to ensure that both students of color and White students have opportunities to be mentored by them.

### **Summary and Conclusions of the Study**

As indicated in the present study, individual (race, sex) and institutional (funding type, institution type, geographic location) factors predicted BOC examination performance. However, age was not predictive of BOC examination performance. Further, findings were not indicative that programmatic factors predicted pass rates for POC on the BOC examination.

Overall, the percentages of White and POC individuals who pass the BOC examination are consistent with the percentages of White and POC individuals belonging to the professional athletic training organization, the NATA (National Athletic Trainers' Association Ethnic Diversity Advisory Committee, 2016). However, the shortage of athletic trainers who are POC is a special concern because of health care disparities associated with being POC. Athletic trainers are included in the health care workforce and should be diverse and culturally competent in order to address health care disparities

especially among Black and Hispanic populations and persons in low-income populations (Perrin, 2015).

In an invited commentary on diversity in *JAMA Internal Medicine*, Saha (2014) made a compelling statement on the state of diversity in medicine:

Diversity would be nice, we believe, as long as it does not require trade-offs in more important factors, particularly academic achievement, as measured by science grades and standardized test scores. With that mind-set, lower average grades and scores among URM students, blamed on unequitable primary and secondary education, provides an easy excuse to shrug our shoulders on the issue of diversity. (p. 291)

The URM students Saha was referring to were “underrepresented minority” (p. 291) students in medicine, but the commentary could also apply to athletic training if more effort is not devoted to facilitating success on the BOC examination for Black and Hispanic students and recruiting more students, faculty, and preceptors of color. Stating that the profession is committed to diversity is not sufficient. In a 2006 study of diversity in allied health care, Baldwin et al., found that 74% of colleges and universities inspected had language about their diversity commitment in the mission statement; however, 67% of the institutions did not consider race when making admissions decisions. Considering race as a factor does not necessarily mean setting a specific benchmark and admitting a particular number of applicants that fit a certain demographic into the program. Considering race could be as simple as weighing other application factors besides those

in which students of color have been shown to have lower achievement compared to White students.

The commitment to diversity has not been duly satisfied once students of color have been admitted to the ATP. Once they matriculate, they may need resources in place in order to advance in the program and ultimately, pass the BOC examination. Athletic training educators need to be aware of the needs of their students and be prepared to address them or make referrals, when appropriate. As an example, preceptors are an integral part of the athletic training student's clinical education. As indicated earlier in the chapter, Black and Hispanic students and male students may benefit from role modeling. Thus, educators with Black, Hispanic, and male students in their programs should endeavor to have Black, Hispanic, and male preceptors for these students to emulate. Furthermore, preceptors are expected to be proficient in diversity issues as they relate to education, so they should receive support as well in the form of diversity training (Johnston & Mohide, 2009). In less diverse locales, educators should encourage their students to attend conferences and support them financially, when possible, so they can meet and network with POC.

In the present study, the variables used were not predictive of BOC examination pass rates for POC. However, one-quarter of the institutions responding to the survey had no students of color attempting the examination from which a pass rate could be calculated. The ability to draw conclusions about the relationship between race and licensing examination performance is stunted in athletic training as it is in other health care professions. For example, Haas et al. (2004) reported a 100% pass rate on the

NCLEX-RN for Hispanic students. Unfortunately, the number of Hispanic students in the study's dataset was two. The shortage of POC in health care profession programs leads to a circular issue where research on specific racial groups is limited because of the low numbers. Then, little is known about how or why specific racial groups are successful or unsuccessful on the respective licensing examination because research on these groups is limited.

In the discussion on secondary admissions in athletic training, Herzog et al. (2008) were hopeful that increasing the number of applications to ATPs would increase the quality of student admitted. Likewise, an increase in the number of applications to ATPs from students of color would perhaps increase the quality of diversity in programs. Increasing the quality of diversity requires more than stating the commitment. Concerted efforts should be in place to recruit and retain students of color in athletic training. The National Athletic Trainers' Association Ethnic Diversity Advisory Committee (NATA EDAC) is charged with addressing issues related to athletic trainers of color and also patients of color (Brooks et al., 2007). The NATA EDAC offers grants for innovative ideas to recruit and retain POC in athletic training. However, the responsibility belongs to the entire profession, especially educators. When students of color are a part of a program, multiple parties can benefit (Saha et al., 2008). Researchers can investigate possible differences in examination performance, and educators can use those findings to implement interventions or share best practices. Finally, and most importantly, students of color and White students alike learn to be culturally competence in working with diverse groups of people, and ultimately, patients benefit from that increased knowledge.

## **Limitations**

Several limitations were present for this study. For the BOC candidate dataset, several racial groups had low numbers of participants. As a result, race was analyzed using only two levels in the planned analyses: White and POC. Some of the racial groups were too small to identify individual concerns with performance. Likewise analyses were constrained for the DPAT Survey because of the absence of POC at a number of institutions, whether as students, faculty, or preceptors. Cohen et al. (2002) suggested the lack of POC in health care professions restricts the research agenda in related fields. The present study was evidence of that restriction in athletic training. POC were underrepresented. In instances where there was research on POC, it was from a related health care profession.

This study also did not include individual academic variables, such as grade point average or entrance examination scores. Previous athletic training researchers have found that grade point average predicts performance on the BOC examination (Bruce, 2014; Draper, 1989; Harrelson et al., 1997; Middlemas et al., 2001; Murray, 2014; Searcy, 2006). In the present study, grade point average would have had a significant amount of variation between institutions. For example, some institutions used an overall calculation, and some used a within-major calculation. When using grade point average as a predictor, the researcher has no ability to distinguish rigor, outcomes, or content (Jones-Schenk & Harper, 2014). Additionally, grade point average has historically been a poorer predictor of performance for Black students than White students (Webb et al., 1997). In at least one athletic training study, grade point average was not a predictor of BOC

examination performance, but the sample size was only 24 students (Hickman, 2010). In the present study, grade point average may have been able to explain more variance between institutions on performance since only about 23% of the variance was explained.

Finally, the response rate for the DPAT Survey was expected to be low. To address the potential low response rate, multiple follow-up emails and phone calls went out to ATPDs to request their participation. Additionally, the Clinical Education Coordinators were invited to participate if the ATPD had not responded. Ultimately, a 49% response rate was achieved, which is close to the 51.6% response rate from another recent study of a survey sent to ATPDs (Bowman, Hertel, Mazerolle, Dodge, & Wathington, 2015). However, the survey was conducted primarily electronically, which is linked to low response rate and nonresponse error (Dillman, Hao, & Millar, 2017; Dillman, Smyth, & Christian, 2014). Nonresponse error, also known as nonresponse bias, is an indicator of survey quality where the non-respondents and respondents differ; therefore, response rate alone is not a sufficient gauge of quality of an instrument.

### **Recommendations for Athletic Training Education**

Based on the findings of the present study, three recommendations would be appropriate for adoption in athletic training education: tracking demographic information, debiasing training, and evidence-based interventions. The recommendations are discussed below.

1. ATP administrators should keep track of demographic information on students and preceptors to include race. Several respondents for the DPAT Survey were unable to provide the number of students and preceptors of color associated with their programs

because they did not track that information. When there is no evidence of a problem, pretending as though no problem exists is easy. Michel (2016) also recommended tracking demographic information because he was unable to find data on ATP faculty and students for his dissertation study. The same was true for students in the present study. The NATA EDAC provides an overview of the profession's demographics but not of the student population (National Athletic Trainers' Association Ethnic Diversity Advisory Committee, 2016). If demographic information was tracked more thoroughly and consistently, trends would be easier to identify.

2. Faculty and preceptors should participate in debiasing training for educators to become aware of and reduce implicit bias. Black and Hispanic students have been shown to be particularly susceptible to stereotype threat which impacts performance on standardized tests (Rodríguez, 2014; Steele, 1997; Steele & Aronson, 1995). Debiasing includes a number of strategies, such as replacing stereotypes, imagining counter images, learning about individuals as opposed to groups, and trying to see the stereotyped group's perspective (Godsil, Tropp, Goff, & Powell, 2014). After completing debiasing training, faculty and preceptors can incorporate what they learned into their classes and work with students to lessen the impact of stereotype threat. Researchers studying Black college students showed that they were more academically engaged and earned higher grade point averages than peers in the control group when they were encouraged to view their intelligence as adaptable (Aronson et al., 2002). This method may be helpful in reducing the potential impact of stereotype threat for Black and Hispanic candidates attempting the BOC examination.



3. Athletic training educators should seek out the most current research on what factors can predict academic performance for students. Being able to identify students' weaknesses can lead to early intervention and access to resources that may help students succeed on the BOC examination (Middlemas et al., 2001). Since the profession is transitioning toward professional master's programs, educators should include nursing, medicine, and physical therapy in their literature searches to supplement athletic training research on master's programs.

### **Recommendations for Future Research**

This study was a first step in identifying demographic predictors of performance on the BOC examination and of pass rates for POC. Ideas for relevant future studies are presented below.

1. The variables used in this study do not represent a complete list of all variables that predict performance on the BOC examination. Future research should include academic variables, such as grade point average, as well as nonacademic variables, such as grit, as possible predictors.

2. POC had a greater likelihood of failure on the BOC examination than White candidates. Future researchers should experiment with interventions for students of color that address test-taking strategies and stereotype threat in athletic training education and observe for differences between the experimental and control groups. Future researchers should conduct studies that are focused on issues of diversity in athletic training, especially since the profession is terminating undergraduate programs. The limited research in athletic training that did include POC will need to be updated.

3. Pass rates for POC could not be calculated for 120 of the institutions included in the DPAT Survey dataset because of the absence of students of color attempting the examination. Future researchers should consider highlighting best practices for recruitment and retention of students of color in athletic training and longitudinally tracking retention trends after the best practices have been implemented.

4. The profession of athletic training is currently transitioning to all master's level professional programs. Future researchers should investigate how these results may have changed or stayed the same once all undergraduate programs have been discontinued.

5. This study placed emphasis on first-time candidates only. Retake candidates were excluded. Additional studies in the future should explore reasons why different racial groups of candidates persist in retaking the examination and differences in the number of attempts between racial groups.

6. Finally, research on race in athletic training should be expanded to include a critical viewpoint. Critical race theory is a theoretical framework originating from legal scholarship, where race takes the primary focus (Chapman, 2007). Critical race theory confronts claims of race neutrality, colorblindness, and meritocracy historically made by educational institutions (Solórzano & Yosso, 2002). Research that comes from a critical race lens can be social action-oriented by guiding educators toward better ways to serve students of color (Chapman, 2007).

Research on race is most commonly presented from a normative framework in which Blacks and Latinos are “viewed predominantly as inferior, underprivileged, or underrepresented, and as underachievers” (Teranishi, 2007, p. 39). The use of a critical

quantitative framework requires researchers to consider the diversity that exists even within one racial group. Furthermore, critical quantitative research does not ignore the intersection of researcher identity and research (Carter & Hurtado, 2007). Future athletic training research should incorporate critical race theory and critical quantitative methodologies to investigate issues of race in athletic training.

## Appendix A

### Institutional Review Board Exempt Letter



#### Office of Research Integrity and Assurance

Research Hall, 4400 University Drive, MS 6D6, Fairfax, Virginia 22030  
Phone: 703-993-5445; Fax: 703-993-9590

DATE: October 19, 2016

TO: Shane Caswell, PhD  
FROM: George Mason University IRB

Project Title: [917797-2] Individual and Institutional Demographic Factors as Predictors of Candidates' Performance on the Board of Certification of Examination

SUBMISSION TYPE: Amendment/Modification

ACTION: DETERMINATION OF EXEMPT STATUS

DECISION DATE: October 19, 2016

REVIEW CATEGORY: Exemption category #2

Thank you for your submission of Amendment/Modification materials for this project. The Office of Research Integrity & Assurance (ORIA) has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

Please remember that all research must be conducted as described in the submitted materials.

Please note that any revision to previously approved materials must be submitted to the ORIA prior to initiation. Please use the appropriate revision forms for this procedure.

If you have any questions, please contact Karen Motsinger at 703-993-4208 or kmotsing@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

## Appendix B

### Demographic Profile of Athletic Training Survey

1. What is the name of the college/university where you are employed?  
\_\_\_\_\_
2. Does your Athletic Training Education Program (ATEP) have a minimum required grade point average to remain in the program? Circle one: Yes    No  
  
If yes, please enter the minimum required grade point average to remain in the program.  
\_\_\_\_\_
3. Is there a secondary admissions process (e.g., additional application, interview) required for entrance into your ATEP? Circle one: Yes        No  
  
If yes, please describe the secondary admissions process. \_\_\_\_\_  
\_\_\_\_\_
4. What is the maximum enrollment allowed in your ATEP? If there is no maximum enrollment, enter N/A. \_\_\_\_\_
5. How many faculty members (full-time and part-time were associated with your ATEP in academic year 2015-2016? \_\_\_\_\_
6. How many total faculty members of color (American Indian/Alaskan Native, Asian/Pacific Islander, Black/not of Hispanic origin, Hispanic, Multiethnic, Other) were associated with your ATEP in academic year 2015-2016? \_\_\_\_\_
7. How many total students of color (American Indian/Alaskan Native, Asian/Pacific Islander, Black/not of Hispanic origin, Hispanic, Multiethnic, Other) applied to your ATEP in academic year 2015-2016? \_\_\_\_\_
8. How many total students of color (American Indian/Alaskan Native, Asian/Pacific Islander, Black/not of Hispanic origin, Hispanic, Multiethnic, Other) were accepted to

your ATEP in academic year 2015-2016? \_\_\_\_\_

9. How many preceptors were associated with your ATEP in academic year 2015-2016?

\_\_\_\_\_

10. How many total preceptors of color (American Indian/Alaskan Native, Asian/Pacific Islander, Black/not of Hispanic origin, Hispanic, Multiethnic, Other) were associated with your ATEP in academic year 2015-2016? \_\_\_\_\_

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## **Biography**

Candace S. Parham graduated from Petersburg High School, Petersburg, Virginia, in 1999. She earned her Bachelor of Science degree in Health and Physical Education with a concentration in Sports Medicine from the University of Virginia in 2003. She also earned her Master of Science degree in Exercise, Fitness, and Health Promotion from George Mason University in 2005. She has been employed at George Mason University since 2005, where she is currently the Clinical Education Coordinator for both the undergraduate and graduate athletic training programs. She is the proud daughter of Rev. Dr. Horace B. Parham, Jr. and Mrs. Teliscia T. Parham. She is also a member of the public service sorority, Delta Sigma Theta Sorority Inc.