Determination of Predictors for Early Program Attrition in a Professional Master’s Level Athletic Training Education Program

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Determination of Predictors for Early Program Attrition in a Professional Master’s Level Athletic Training Education Program

by

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Submitted in partial fulfillment of the requirements for the degree

Doctor of Philosophy

Department of Higher Education, Leadership, Management and Policy

Seton Hall University

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

APPROVAL FOR SUCCESSFUL DEFENSE

Dawn M. Maffucci has successfully defended and made the required modifications to the text of the doctoral dissertation for the PhD during this Fall Semester 2019.

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Abstract

Making graduate level admission decisions is a complicated process. It is beneficial to the institution, the academic program and the student that every applicant who is admitted into a program is retained and graduates. The utilization of pre-admission factors can be helpful in determining who will succeed and who will not. This study was completed on a cohort of 183 students, spanning nine years. The goal was to identify variables that were predictive of student retention past the first six months of a professional master’s athletic training program (PM). Variables looked at were method of program admission (3+2 program vs. traditional admission process), undergraduate GPA, social science GPA, science GPA, whether the applicant took calculus, Barron’s rating of undergraduate institution, score on letters of recommendation (LORs), score on personal essay, observation hours, race, gender, and age at admission. Chi-square data indicated that there was no difference in student retention when students were admitted through a 3+2 program or through traditional admission processes. Logistic regression results showed that LORs, Barron’s rating, and whether the student took calculus had the greatest predictive ability of student retention. No other variables showed significant findings. These results indicate that GPA is not always the predictor of success it has been known to be. LORs, Barron’s rating, and whether the student took calculus can give insight into elements of the applicant not clearly defined by GPA. Analyzing admission protocol and adjusting it to reflect non-graded elements can benefit graduate programs by improving admission decisions.

Key words: retention, attrition, letter of recommendation, Barron’s selectivity rating, calculus, GPA, athletic training education, admissions, higher education
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Chapter 1

Introduction

The passing of the Patient Protection and Affordable Care Act (ACA) in 2010 has resulted in a changing landscape of healthcare in the United States. With the increase in individuals that have access to health insurance, the demand for properly trained allied healthcare professionals has significantly increased (Demo et al., 2015). According to the National Bureau of Labor Statistics published in 2016, 15 of the top 30 fastest growing professions in the country fall under the allied healthcare umbrella (Bureau of Labor Statistics, n.d.-b). The allied healthcare profession of athletic training, the focus of this dissertation, is predicted to grow by 23% by 2026 (Bureau of Labor Statistics, n.d.-a). This predicted growth is buoyed by an increase in the country’s active population and a focus on injury prevention and care across the lifespan (Flanigan, 2014). These numbers and trends indicate that the need for appropriately trained athletic trainers is growing and will continue to grow into the future.

Attracting, admitting, and retaining students is important to the success and continuance of any academic discipline. When it comes to allied healthcare professions and the current healthcare landscape, these topics become essential in order to ensure that there are enough qualified graduates to meet market demands. Without appropriate admission and retention of highly prepared students, academic programs will be unable to produce the qualified professionals needed for the growing job market and patient population.

The selection of appropriate candidates from a large applicant pool is a difficult yet essential process of graduate school admissions (Bruce, Crawford, Wilkerson, Rausch, Dale, & Harris, 2016; Luce, 2011; Schmalz, Rahr, & Allen, 1990; Utzman, Riddle, & Jewell, 2007). There has been academic work completed across allied healthcare disciplines to try and objectify
the admissions process using pre-admission criteria. The goal of these studies was to preemptively identify applicants who would be able to achieve various levels of programmatic success. Success is defined differently in each study, ranging from first year GPA to successful completion of the discipline’s board of certification exam (Bruce et al., 2016; Keskula, Sammarone, & Perrin, 1995; Luce, 2011; Platt, Turocy, & McGlumphy, 2001; Ruscingno, Zipp, & Olson, 2010; Salvatori, 2001; Utzman et al., 2007).

The goal of this dissertation is to build upon the current knowledge base and determine appropriate admission criteria for professional master’s programs in athletic training (PM). The end goal of this project would be to develop an objective method of applicant assessment in order to decrease student attrition in PMs. This would result in an increased number of athletic trainers (ATs) available to enter the growing workforce and meet market demand.

**Persistence, Retention, and Attrition Landscape**

Student persistence, retention, and attrition are historically relevant topics in higher education (Cabrera, Nora, & Castaneda, 1993; Crede & Borrego, 2014; Dodge, Mitchell, & Mensch, 2009; Tinto, 1975). This is at least partially because student educational completion has stakeholders ranging from the student and academic institution to the general public. As public opinion pushes the college/university system for greater transparency and accountability (Hillman, Tandberg, & Fryar, 2015), and the job market is demanding more trained individuals (Bureau of Labor Statistics, n.d.-b), the ability to not only attract quality students but to retain them through to graduation is essential for higher education and the professional work force.

Undergraduate attrition across academic disciplines has been a problem that has been well-studied and nationally tracked for years (Cabrera et al., 1993; Tinto, 1975). Unfortunately
even though researchers have studied this topic in-depth, the national numbers for undergraduate completion rates have remained stable at only 59%. ("The Condition of Education—Participation in Education—Postsecondary—Postbaccalaureate Enrollment—Indicator May (2017),” n.d.). This low number is a problem for the relevant academic stakeholders in that once a student is admitted into an academic program, the most fiscally responsible, socially responsible, and time-efficient outcome is for the individual to persist through to graduation (Dodge et al., 2009; Schneider, Yin, & American Institutes for Research, 2011; Terenzini & Pascarella, 1991).

Within the last 10 years there has been an increase in the number of studies published on graduate school attrition and completion (Baum & Steele, 2017; Ma, Pender, & Welch, 2016). One such study completed by Baum & Steele (2017) utilized the US Census Bureau and the Baccalaureate and Beyond data base to study attrition rates and demographics of those attending graduate school and those who succeed. Baum & Steele (2017) found attrition rates for master’s programs to be higher than for professional and doctoral programs. The researchers defined master’s programs as those having “master” in the title. The academic program studied in this dissertation (professional master’s in athletic training) would fall in the master’s category. Professional degrees included medical and law degrees, and doctoral programs included PhD’s and EdD’s. Seventy-three percent of people who enrolled in a post-baccalaureate degree enrolled at the master’s level, thereby making this by far the greatest route for post-baccalaureate attainment.

Baum & Steele (2017) found that 26% of people who started a master’s degree did not complete the degree, compared to 14% of those enrolled in a professional degree program and only 12% of those enrolled in a doctoral degree program. Women, underrepresented minorities (Black and Hispanic), older college graduates, and those from the lowest income quartile were
less likely to complete their degree once enrolled. However, regardless of the specific demographic, there is significant attrition in graduate school and this attrition should be studied and analyzed in order to seek methods of improvement.

While graduate level attrition numbers may not be as high as those seen at the undergraduate level, this level of attrition is still problematic. The overall number of people who enroll in graduate school is significantly less than those who enroll in undergraduate education. As such, when discussing graduate level attrition, the focus is on a subset of the population who are highly educated individuals that are not being retained by their chosen academic program. Graduate level students are often emotionally and professionally invested in their graduate work, and programmatic attrition may be devastating to their self-esteem as well as proposed professional achievements (Anderton, 2017; Crocker, Sommers, & Luhtanen, 2002; Stetto, Gackstetter, Cruess, & Hooper, 2004). This lack of retention can come at a steep economic, social, and personal cost to the student, the institution, and potentially society as a whole (Brock, 2010; Dodge et al., 2009; Luce, 2011; “Master’s Completion Project | Council of Graduate Schools,” n.d.; Stetto et al., 2004; Zhang, 2005).

Research has shown that there are significant financial and social benefits that come with obtaining a college degree. Increased income, increased social awareness, and civic participation (e.g. voting and civic engagement) have been shown to occur with higher education (Brock, 2010; Ma, Pender, & Welch, 2016; Zhang, 2005). Civic engagement has been noted as a goal of many graduate level students, professors, and academic programs in order to give back and serve their community (Bloomfield, 2005; Brock, 2010; Ma et al., 2016; Zhang, 2005).

While earning a bachelor’s degree has significant financial benefits over a high school diploma, attendance and completion of post-baccalaureate work can have even greater financial
benefits for the successful student. In 2015, earnings for individuals 35-44 years old with a
master’s degree were 23% higher than those who held a bachelor's degree; the average earnings
for those with a doctorate was 63% higher than those with a bachelor’s degree (Baum & Steele,
2017). Since graduate school can cost the student an average of $30,000-$40,000 per year
(Peterson’s, 2018), successful completion of graduate school and the increased income that
comes with it is essential for the student to pay off their student debt as well as reap the future
financial, societal, and health benefits that come with increased income and social status.

An inability to succeed in graduate school results in lost financial revenue for the student,
the academic program, and the university. In addition, the student experiences lost social and
health capital. Considering this, higher education degree attainment has a plethora of advantages
for the student and university alike.

**Graduate Education Attainment**

Unlike undergraduate enrollees, the tracking of graduate level students has not been long
followed or studied (Gururaj, Heilig, & Somers, 2010). One reason for this may be the relatively
small number of post-baccalaureate enrollees. In the fall of 2015, there were only 2.9 million
students enrolled in a post-baccalaureate program versus 17 million undergraduate students
(“The Condition of Education - Participation in Education - Postsecondary - Postbaccalaureate
Enrollment - Indicator May (2017),” n.d.). However, considering that post-baccalaureate
students become allied healthcare professionals, doctors, lawyers, scientists, professors, business
and other societal leaders, understanding outcomes for these enrollees can have significant
societal importance.

The number of individuals with a master’s, professional, or doctoral degree has increased
significantly over the last 20 years. Many believe that the master’s degree is becoming the new
bachelor’s degree for a multitude of professions, and as such, has a growing importance in higher education (Ma et al., 2016; Pappano, 2011). The number of individuals 25 and over who have an advanced degree has increased nationally by 50 percent, growing from 8 percent of the population in 1995 to 12 percent in 2015 (Baum & Steele, 2017). As more people are seeking higher levels of education, the need to track attrition and retention continues to grow along with it. It is becoming increasingly more important to understand who goes to graduate school and who can succeed in that environment.

**Program Attrition Allied Healthcare Fields**

Most of the academic work done on admission processes and success/retention in the field of allied healthcare education has been done on fields other than athletic training. These fields include physical therapy (Dockter, 2001; Ruscingno et al., 2010; Utzman et al., 2007), physician assistant (Luce, 2011), and occupational therapy (Schmalz et al., 1990). However, these studies provide insight into the overall admission process that this dissertation will be analyzing. Allied healthcare programs, including athletic training, are academically rigorous, require outside accreditation, and are mostly offered at the graduate level. The accrediting bodies of these programs generally track student retention and graduation rates as part of their regular program monitoring. These numbers are often reported as part of programmatic annual reports and are frequently tied to obtaining and maintaining national accreditation. Traditionally, the accrediting body for athletic training has not tracked this information. However, this is no longer the case as a new accreditation requirement was implemented on July 1, 2018 mandating that all accredited athletic programs collect and report data to the accrediting body as well as post on their websites. This data must include retention data, graduation/completion rates as well as
employment rates. (Commission on Accreditation of Athletic Training Education [CAATE], n.d.-d).

Allied healthcare programs have historically shown low attrition numbers with subsequent high levels of retention. Programs such as: physician assistant, physical therapy, and occupational therapy have graduation and retention rates in the mid to upper 90’s. In 2017, the Commission on Accreditation of Physical Therapy Education (CAPTE) reported a graduation rate of 97.2% (Commission on Accreditation of Physical Therapy Education [CAPTE], n.d.-b). The Physician Assistant Education Association in their 2016-2017 Annual Report reported a graduation rate of 96.7% (Physician Assistant Education Association [PAEA], Yuen, Lessard, & Keahey, 2018). The American Occupational Therapy Association (AOTA) 2017-2018 Annual Data Report reported a graduation rate of 98% (American Occupational Therapy Association [AOTA], n.d.). As discussed earlier, high levels of retention are important in the allied healthcare fields so that academic programs can produce enough quality students to meet the growing societal need.

**Program Attrition in Athletic Training Education**

While allied healthcare programs in general have high retention rates, professional master’s program in athletic training (PMs) lag their peer professions. Even though the CAATE started collecting graduation and retention data in the fall of 2018, the aggregate data for every PM, as of fall 2019, it is not yet publicly available. However, in a study published in 2015, Bowman, Pitney, Mazerolle and Dodge (2015) found that Athletic Training professional master’s programs (PMs) had an average retention rate of only 88.7%. This translates to an attrition rate of 11.3%. While this study was not inclusive of every PM, it does illustrate that for the surveyed athletic training education programs, they demonstrated a lower attrition rate than
the general master’s level attrition numbers of 23% (Baum & Steele, 2017) but had a significantly higher attrition rate than their peer professions.

Besides being higher than that of their peer professions, another factor making an 11.3% attrition rate problematic for athletic training education is that the average enrollment in a PM is approximately 15 students per incoming class (CAATE, 2019). In comparison the average incoming physical therapy class in 2016 was 45 (CAPTE, n.d.-b) as was the average physician assistant class (“Choosing a Program,” n.d.). As a result of the small incoming class sizes, the implication of the relatively high attrition rate seen in PMs becomes even more important. In order to keep an academic program solvent as well as produce enough qualified professionals to meet the predicted 23% growth in need (Bureau of Labor Statistics, n.d.-a), there needs to be a consistent student body. The best way to maintain a consistent student body is to ensure that the students who are admitted are also retained.

Moving to the Professional Master’s Program

Currently, in order to become a practicing professional, the athletic training student must graduate from an education program accredited by the Commission on Accreditation of Athletic Training Education (CAATE) and pass the national Board of Certification (BOC) exam. The accredited education program that the student graduates from can be at either the professional bachelor’s or professional master’s level. In 2015 the BOC, CAATE, and the NATA, which are the three organizations that govern all aspects of athletic training education and certification, announced that all entry-level education programs need to move to and be taught at the professional master’s level. This mandate was put in place in order for the educational requirements for athletic trainers to be brought up to a standard that is more in line with their peer professions. As such, 2022 will be the last year that an undergraduate class can be admitted
into an undergraduate athletic training education program (CAATE, n.d.-c.). This change was
decided on after years of study and comes with stricter academic standards and the need to adjust
to a graduate model and mentality. This shift requires not only a change in coursework but a
development of admission procedures, as well as policies and procedures regarding student
retention that are geared towards the graduate level student (CAATE, n.d.-b).

As a result of this mandate it is imperative that the administration of PMs determine
appropriate techniques to increase student retention while maintaining the strict academic criteria
necessary to produce a student able to pass the BOC examination and become a highly
competent allied healthcare professional. One potential way of doing this is to evaluate
admission criteria in order to ensure that the students that are admitted to a PM can sustain the
rigor of that program. This is an issue that is not unique to AT. All professional fields that
require a certification exam have similar requirements. However, AT currently has the lowest
retention rate among their peer professions making this issue particularly relevant to the evolving
programs.

Admission Standards and Program Attrition

When individuals enter a graduate level allied healthcare program, they not only need to
graduate from that program but need to pass a certification exam in order to become a practicing
professional. In the case of athletic training, this exam is administered by the Board of
Certification (BOC) and programmatic pass rates are a factor in obtaining CAATE accreditation.
As a result, simply lowering programmatic academic standards, in order to decrease attrition, is
not a viable option for PM’s. Instead, programs should look to address early program attrition by
evaluating program admission criteria in order to ensure that the people being admitted can meet
the demands of the program.
In studies specifically looking at admission criteria as predictors of success in athletic training education, multiple studies have been done at the undergraduate level and have shown incoming GPA to be an accurate predictor of programmatic success (Keskula et al., 1995; Platt et al., 2001; Salvatori, 2001). This seems to hold true whether the researcher analyzed high school GPA (Platt et al., 2001), program pre-admission GPA (Salvatori, 2001), or undergraduate GPA (Keskula et al., 1995). Simply put, research has consistently shown that the higher a student’s incoming GPA, the more likely they are to succeed in a professional bachelor’s athletic training program.

In addition to GPA, researchers also found that students who were more integrated into the program, had a high desire to become an Athletic Trainer (AT), as well as a strong knowledge of the requirements of the AT profession were more likely to persist than their peers (Dodge et al., 2009; Mazerolle & Dodge, 2014). While this professional integration often occurs after a student is admitted to the educational program, researchers have found that a structured observational experience prior to program admission was beneficial in providing students a level of assimilation and clinical integration that properly prepared them for the rigors of the athletic training profession and assisted in programmatic retention (Mazerolle & Dodge, 2014). This prior preparation is thought to prepare the students for the reality of athletic training so that they are not surprised by the daily requirements once they are in the program and/or a practicing professional.

Factoring in the amount of experience and exposure a student has to the athletic training field may be a beneficial addition to the admission application. This is commonly attempted using personal essays, letters of recommendation from athletic trainers, and clinical observation hours. Ensuring that a student has extensive knowledge of the field of athletic training prior to
admission may assist in decreasing student attrition as a result of change in career aspiration. Utilizing number of observation hours, letters of recommendation and a personal essay as indicators of knowledge of the profession may be a feasible and accurate predictor of student success (Mazerolle & Dodge, 2014).

Professional Master’s Programs

There has been one study completed that looked at predictive factors of success in a PM (Bruce et al., 2016). Bruce et al., (2016), completed a study aimed at developing a prediction model for academic success in a PM. The researchers utilized a cohort model that included 119 students that were admitted over a span of nine years at one PM. The researchers identified success as the student having a GPA of 3.45 or higher after the first year. This GPA was determined has having the most predictive ability of BOC success. The researchers started with 35 predictor variables identified through previous research as well as beliefs, hypotheses and the past experiences of the PM’s faculty. These 35 variables ranged from GPA and number of advanced science courses taken to factors regarding the applicant’s undergraduate institution such as Carnegie Classification and average SAT score. Through a series of univariate analyses, these variables were pared down to the nine most potentially significant ones. These nine variables were: Academic Profile of Undergraduate Institution (APUI), Graduate Record Examination quantitative (GREq), Graduate Record Examination verbal (GREv), Graduate Record Examination written (GREw), number of advanced math and science courses taken, calculus, physics, graduate from a research intensive institution, and undergraduate Grade Point Average (uGPA). No multicollinearity was found between these nine variables. Once no multicollinearity was found then a backward, stepwise, logistic regression was performed to produce a 3-factor model. This model indicated that the combination of an uGPA of $\geq 3.18$, GREq $\geq 145.5$
and that the applicant took calculus as an undergraduate student was able to predict success in a PM with a 90.5% accuracy. A student who has at least two of these factors was 20 times more likely to be successful in the program than a student who only had one. However, while these three factors in combination were determined to be the most predictive of PM success, all nine factors showed a higher level of success than when they were not present in the applicant.

**Non-Athletic Training Allied Healthcare Programs**

While there has only been one study looking at graduate level athletic training education programs, there has been work done analyzing the admission criteria of various graduate level allied healthcare programs and how these criteria predict student success. A few of the key studies were done on physician assistant (PA) programs (Luce, 2011), physical therapy (PT) programs (Utzman et al., 2007), and one study that contained three allied healthcare programs including, PA, PT, and occupational therapy (OT) programs (Schmalz et al., 1990). These studies had varying levels of success. Luce (2011) developed a prediction rule to identify at risk PA students with a 92% success rate. Luce (2011) utilized undergraduate GPA, science GPA, and the three sections of the GRE to formulate his rule.

Utzman, Riddle, and Jewell (2007) studied physical therapy students and formulated their prediction rule using undergraduate GPA, verbal and quantitative GRE scores, as well as age, race and ethnicity. This group experienced varying results with their prediction rule depending on the specific program. It was determined that each school has unique properties and as such should develop their own prediction rule specific to their program.

Schmaltz, Rahr and Allan (1990) studied common application criteria for PA, PT, and OT students and discovered several predictive variables for student success. The variables with
the highest predictive ability included the Otis Quick-Scoring Mental Abilities Test, institution where courses were taken, cumulative GPA, and admissions essay scores.

The four primary studies that have focused on a similar project as the one I aim to do have certain trends in their predictive factors. These studies utilized academic factors such as GPA, GRE, and specific undergraduate coursework (Bruce et al., 2016; Luce, 2011; Schmalz et al., 1990; Utzman et al., 2007) as well as the undergraduate institution where the applicant completed their undergraduate degree (Bruce et al., 2016; Schmalz et al., 1990).

Non-Academic Predictive Factors

In the predictive admission literature in general, factors such as age, race, gender, student motivation, and academic integration have shown to be contributors to academic success. Baum & Steele (2017) found that 61% of people completed their master’s level degree within 10 years of enrollment in the graduate program. However, non-academic factors played a significant role in determining the chance of success in graduate school education. According to Baum & Steele (2017), socio-economic status affected graduate program completion with completion rates increasing from 59% to 72% as income quartile increased. Males were also slightly more likely to graduate than females at a rate of 62% vs 60%. The researchers also found that individuals who received their bachelor’s degree when they were 22 or younger had a 65% chance of completing their graduate degree when all other ages ranged from 53-56%.

Other factors such as financial strain, change in career aspirations, and inadequate educational preparation can lead to high levels of attrition in allied health programs (Bowman, Pitney, Mazerolle, & Dodge, 2015; Jeffreys, 2014) All of these factors are ones that could potentially be traced back to pre-admission criteria. Appropriate academic preparation (grades in pre-requisite courses, GPA, and Barron’s Score 2016), recognition of financial strain (personal
statement, resume) as well as learning more about a chosen field prior to programmatic application (personal statement, letters of recommendation, observation hours, and previous clinical experience) can all be tasked to the pre-admitted student and evaluated prior to program admission.

**Method of Admission**

Dual degree programs are programs where high school students are admitted into the university on a track designed for direct entry into a graduate program. Overall, the literature for dual degree programs has been positive when it comes to student success. In 2010 Ruscigno, et al., did a retrospective study and looked at the graduate level GPA of physical therapy students admitted to the Doctor of Physical Therapy program through a 3 + 4 dual degree program versus students who were admitted into the doctorate program after obtaining a BA/BS prior to admission. Ruscigno, et al. (2010), found that while controlling for other factors such as pre-admission GPA, the students who were part of the dual degree program had a first-year programmatic GPA that was higher than the students who were admitted through the traditional admission process. Determining whether a dual degree program would be beneficial to a PM is an important factor when setting admission standards for a newly established program.

The benefit of looking at admission criteria to flag potential early program attrition is that these factors are presented to the program even before the student is admitted. If certain criteria can be flagged or focused on, programs can work towards altering their admission criteria to only admit students with the highest chance of academic success. Program may also use this information to allocate resources for program remediation and to flag certain students as “at-risk” in order to put assistance programs in place before the student gets into academic difficulty. Whether this information is used to make admission decisions or to put remediation programs in
place, the overarching goal is to increase student retention and ultimately increase the number of properly trained athletic trainers.

**Problem Statement and Purpose of Study**

As a result of the significant impact that early program attrition can have on the student, academic program, and the institution, it is important that policies and procedures are put in place to retain as many students as possible. In 1970 Pinkston and Margolis presented work indicating that for education to be effective and economical, a means of predicting success among applicants is essential. A key point to retaining students is ensuring that only students who can meet the academic and personal demands of the program are admitted. Developing admission criteria that accurately predicts the success and failure of a student is a key component of an academic program’s success (Pinkston & Margolis, 1970).

This dissertation focused on graduate level admission variables and how they may predict early program attrition. The programmatic focus is on the professional master’s athletic training program (PM). There is a significant lack of study linking graduate level admission criteria to programmatic success. This lack of information is particularly obvious in athletic training where there is only one other study that has researched this topic. However, with the growth of master’s level education and the move of the athletic training entry degree to the master’s level, this study has significant importance.

In order to be a practicing athletic trainer, an individual must graduate from a PM that is accredited by the CAATE and then also pass a certification examination administered by the national BOC. As a result of these requirements, PMs must be academically challenging and rigorous with their standards. However, PMs currently have an attrition rate that is higher than
their allied health peers. Developing and determining appropriate admission criteria is essential to admitting appropriate students, limiting student attrition and promoting student success.

The purpose of this study is to develop a prediction model in order to understand what admission factors may predict student attrition in a professional master’s program (PM). The goal of this model would be to improve the admission process so that PMs decrease programmatic attrition and have a retention rate in line with their allied health peers.

**Conceptual Framework**

Established theories that fully explain admission criteria’s relationship to early programmatic attrition in graduate level education do not exist. However, an attempt can be made to explain this issue through the combined analysis of Tinto’s work on student attrition and retention (Tinto, 1975), Astin’s theory of involvement (Astin, 1999) and Vroom’s Expectancy Theory (Gyurko, 2011). Combined, these three theories address various components of not only graduate student behavior but human behavior in general. These combined theories have a particular focus on how human behavior relates to persistence, motivation and desire. The synthesis of these three established theories will help to explain some of the academic and non-academic factors that may affect student attrition and which of these factors can be proactively addressed as part of the student admission portfolio. Together these theories support that pre-admission factors, combined with academic integration, clinical integration and student expectancy of success are critical and together may be able to predict student attrition.

**Research Questions**

The graduate admission portfolio contains a variety of information that may help predict early program attrition. Several of the variables I chose to research were briefly touched on above and will be described in future chapters in greater detail. I choose these variables as a
result of prior studies, theoretical literature and previous experience with admissions. The main themes that I looked at included academic variables (question 1), demographic variables (question 2), student knowledge of profession (question 3), method of admission (question 4), and prior academic preparation (question 5).

1) What is the relationship between: undergraduate GPA, science prerequisite GPA, social science prerequisite GPA as well as whether a student took undergraduate calculus and early program attrition in a professional master’s athletic training education program?

2) What is the relationship between: race, age, or gender and early program attrition in a professional master’s athletic training education program?

3) What is the relationship between number of clinical observation hours, average score on letters of recommendation as well as average score on personal essay and early program attrition in a professional master’s athletic training education program?

4) What is the difference in early program attrition rates of students admitted through traditional methods and those admitted to the PM from a direct admission (3+2) program?

5) What is the relationship between the Barron’s college selectivity rating of the applicant’s undergraduate institution and early program attrition in a professional master’s athletic training program?

**Significance of Study**

If admission criteria and procedures are appropriate and adequate, then admitted students should have the academic and non-academic capabilities to succeed. However, approximately 11.3% of professional master’s students do not persist through their academic program (Bowman, Pitney, et al., 2015). The goal of this project is to determine what admission criteria
are an accurate predictor of early program attrition, as measured by attrition during the first six months of the academic program.

Determination of these predictors will allow PMs to either alter admission criteria and/or put preventative measures in place to assist at risk students. This study is timely in that athletic training education programs across the country are moving from a professional bachelor’s degree to a professional master’s due to an accreditation mandate. Having knowledge of key admission criteria could be extremely helpful in the development of their admission portfolio, ensuring admission of appropriately prepared students, and bringing the overall retention rate of PMs in line with that of other allied health professions.

The remaining chapters of this dissertation will fully illustrate the theoretical framework for this study and summarize the existing literature, while pointing out the significant gaps in knowledge. I will attempt to fill some of these gaps through statistical analysis of admission application data and student attrition.
Chapter 2

Literature Review

The focus of this dissertation is the determination of admission factors that can be used to identify students who are most susceptible to early program attrition in PMs. Early program attrition is being defined here as attrition that occurs during the first six months of the PM and can be the result of academic or non-academic related issues. This topic is particularly timely, as the mandated entry-level degree for athletic training is being elevated from the bachelor’s to the master’s level (Commission on Accreditation of Athletic Training Education, n.d.-b). Colleges and universities across the country are starting PMs as well as converting their current bachelor’s programs to professional master’s programs. While this change in education level will bring athletic training education programs in line with their peer allied healthcare fields such as physician assistant, physical therapy, speech-language pathology, and occupational therapy, it comes with a variety of required programmatic changes. One change is the need to develop graduate-level admission criteria that will ensure that students who are admitted into the PM will be able to succeed in the academic program, pass the board certification exam, and go on to be successful allied healthcare professionals.

Currently, admission into athletic training education programs may occur through one of two ways: direct or secondary admission. Depending on the specific program, the student may either be admitted directly into the athletic training education program or they may need to go through a secondary admission process to gain admittance into the program, after being admitted to the college/university (Bowman, Mazerolle, & Dodge, 2016). Regardless of admission method, the undergraduate student is first and foremost a student of the university. This means that if the undergraduate student fails in the athletic training education program, they can change
majors within the school and seek a different degree. As is true for most if not all graduate and professional education, the traditional graduate level student applies and is admitted into a program. As such, their academic success or failure is tied specifically to that program. If a graduate level student fails in their program, they are unable to easily move to another department thereby most often ending their education at that university. This is problematic since student attrition results in loss of time, revenue, and resources for not only the student but for the specific educational program as well as the university. Regarding the allied healthcare fields, in addition to the overall financial loss, early program attrition results in the compounding issue of losing a future allied healthcare provider.

Ensuring student success in PMs is important to the future of athletic training education and the athletic training profession. The development of a prediction rule to flag at-risk students would be beneficial to PMs across the country in helping to admit students who have a higher chance of retention as well as provide prophylactic assistance to students who are at risk for early program attrition. Similar studies on predictive admission factors have been done on physical therapy and physician assistant programs with various levels of success. However to date, there has only been one study done that has addressed professional master’s programs in athletic training.

**Pertinent Definitions**

For this dissertation, decreasing attrition in PMs will be looked at through the lens of programmatic admission criteria. Analysis of previous literature will address which admission factors have been shown to predict programmatic success as well as programmatic failure in, not only athletic training, but peer allied healthcare education programs and other post-baccalaureate fields of study in order to set the stage for this project. The foundational research done on the
topic of retention and attrition looks at this problem from a variety of perspectives. Studies that look at student success or failure include studies on persistence, retention, and attrition. In order to understand the subtle differences between these topics, clear definitions are important.

The National Student Clearinghouse Research Center differentiates the rate of persistence and retention by determining if and where the student returns to college for their second year. Persistence is when a student returns to any college for their second year, while retention is when the student returns to the same college for their second year (National Student Clearinghouse Research Center, 2015).

Of interest to this study is student attrition, which is defined as either a decrease in student numbers over time, or the number of students who fail to complete an academic program (Ascend Learning, LLC., 2012). Attrition may occur in the first week of school or the final week of a program. The underlying cause of attrition can be the result of academic or non-academic reasons. This dissertation will concentrate on early program attrition, which is being defined as the loss of a student for academic or non-academic reasons within the first six months of the PM. This time frame was picked as it was identified by the program of study as when most students leave the PM. This time frame is also important to the academic program because a student lost that early results in an “empty seat” for the duration of the academic program resulting in a significant loss of program revenue as well as the loss of a future healthcare provider (Bowman, Pitney, et al., 2015; Luce, 2011). The loss of revenue and missed opportunity are significant drivers in the quest to decrease attrition.

Allied health programs such as: physician assistant, physical therapy, and occupational therapy have historically shown graduation and retention rates in the upper 90’s. In 2017, the Commission on Accreditation of Physical Therapy Education (CAPTE) reported a graduation
rate of 95.5% (CAPTE, n.d.-b). The Physician Assistant Education Association in their 2017 Annual Report reported a graduation rate of 96.7% (PAEA, Yuen, Lessard, & Keahey, 2018). The American Occupational Therapy Association (AOTA) 2017-2018 Annual Data Report found master’s level retention to be 98% (AOTA, n.d.).

While allied healthcare programs in general have very high retention rates, professional master’s programs in athletic training (PMs) lag their peer professions. The Commission on Accreditation of Athletic Training Education (CAATE) is the accrediting body responsible for the accreditation of all athletic training education programs. Unlike its peer organizations the CAATE has not historically tracked student retention to the second year or graduation rates. However, in a study published in 2015, Bowman, Pitney, Mazerolle and Dodge (2015) found that PMs had an average retention rate of 88.7%, a number that is significantly lower than athletic training’s peer professions. The researchers also found that 40% of the program directors at these schools found this level of retention to be a problem.

Professional master’s programs have an overall national retention rate that is lower than their peer allied healthcare programs. Understanding the reasons for and predictors of attrition that lead to this lower retention rate, will allow PMs across the country to develop strong admission criteria to avoid attrition. By decreasing overall attrition, it will help bring athletic training’s retention numbers in line with their peer allied healthcare professions.

The remainder of this chapter will present the theoretical framework that this dissertation is built on and then go on to outline the history of athletic training education, illustrating the importance of the move to the entry-level master’s requirement. I will compare athletic training attrition and retention rates to athletic training’s peer allied healthcare fields and graduate programs in general. I will also explore the studies done on graduate programs concerning
attrition, retention, and admission protocol predictors with the goal of identifying admission factors that can be used to flag students who are most susceptible to early program attrition. Lastly, this chapter will address gaps in the literature and how this proposed project will help fill those gaps.

Theoretical Framework

Established theories that fully explain admission criteria’s relationship to early programmatic attrition in graduate level education do not exist. However, an attempt can be made to explain this issue through the combined analysis of Tinto’s work on student attrition and retention (Tinto, 1975), Astin’s theory of involvement (Astin, 1999), and Vroom’s Expectancy Theory (Gyurko, 2011). Combined, these three theories address various components of not only graduate student behavior but human behavior in general. Particularly, as human behavior relates to persistence, motivation, and desire. The synthesis of these theories will help to explain some of the academic and non-academic factors that may affect student attrition and which ones can be proactively addressed as part of the student admission portfolio.

Student Retention/Graduation Rates

Prior to evaluating these attrition/retention theories and applying them to this dissertation, it is important to get a picture of the retention landscape and why it is such a commonly studied phenomenon. Theories of retention and attrition have been driven by undergraduate graduation rates that historically are quite low. Undergraduate graduation and attrition has been a problem that has been well-studied and nationally tracked (Cabrera et al., 1993; Daempfle, 2003; Tinto, 1975). Unfortunately, even though many researchers have looked at this topic, undergraduate graduation rates have remained stable at approximately 59%. (“The Condition of Education—
Graduate level attrition and retention have not historically been studied with the same rigor as at the undergraduate level. However, in recent years this has started to change with governmental and private research studies. In a study that looked at graduate level retention drawing from the NCES, Baccalaureate and Beyond Longitudinal Study, 1993-2003 Baum & Steele (2017) found that 26% of people who started a master’s degree did not complete the degree as compared to 14% of those enrolled in a professional degree program and 12% of those enrolled in a doctoral degree program. However, not all master’s level students had the same level of difficulty graduating. Non-academic factors played a significant role in determining the chance of success in graduate school education. This is relevant because many of the retention theories are based on non-academic student factors. According to Baum & Steele (2017), socio-economic status is shown to be associated with graduate program completion with completion rates increasing from 59% to 72% as income quartile increased. Males were also slightly more likely to graduate than females at a rate of 62% versus 60%. The researchers also found that individuals who received their bachelor’s degree when they were 22 or younger had a 65% chance of completing their graduate degree when all other ages ranged from 53-56%. Individuals without kids had a 63% chance of graduating while those with kids had a 58% chance of graduating. These statistics will become important later in the chapter as I look at non-academic admission factors and how they relate to retention theories as well as programmatic attrition.

In a study focused on specific academic programs, The Council of Graduate Schools launched a pilot study to look at specific programmatic graduate school retention and graduation rates. They analyzed STEM and MBA programs at five major institutions. This study found that
66% of STEM students completed their academic program in 4 years while 86% of MBA students completed their academic program in 4 years. In regard to early program attrition, 10% of STEM students left the program within the first six months and 23% left within 2 years. MBA programs showed 10% attrition in the first 2 years which at many institutions constitutes the entire length of the program (“Master’s Completion Project | Council of Graduate Schools,” n.d.). In discipline specific studies, attrition on the doctoral level has been found to be even higher than in other sections of graduate school with reported rates being anywhere from 40% (Golde, 2005) to 50% (Gururaj et al., 2010) throughout the life of the program. These numbers are significantly different than what Baum & Steele (2017), found however while these researchers did not look at the specific factors behind attrition, they did highlight the high level of attrition that occurs at the graduate level. These are highly educated individuals who are not being retained, at a steep economic and personal cost to both the student and the institution.

What these rates mean is that while graduate/professional level programs may have a higher overall retention rate than undergraduate programs, there is still room for improvement and development. The graduate level student is a highly educated individual who invests a large amount of time and money into their education. Working to ensure that these students can succeed is important for not only the student but the university, individual professions, and society as well. Tinto theories of attrition and retention, Astin’s theory of involvement, and Vroom’s Expectancy Theory should be able to provide some insight into decreasing attrition numbers and subsequently improving retention for this group of individuals.

**Tinto’s Theories of Attrition and Retention**

Vincent Tinto published numerous papers and books on theories surrounding undergraduate student attrition and retention. Prior to his work and the work of others, student
attributes were often solely blamed for attrition. It was commonly thought that the student either did not work hard enough or simply did not have the academic capabilities to achieve at the undergraduate collegiate level (Tinto, 2006). While Tinto agreed that a student brought characteristics with them such as varying pre-college schooling experiences, family background, and levels of motivation (Terenzini, Pascarella, Theophilides, & Lorang, 2017), he developed a theory putting equal emphasis on the collegiate environment as well as student attributes. Tinto believed that an institution’s ability to integrate its students into the academic and social systems of the university was just as important to student retention as student characteristics, especially during the first year of college (Tinto, 2006).

One retention study which highlights Tinto’s theory showed that the integration of first- and second-year students into student-faculty research groups had a significant impact on student retention. This program was most beneficial to minority students and students with low GPAs who traditionally have a higher attrition rate than their peers (Gregerman, Lerner, Hippel, Jonides, & Nagda, 1998). In a different study looking at the effect of mentorship, social integration and academic integration on the retention of African American males, the researchers found a significant difference in retention for students who participated in the university retention program versus ones who did not (Brooks, Jones, & Burt, 2013). The fact that these studies showed the benefit of social and academic integration in groups that have a traditionally high attrition rate gives credence to the benefit of these retention programs, which were driven by and based on Tinto’s theories.

In addition to the undergraduate work highlighted above, there have been several studies supporting various components of Tinto’s theory as it applies to graduate level allied health education. Jeffreys, in a 2014 study looking at nursing student retention, determined that pre-
admission factors such as financial strain, unstable home life, and inadequate educational preparation lead to high levels of attrition. Bowman, Pitney, Mazzerolle, and Dodge (2015) found that graduate level athletic training students were more likely to depart their academic program due to academic rigor, financial difficulty, and a change in career aspirations. All these factors are ones that could potentially be traced back to pre-admission criteria. Appropriate academic preparation (grades in pre-requisite courses and overall GPA), recognition of financial strain (personal statement, resume) as well as learning more about a chosen field prior to programmatic application (personal statement, observation hours, and previous clinical experience) can all be tasked to the pre-admitted student.

While appropriate academic preparation is a recognized aspect of an admission application and often used to admit or deny students, recognition of financial strain and lack of knowledge of the chosen field is not. Programmatic recognition of financial instability should not be reason to deny admission especially due to the ability of a graduate student to borrow the full cost of attendance. However, developing programs and working to assure that the student utilizes available resources is something that the graduate level academic program can help with. Preemptively recognizing student needs can assist in ensuring that the student has what they need to succeed.

Regarding knowledge of the professional field, the implementation of admission items such as a personal statement that focuses on knowledge of the field as well as the completion of observation hours can assist with ensuring an appropriate level of student knowledge. Through a combination of literature review and personal experience, Mazerolle & Dodge (2014) suggest that a potential AT student gains improved programmatic and professional knowledge through the completion of a structured observational experience that focuses on specific aspects of the
day to day function of an athletic trainer. This experience would help to decrease the chance of attrition due to the student changing their mind regarding wanting to be an athletic trainer.

The second half of Tinto’s theory regarding the role of the university in student retention was recently supported in a study completed by Bowman and Dodge on undergraduate athletic training programs (Bowman & Dodge, 2011). These researchers interviewed 14 students who recently graduated from a bachelor’s program in athletic training education. These students represented 14 different programs spread over 11 different states. Through the interview process, the researchers found that interactions with faculty, peers, and preceptors influenced students’ decision to persist. While this research was completed on a very small sample size, the diversity of student and similarity of answers lend credence to the results. In addition, similar results were found by Bowman, et al, (2015) who interviewed 15 of the possible 25 program directors at professional master’s programs (total number of programs at the time of the study) and found that graduate level athletic training students were more likely to persist as a result of commitment to the profession and interpersonal relationships. Dodge, Mitchell, and Mensch (2009) found that clinical and academic integration along with student motivation and a peer-support system influenced undergraduate student persistence. The idea of clinical integration can also apply to pre-admission criteria as many if not all athletic training education programs mandate observation hours prior to admission. Ensuring that a student has extensive knowledge of the field of athletic training prior to admission may assist in decreasing student attrition as a result of change in career aspiration.

While researchers have shown that students tend to persist as a result of clinical and academic integration, they have also shown that students tend to leave undergraduate athletic training education programs due to academic rigor and a misalignment of programmatic
expectations (Bowman, Hertel, Mazerolle, Dodge, & Wathington, 2015). This misalignment of expectations is one that can be at least partially corrected through appropriate marketing material and education of the prospective student. Once again, ensuring that the student has appropriate knowledge of the field and the program through personal statements and observation hours can be helpful in this area. While most of these studies focused on the undergraduate athletic training program, the basic idea and premise behind them can be directly applied to graduate level education and admissions.

**Astin’s Theory of Involvement**

Astin’s theory of involvement (1999) addresses the amount of physical and psychological energy that the student applies to their academic studies. This theory can also be applied to many of the studies used to support Tinto’s theories. Studies have shown that clinical and academic integration has a positive effect on student attrition, meaning that the more integrated a student is in their clinical and academic studies, the more likely they are to persist through the program (Bowman & Dodge, 2011; Bowman, Pitney, et al., 2015; Dodge, Mitchell, & Mensch, 2009; Mazerolle & Dodge, 2014). These findings can be applied to Astin’s theory of involvement. Astin’s involvement theory models, in part, the psychology theory of motivation (Astin, 1999). When students are more motivated to be involved, whether it is clinically or academically, they are more likely to persist through school and succeed in their academic program of choice. Astin also showed that when students were involved in campus-based activities and had significant faculty interaction they were more likely to persist in their studies. This can also be applied to the clinical and academic integration into athletic training education programs discussed earlier. However, it is important to note that these theories are focused on the traditional-aged undergraduate student as opposed to the graduate level student.
While components of Astin’s theory may be applicable to the graduate level student the fact that graduate and professional students are older may detract from its direct applicability to the entire graduate level population. Studies have shown that increased age has been correlated with a decrease in academic performance, which many researchers attribute to outside family and social responsibilities that would decrease the student’s ability to become integrated into the academic program (Baum & Steele, 2017; Dockter, 2001; Ruscigno et al., 2010; Utzman et al., 2007). Astin also found that students who lived in a student residence had lower levels of attrition regardless of gender, race, academic ability or family background (Astin, 1999). It is likely that the older the student, the more likely they are to live with family, as opposed to other students. While not directly applicable to admission criteria, age of student may be able to be used as part of a prediction rule to help flag at-risk students.

**Vroom’s Expectancy Theory**

The next theory that can play into the framework of this dissertation is Vroom’s Expectancy Theory (VET). VET looks to explain why people either succeed or not when pursuing educational experiences (Gyurko, 2011). VET is based on three components: force, valence, and expectancy. Force describes the amount of effort a person is willing to put forth to achieve a goal, valence is the attractiveness of the goal, and expectancy is the perception as to whether the goal is achievable. Vroom developed a mathematical equation stating that $force = valence \times expectancy$. Meaning that if you multiplied the attractiveness of the goal by the perception of achievement you would get how much effort the person is willing to put into achieving the goal. In the case of college persistence, these three factors will determine whether the student believes they can achieve the goal of program completion, how much they want to complete the program, and whether they think they can accomplish this goal. For the graduate
level allied healthcare student, the desire to gain their graduate level degree should be high, thereby making the student’s belief in whether they can complete the academic program as a large part of the equation. The student’s knowledge of the profession, their previous academic and non-academic achievements, as well as their self-image, can play into each aspect of VET and can have a significant effect on student persistence and attrition.

This theory applies to pre-admission standards and program attrition when looking through the lens of motivation and ability to complete the task at hand. This theory has similar components to both Astin and Tinto in that it relates to the student’s ability to apply themselves, despite the outside factors that they are bringing to the program. Gyorko (2011) specifically applied the VET theory to nurse education. Gyorko believed that programmatic success was driven by the components of VET. Using non-academic admission criteria, such as personal statements and interviews, the determination of an individual’s VET score could be used to determine chance of programmatic success.

**Theoretical Conclusion**

While one educational theory is unable to provide a full framework for the development of this study, the combination of Tinto’s theories of attrition and retention, Astin’s theory of involvement along with Vroom’s Expectancy Theory can provide a solid foundation for this research. Together these theories support that pre-admission factors combined with academic and clinical integration, along with expectancy of success are important and may be able to predict student attrition.

While it is known that student academic integration is important to retention, how this theory can be utilized to affect retention has not been well illustrated. Tinto indicates that retention rates have not changed much since these theories started in the 1970s. So while
educators theoretically know what needs to be done, and colleges have implemented programs that experience a level of success on a small scale, there has been no wide-spread significant effect on student retention and graduation during this time (Tinto, 2006). Perhaps, instead of focusing on what can be done once the student is enrolled in the university, the focus should shift to ensuring that the students who are accepted into the university can succeed in their program of choice.

The discussed theories do support the work of researchers that have found that appropriate student preparation, programmatic knowledge, and professional integration can benefit a student and lead to higher levels of persistence. This is applicable to this dissertation because setting appropriate academic prerequisites and entry GPA along with the completion of clinical observation hours is a significant part of many athletic training applications. Ensuring that a student has appropriate academic background as well as knowledge of the field of athletic training prior to application into the program may result in decreased attrition due to the student being academically prepared as well as decreasing the chance of them changing their mind regarding the athletic training field as a whole.

**History of Athletic Training Education**

In order to fully understand the importance of the switch to the professional master’s program, it is important to have a clear understanding of what an athletic trainer is, what an athletic trainer does, and the history of athletic training education. The National Athletic Trainers’ Association (NATA) is the professional association for athletic trainers. On the NATA webpage, athletic training is defined in the following terms:

“Athletic training encompasses the prevention, examination, diagnosis, treatment and rehabilitation of emergent, acute or chronic injuries and medical conditions. Athletic
training is recognized by the American Medical Association (AMA), Health Resources Services Administration (HRSA) and the Department of Health and Human Services (HHS) as an allied health care profession” (NATA (n.d.) Athletic Training).

Athletic training may now have the above recognition, but in the medical world it is a relatively new allied health field. Athletic Trainers (ATs) have been working with athletes for as long as there have been athletics. However, it was not until the 1950s that athletic training became an organized profession and not until 1969 that the first official education program was recognized by the NATA’s Professional Education Committee. It was also in 1969 that the first certification exam was administered (Delforge & Benke, 1999). The recognition of the first education program, combined with the administration of a certification exam, helped lend legitimacy to the athletic training profession (Grace, 1999), setting it on its current academic trajectory.

In the late 1960s there were four routes which would qualify the interested individual to sit for the NATA Board of Certification (BOC) Exam. Those routes were: graduation from an NATA approved education program, completion of an apprenticeship program (the internship route), graduation from a school of physical therapy, and a special consideration route where the individual could qualify to sit for the exam if they had been “actively engaged” as an athletic trainer for at least five years (grandfather clause) (Delforge & Behnke, 1999). These four routes remained viable until the early 1980s when graduation from a school of physical therapy and the special consideration route were eliminated as appropriate qualifications for sitting for the BOC exam (Delforge & Behnke, 1999).

Throughout the 1970s and 1980s curriculum programs continued to evolve and schools began seeking NATA approval of their athletic training education programs. In 1969 there were
four NATA-approved programs. By 1982 this number had grown to 62 (Delforge & Behnke, 1999). According to the 2017-2018 CAATE Analytics Report there are more than 263 accredited undergraduate programs and over 111 professional master’s (PMs) programs across the US (CAATE, 2019). Throughout the 1970s and 1980s the curriculum requirements for these programs changed. The education an athletic trainer received became more specific to the needs of the athletic trainer and eliminated the need for athletic training students to take education classes and prerequisites for physical therapy schools. In addition to the change in didactic coursework, a requirement was added that all athletic training students must obtain practical experience under the direct supervision of a NATA certified athletic trainer. To this end a skill requirement check list was developed for the evaluation of a student’s clinical skills (Delforge & Behnke, 1999). These additions were a nod towards the hands-on portion of the profession and are two significant requirements that continue in the education programs of today.

The next major milestone in athletic training education occurred with recognition from the medical community as well as outside programmatic accreditation. In June 1990 the American Medical Association (AMA) recognized athletic training as an allied health profession (Delforge & Behnke, 1999). This recognition allowed for athletic training education programs (ATEPs) to be accredited by the AMA’s Committee on Allied Health Education and Accreditation (CAHEA) lending further credence and value to the athletic training profession. Along with the AMA the American Academy of Family Physicians and the American Academy of Pediatrics joined with the NATA to form the Joint Review Committee on Educational Programs in Athletic Training (JRC-AT). The JRC-AT was tasked with monitoring athletic training education programs and ensuring that they maintained appropriate educational standards (Delforge & Behnke, 1999).
On December 6, 1991 the AMA Committee on Medical Education adapted the *Essentials and Guidelines for an Accredited Educational Program for the Athletic Trainer* which became the new guideline for accrediting athletic training education programs (Delforge & Behnke, 1999). The AMA disbanded CAHEA in 1994 and sponsored a new agency titled the Commission on Accreditation of Allied Health Education Programs (CAAHEP). CAAHEP was soon recognized by the federal Commission on Higher Education Accreditation (CHEA) giving it full recognition as an accrediting body for programs of higher education (Delforge & Behnke, 1999).

The ATEP accreditation process remained virtually unchanged throughout this time and undergraduate programs continued to gain accreditation. It is important to note that while many undergraduate programs were seeking accreditation, graduation from an accredited program was not yet necessary to become certified. Students could still attend a non-accredited program and complete a prescribed number of courses along with 1500 observational hours in order to qualify to sit for the Board of Certification (BOC) exam. This method of education and BOC qualification was referred to as the internship-route. What this means is that while some institutions decided to become accredited through CAAHEP, it was not necessary to do so in order to have an athletic training education program. The internship route would be the next avenue to fall out in the streamlining of athletic training education and the continued quest for national recognition within the allied health field (Perrin, 2007).

In June 1994, with the intention of further addressing the professional preparation and education of athletic trainers, the NATA formed the Education Task Force. In 1996 the Task Force presented the NATA with 18 recommendations to improve athletic training education and professional preparation. The ones that had some of the greatest effect on higher education were:
Provision 1) the elimination of the internship route to certification, Provision 2) the development of entry-level graduate programs, Provision 12) the alignment of athletic training education programs with colleges of health professions as opposed to schools of physical education and kinesiology, and Provision 13) programs should be titled “Athletic Training” versus being grouped into another program such as “Health and Physical Education” (National Athletic Trainers’ Association Education Task Force, 1997). The NATA’s adoption of these and the other 14 provisions lead to much discussion and discourse throughout the athletic training community.

Due to its historical place in athletic training education, many disagreed with the elimination of the internship route. However, the Task Force viewed the new requirements as a combination of the current educational model and the internship route rather than an elimination of the internship route (Delforge & Behnke, 1999). The Task Force referred to it as a blending of the two routes to certification, taking the best of each and combining them to make a stronger educational model. The goal of this reform being improved clinical instruction, strengthening of the ATC credential, decreasing disparities in the educational preparation of students, and ultimately standardizing the route to certification (Craig, 2003). In addition, the standardization of the education process brought athletic training in line with other allied health care professions credentialing practices (Craig, 2003; McMullen, 1997). It is believed that this standardization has helped led the way for greater professional recognition throughout the medical community, on the state level and in employment settings (Perrin, 2007).

In 1996 in response to the recommendation of the Task Force, it was decided that by 2004 in order to become a certified athletic trainer, the interested individual must graduate from an accredited athletic training education program which would consist of a minimum of two years of clinical experience as well as being an academic major (Craig, 2003; Rosenberg, 2003).
Athletic training education programs were once again going through a major overhaul as internship programs around the country needed to decide whether to take the jump and become an accredited program or to drop their program all together. Considering the significant time and resources needed to develop a program that met accreditation standards, many internship programs folded and eliminated athletic training education from their institutions. Exactly how many institutions decided to fold is unknown as these programs were unaccredited and therefore mostly unmonitored. Other internship programs decided to take the difficult step and quickly worked to build a program that met accreditation guidelines (Craig, 2003; Rosenberg, 2003).

On June 30, 2006 the accrediting of athletic training education programs was once again turned over, this time to the Commission on Accreditation of Athletic Training Education (CAATE). As of the writing of this paper, the CAATE remains the accrediting body for athletic training education programs (CAATE, n.d.-a). The initial CAATE accreditation process is lengthy, followed by yearly reports and regular reaccreditation periods. Standards and guidelines for accredited programs are released on a regular basis and programs need to change based on these guidelines. Programs can teach and evaluate these standards and guidelines any way they see fit. However, the accreditation requirements are very specific and extensive documentation illustrating how these standards are being met and evaluated is mandated. (Pottieger, Brown & Kahanov, 2012). Athletic training education programs need to have athletic training specific courses, dedicated faculty, program leadership, detailed admission criteria, and demonstrate appropriate outcomes in order to obtain and maintain national accreditation (Commission on Accreditation of Athletic Training Education, n.d. – c). The goal of these programs is to train students who will not only be able to graduate from the CAATE accredited program, but who also have the knowledge and preparation to pass the national certification exam administered by
the BOC and be a successful healthcare provider. To this end, CAATE accredited programs must maintain high academic standards and rigor.

**Moving to the Professional Master’s Program**

In the last 49 years athletic training education has grown by leaps and bounds. Starting with four NATA approved programs in 1969 there are over 350 CAATE accredited programs today (Commission on Accreditation of Athletic Training Education, n.d. – a). Over time, athletic training education programs have changed from being driven by physical education and physical therapy curricula to being a major onto itself (Delforge & Benke, 1999). Academic programs are held to strict standards and need to be accredited by the CAATE.

Historically, ATEPs have been taught at the baccalaureate level. However, in the 1990s in response to Task Force recommendations, college and universities began introducing and teaching the athletic training curriculum as an entry-level master’s program, now referred to as “professional master’s (PMs)” programs (National Athletic Trainers’ Association, 2013). In the next iteration of athletic training education all education programs will be required to be taught at the professional master’s level.

In 2015, the three organizations that govern all aspects of athletic training education and certification announced the elimination of the bachelor’s level route to accreditation and mandated that all entry-level education programs move to the PM level. 2022 will be the last year that an academic class can be admitted into a bachelor level athletic training education program (Commission on Accreditation of Athletic Training Education, n.d.- b). These three organizations include: the BOC, the CAATE, and the NATA. The BOC is directly responsible for the development of the national certification exam, the CAATE is responsible for the
accréditation of athletic training education programs and the NATA is the national member organization.

The mandate to move all athletic training education programs to the master’s level was decided on after years of study and debate. The debate centered on the changing health care landscape and a trend in allied health education. The new athletic training education degree requirement will bring athletic training education to a minimum educational level on par with similar allied health peers. Physician assistants (PA), occupational therapists (OT), physical therapists (PT), and speech-language pathologists (SLP) all now receive their education at the graduate level (National Athletic Trainers' Association, 2013).

The increase in graduate level education is being seen not only in the allied health fields but throughout higher education. Since 1995 the percentage of adults 25 of older who completed graduate degrees rose from eight percent to 12% in 2015. This 12% represents 37% of all individuals in the United States who hold a bachelor’s degree (Baum & Steele, 2017). The growth of graduate education has caused some people to start referring to the master’s degree as the “new bachelor’s degree.” (Pappano, 2011). While the push to graduate level education for the athletic trainer is mostly driven by peer professions, the push towards increased graduate level education in general is most likely a reflection of the increased earnings that people with an advanced degree see over those individuals who hold a bachelor’s degree. In 2015, students who were 35-44 years old with master’s degrees earned 23% more than their bachelor’s degree holding peers. Individuals with doctorates saw a 63% increase in salary over those with a bachelor’s degree (Baum & Steele, 2017). The increase in financial earnings is a driver for advanced education across the board.
For athletic training, the revised requirements will not only mandate stricter academic standards but a development of admission procedures and requirements, as well as policies and procedures regarding student attrition and retention that are geared towards the graduate level student. In light of this, it is imperative that the administration of PMs determine appropriate admission requirements and program policies and procedures to limit student attrition while still maintaining the strict academic criteria necessary to produce a student able to pass the BOC examination and go on to be a practicing health care professional.

**Current Educational Model**

Currently, whether a student graduates from a professional bachelor’s program or a professional master’s program, in order to be a practicing athletic trainer, the student must also pass the BOC examination. To ensure that education programs are properly preparing students, CAATE-accredited athletic training education programs must maintain a three-year aggregate BOC examination pass rate of at least 70%. This is a similar standard to that held by peer allied healthcare fields as well. Physical therapy requires an 85% certification exam pass rate (Commission on Accreditation of Physical Therapy Education, n.d. - a) and occupational therapy requires an 80% three-year aggregate pass rate (American Occupational Therapy Association, n.d.).

Given this CAATE regulation, it becomes even more important to ensure that PMs are admitting students who can succeed. CAATE accredited programs must hold an academic standard that ensures that students will not only pass their classes but pass the BOC exam as well. As a result, CAATE accredited programs cannot decrease their early program attrition rate by simply making classes easier. If a program falls below the 70% BOC pass rate threshold, they will be placed on probation and will lose their accreditation if the issue is not remedied.
For most graduate level athletic training programs, meeting the 70% pass rate has not been an issue. For the 2016-2017 reporting period, the average first time BOC pass rate for professional master’s programs was 90%. These programs had an anytime pass rate of 96%. During this time frame, only 4% of entry-level master’s programs fell below the required 70% three-year aggregate rate. For bachelor’s programs, the average first time BOC pass rate was 83%, with a 92% anytime pass rate. However, 20% of bachelor’s level programs had an aggregate pass rate that fell below the required 70% (CAATE, n.d. - d).

The professional master’s (PM) level pass rates and the anytime bachelor’s level pass rates were in line with their peer allied health fields. For the 2016-2017 testing year, physical therapy reported a 91% first time pass rate (CAPTE, n.d. - b). Physician assistant programs had a pass rate of 93% (PAEA, n.d.). These comparison numbers between athletic training education programs, physical therapy, and physician assistant programs show that if a student graduates from a professional master’s level program, they have the same chance of passing their national board exam as that of their peer allied health professions. This means that PMs across the country are teaching at a high level of academic rigor and are producing a quality allied health care student on par with their peer professions. However, these other professions have a retention rate that is much higher than that of athletic training, indicating that these academic programs are either doing a better job of admitting students who can meet the demands of their program, or they are providing better student support once the student is admitted into the professional program. Developing a prediction rule to identify students who are more susceptible to early program attrition will allow the PM to address both potential reasons for the difference in retention between athletic training and their peer professions.
Predictors of Program Attrition/Program Retention

The development of appropriate admission criteria is essential to ensuring that students admitted into academic programs have the academic capabilities, knowledge of professional field, and personal attributes to succeed in their program of choice. When utilizing admission criteria to predict graduate level program attrition, the categories of study broadly fall into academic and demographic/non-academic predictors. Academic predictors may include undergraduate GPA (Bruce et.al., 2016; Organ, 2018; Stetto et al., 2004; Stock, Finegan, & Siegfried, 2006), grades in pre-requisite courses (Bruce et.al., 2016; Hayes, Fiebert, Carroll, & Magill, 1997), undergraduate institution where the student graduated from (Park, et.al, 2018; Posselt, 2016), and standardized test scores (Stetto et al., 2004). Demographic/non-academic factors may include: gender (Anderton, 2017), ethnicity (Stetto et al., 2004), age (Baum & Steele, 2017; Dockter, 2001; Ruscingno et al., 2010; Utzman et al., 2007), letters of recommendation (Naylor, Reisch, & Valentine, 2008; Ruscingno et al., 2010; Stohl, Hueppchen, & Bienstock, 2011; Walters, Kyllonen, & Plante, 2006), applicant motivation, admission interview, integration into the profession, and knowledge of the profession (Bowman & Dodge, 2011; Bowman, Hertel, et al., 2015; Bowman, Pitney, et al., 2015; Dockter, 2001; Dodge et al., 2009).

Most studies done on the topic of admission predictors analyze a combination of academic, demographic, and non-academic factors to determine which have the greatest correlation with programmatic success and/or failure. Some studies narrow the predictive factor down to one specific unit such as GPA. However, most studies show correlation between multiple factors, usually a combination of academic and non-academic that lead to the prediction of success or failure in an academic program. How success and failure are measured varies from
study to study. Some studies utilize program attrition, program retention, GPA, or passage of professional certification exams. However, in all cases there is a clear link between admission criteria and a measure of student success or failure. The studies analyzed will address this topic on a wide range of allied healthcare programs and as well as other graduate programs of study.

**Academic Predictors**

Academic predictors such as GPA and standardized test scores such as the GRE, MCAT, and LSAT are commonly used admission factors that have shown a high level of correlation with program performance (Bruce et al., 2016; Organ, 2018; Stetto et al., 2004; Stock, Finegan, & Siegfried, 2006). In addition, strength of undergraduate institution attended has also been shown to be used in graduate level admissions (Park, et al., 2018; Posselt, 2016). This section will review some key studies and the main academic based factors that researchers have found to be linked to program performance. This section will focus mainly on academic based factors, however for the sake of clarity, I will also discuss the relevant non-academic factors within certain studies.

Pre-admission GPA has been studied the most and has shown significant correlation with programmatic success across disciplines (Bruce et al., 2016; Keskula et al., 1995; Park, Berkowitz, Symes, & Dasgupta, 2018; Posselt, 2016; Salvatori, 2001; Utzman, et al., 2007). Overall undergraduate GPA, as well as prerequisite GPA, are often indicated by program directors as being the primary factor when making programmatic admission decisions (Utzman et al., 2007). Hayes, et al. (1997) did a retrospective study and looked at admission criteria to one physical therapy school. Using t-tests and multiple regression procedures, they found that the best predictors of programmatic success were science GPA and interview score, with older
students having a higher correlation between interview score and programmatic success. Specific grades in chemistry and physics were also important determinants of student performance.

Dockter (2001) completed a retrospective study on admission criteria for 107 physical therapy students from four admission classes at one institution. The study looked at admission criteria over four years of a physical therapy program and sought out whether there was predictive value for program success and success on the National Physical Therapy Exam (NPTE). The researcher found that undergraduate GPA, total admission score (comprised of undergraduate GPA, interview score, and writing sample, and age on admission correlated with first year GPA in a Doctor of Physical Therapy program. Dockter (2001) found that students with a higher undergraduate GPA and total admission score tended to have a higher first year GPA. Students with a higher undergraduate GPA were also more likely to pass the NPTE. The researcher also found a negative correlation between age upon admission and first year GPA. The older the student was upon admission, the lower their first year GPA.

In a 2006 study, Stock et al., tracked 586 students enrolled across 27 economic doctoral programs. Within this sample, the researchers found a first-year attrition rate of 13%. During the second year of the academic program, there was an additional 15% attrition of the remaining cohort leading to a 26.5% two-year attrition rate for the original 586 students. The researchers found a direct correlation between the verbal and quantitative sections of the GRE and attrition, where higher GRE scores were inversely correlated with likelihood of attrition. There was no correlation between attrition and undergraduate field of study, level of institution, gender, or receipt of financial aid. However, researchers did find that first year students who had a shared office space were less likely to drop out. They attributed this finding to a greater integration of the student into the culture of the department (Stock et al., 2006). This is in direct line with
theories of retention and attrition that had been discussed previously. The theory is that the
greater the integration into the culture of the school and/or the profession, the greater the
likelihood is that the student will persist.

The quality of undergraduate institution has been shown to affect graduate student
enrollment and graduate degree attainment (Eide, Brewer & Ehrenberg, 1998; English &
Umbach, 2015; Utzman et al., 2007; Zhang, 2005). In a book written on doctoral admissions,
Julie Posselt studied ten top ranked doctoral programs and noted that in the programs studied the
three strongest determinates of admission were grades, GRE scores and reputation of
undergraduate institution (Posselt, 2016). This study by Posselt was also supported by Park et. al.
(2018) who studied a doctoral program in biomedical sciences and found that undergraduate
GPA and the competitiveness of the undergraduate institution had the greatest correlation to
student success (Park et al., 2018).

In a study that supports that admission standards are linked to attrition, Organ (2018)
found that as law schools lowered their median LSAT requirement for admission, their first-year
attrition rates grew accordingly. Organ (2018) tied attrition rates at ABA accredited law schools
to the median LSAT score of their students. Organ (2018) found that as median LSAT scores
dropped, the attrition rate increased significantly. Over a 7-year time frame, the average first year
attrition rate for a law school with a median LSAT of 160 or higher was 2%. When the median
LSAT was less than 150, the average first year attrition rate tracked over a 7-year time frame
increased to 14.8%. For context, according to Kaplan Testing Services the average LSAT score
in 2017 was 151 (Sterling, 2019) The lowering of LSAT score requirements for some law schools
is thought to be the direct result of decreased law school enrollment and is an effort to increase
enrollment by decreasing admission standards. Athletic training programs currently have a
similar enrollment issue as law schools, in that the average PM class is only 50% full (CAATE, 2019). This low enrollment may make lowering academic standards within the program appealing. This study is relevant in that it illustrates the direct correlation between admission requirements and academic success. It can also be extrapolated that in the case of PMs, the lowering of programmatic academic standards would result in poorer BOC pass rates, potentially resulting in accreditation issues, thereby making the lowering of admission standards to increase attendance a less appealing option.

In summary, academic factors such as undergraduate GPA, science GPA and standardized test scores have been consistently linked to various measures of programmatic success and/or failure across disciplines. These studies indicate that these common admission standards should be part of any prediction rule used to determine the possibility of early program attrition. Non-academic factors, such as student age and integration into the discipline, were also shown to influence attrition. These factors along with several other non-academic admission factors will be discussed in greater depth throughout the next section.

Non-Academic Predictors

Non-academic admission predictors can vary from factors such as demographic information and financial data to aspects of the application such as interview score, essay, completion of observation hours, and letters of recommendation. Demographic information such as gender (Anderton, 2017; Baum & Steele, 2017; Stetto et al., 2004), age (Baum & Steele, 2017; Dockter, 2001; Ruscigno et al., 2010; Utzman et al., 2007), and ethnicity (Stetto et al., 2004; Utzman et al., 2007) have been shown in numerous studies to be associated with academic performance, either positively or negatively. Interview score, essay and letters of
recommendation are often used by programs to try to get to know the applicant and decide upon their ability to succeed in the program.

In 2004 Stetto et. al. performed a logistic regression analysis on admission data on medical students at the Uniformed Services University of the Health Sciences. This institution was designed to train medical doctors for the armed forces and as such does not charge tuition in exchange for the promise of service. The researchers analyzed both academic and non-academic admission data for the students who entered the medical school between 1984 and 1999. During this time there were 3,550 students admitted and 97 failed to graduate leaving an attrition rate of 3.0%. Statistical analysis indicated that sex (female), ethnicity (non-white), and a decelerated curriculum were predictive of attrition in this medical student population. A decelerated curriculum was defined as any time a student needed longer than four years to complete the medical school curriculum and graduate. This could result from retaking classes or decreasing the number of classes taken at one time and was used in this study to measure academic difficulty. Women were twice as likely to leave as men were, non-white students had a 79% higher likelihood of attrition, and decelerated students were 16 times more likely to leave.

MCAT scores and interview scores were also associated with rate of attrition. The lower the individual scored on these variables the more likely they were to dis-enroll. Records of attrition indicated that over one-half of the students who dis-enrolled left voluntarily and for nonacademic reasons. Out of the students who left for nonacademic reasons, 51.4% indicated that they left for family or health reasons and 24% indicated a change in motivation towards either medicine or the military. Sixteen percent of students left for various other reasons, including difficulty with curriculum and an inability to meet military standards.
Stetto et. al.’s, (2004) findings regarding gender are in contradiction to a more recent study completed by Anderton (2017). Anderton (2017) studied admission factors for five different allied health programs in Australia and found that woman had significantly higher first year GPA’s than their male counterparts. Researchers also found that the pre-admission standardized test scores were positively correlated with higher first year GPA. Overall, the studied cohort had a 16% first year attrition rate, and logistic regression showed that gender (female) and standardized test scores were the greatest predictors of student success.

A non-academic factor that has been closely linked to academic performance is age. Utzman et. al., (2007) found that after controlling for cohort, degree, ethnicity and sex, physical therapy students over the age of 27 with an incoming GPA of 3.5 or higher were over twice as likely to have academic difficulty as a younger student with the same GPA. Utzman et. al. (2007) found that for each year that age at admission increased the chance of having academic difficulty increased by 10%. The researchers for this study defined academic difficulty as a variety of issues ranging from the student having academic problems through academic withdrawal and dismissal. This association of increased age resulting in academic difficulty was supported by Dockter (2001) and Ruscingo et al (2010). In both studies the researchers found a negative correlation between age and first year GPA in a physical therapy program. Both sets of researchers attributed this finding to the idea that older students tend to have greater external responsibilities as well as increased time commitments outside of the classroom. The researchers believed that younger students succeed at a higher rate because they are more likely to have time to focus on their academic studies than their older classmates. Older students tend to have outside responsibilities including family and financial responsibilities and as such are unable to focus purely on their studies. Baum & Steele’s (2017) research supports the age-related findings,
indicating that younger students were 10% more likely to complete their master’s degree than their older counterparts.

Utzman et. al., (2007) also found that race was a predictor of academic difficulty with non-white students having a 200% greater chance of having academic difficulty than their white counterparts, when controlled for other variables. This also aligns with Stetto et. al.,’s (2004) findings where non-whites had a 79% higher likelihood of attrition than their white counterparts. As discussed in the next section Utzman et. al., (2007) utilized race as part of their admissions prediction rule with a high level of success.

Letters of recommendation are frequently used in admission decisions yet their actual efficacy in making admission decisions is generally not well supported by the literature. Generally, letters of recommendation can be difficult for admission committees to evaluate due to vague statements and a lack of continuity in standards from one letter writer to another. One person’s “highly successful student” can be another person’s “average performer” (Walters et al., 2006). Historically, letters of recommendation have also been known to have a negative impact on students of color (Lund & Colin, 2010) and woman (Lunneborg & Lillie, 1973) regarding graduate admission. However, in a meta-analysis study done by Kuncel, et al (2014) the researchers indicated that letters of recommendation for graduate schools, particularly those in the medical field, as well as letters that are given a numerical value by the admissions committee have a greater predictive value than letters written for non-medical professions and for letters that do not have a numerical score (Kuncel, Kochevar, & Ones, 2014).

The benefit of letters of recommendation for graduate level allied healthcare professions is further supported in the research by two studies that focused on letters of recommendation and residence placement for medical students. Both studies showed a strong correlation between
letters of recommendation and success in the residency. The researchers determined that since these letters were written by prior supervisors in their field, they were able to speak to the resident’s strength and weaknesses as related to their ability to perform in the profession, and as such, had strong predictive ability of future success (Naylor et al., 2008; Stohl et al., 2011). This was further supported by research on psychology graduate schools which determined that letters of recommendation were one of the top three admission variables utilized along with GPA and GRE (Walters et al., 2006). In contrast, a study done on graduate-level nursing students found no correlation between letter of recommendation and program performance (Creech, Cooper, Aplin-Kalisz, Maynard, & Baker, 2018). In general, the overarching opinion of the literature along with the current study is that letters of recommendation, especially if evaluated objectively, are strong predictors of graduate student success in health and science based academic fields.

**Development of Prediction Rules**

A summary of current research indicates that the admission factors of GPA and standardized test scores have been positively associated with academic program performance. Age has been shown to be negatively correlated with academic performance, indicating that the older the student upon admission the less likely they are to perform well. Non-whites have traditionally done worse academically than their white peers. Studies have different results for gender. Depending on the study, program performance may have been measured through attrition, retention, GPA, or performance on national certification exams. As mentioned previously, the goal of this dissertation is to utilize admission factors to help predict early program attrition in professional master’s athletic training programs. At this time there has only been one study done on PMs (Bruce et al., 2016) to predict program success. However, two other
studies have been done to produce a prediction rule for both physical therapy (Utzman et al., 2007) and physician assistant (Luce, 2011) programs.

Bruce et. al., (2016) completed a study aimed at developing a prediction model for academic success in a PM using only academic-based, pre-admission variables. The researchers utilized a cohort model that included 119 students that were admitted over a span of nine years at one PM. The researchers identified success as the student having a GPA of 3.45 or higher after the first year. This GPA was determined as having the most predictive ability of BOC success. The researchers started with a potential 35 predictor variables identified through previous research as well as beliefs, hypothesis and the past experiences of the PM’s faculty. These 35 variables ranged from GPA and number of completed advanced science courses to factors regarding the applicant’s undergraduate institution such as Carnegie Classification and average SAT score. Through a series of univariate analyses, these variables were pared down to the nine most potentially significant ones. These nine variables were: Academic Profile of Undergraduate Institution (APUI), Graduate Record Examination quantitative (GREq), Graduate Record Examination verbal (GREv), Graduate Record Examination written (GREw), number of completed advanced math and science courses, calculus, physics, attended a research intensive institution, and undergraduate Grade Point Average (uGPA). No multicollinearity was found between these nine variables. Once no multi-collinearity was found then a backward, stepwise, logistic regression was performed to produce a 3-factor model. This model indicated that the combination of a uGPA of $\geq 3.18$, GREq $\geq 145.5$ and whether the applicant took calculus as an undergraduate student was able to predict success in a PM with a 90.5% accuracy. A student who has at least two of these factors was 20 times more likely to be successful in the program than a student who only had one. However, while these three factors in combination were determined to
be the most predictive of PM success, all nine factors showed a higher level of success than when they were not present in the applicant.

Bruce’s results correlate with earlier studies mentioned regarding the predictive factor of undergraduate GPA and GRE (Organ, 2018; Stetto et al., 2004; Stock, Finegan, & Siegfried, 2006). However, the results regarding the predictive nature of whether the student took calculus is not as well supported in allied healthcare education retention literature. However, performance in first year calculus is a well-known predictor for progress and success in various STEM programs (Aintablian & Ghirmai, 2017; Bowen, Wilkins, & Ernst 2019, Moreno & Muller, 1999) and for progress through a highly rated technology institution (Avreham, Kluger, & Koslowsky, 1988).

Both Utzman et al (2007) and Luce (2011) also used logistic regression to develop prediction rules to try and forecast students who would have academic difficulty in their respective allied health programs. In 2007, Utzman et al., completed a study looking at 3,582 physical therapy students across 20 physical therapy education programs and spanning 5 academic years. Utilizing logistic regression, the researchers studied the academic factors of undergraduate GPA, verbal GRE, and quantitative GRE scores to predict academic performance during the physical therapy program as well as likelihood of passing the National Physical Therapy Exam (NPTE). Utzman, et al. (2007) found that undergraduate GPA was the most significant predictor of success in the physical therapy program and verbal GRE score was the most significant predictor of failing the NPTE. However, all three admission factors of undergraduate GPA, verbal GRE, and quantitative GRE had significant predictive value of both success in the physical therapy program as well as how a student would perform on the NPTE. To summarize, the researchers found that the higher a student’s undergraduate GPA or score on
either the verbal or quantitative section of the GRE, the better their programmatic outcome (Utzman et al., 2007).

Utzman et al. (2007) also used their data to develop a prediction rule to predict academic difficulty and NPTE failure. The rule included race/ethnicity, undergraduate GPA, verbal GRE score, and quantitative GRE score. The researchers utilized hierarchical logistic regression analysis as well as receiving operating characteristic (ROC) curves to determine the following cutoffs for each admission factor utilized in the prediction rule. A student started off with zero points and was awarded 1 point for being a race/ethnicity other than white, they were given - .5 points for having a undergraduate GPA of 3.49 or higher, if their verbal GRE score was 400 or lower they had +.5 points, -.5 points for a verbal GRE score of 490 or higher, and finally was awarded 1 point for a quantitative GRE score of 530 or lower. Students who ended up with a score of 0 or less failed the NPTE at a rate of 7%. Those students who had a score of 1.5 or higher failed the NPTE at a rate of 39%. All these students were able to get through their respective physical therapy programs but ultimately failed the NPTE at least once. The prediction rule developed by Utzman et al (2007) shows that it is possible to predict board exam success/failure based on pre-admission criteria. While the researchers did not look at early program attrition, the ability to predict a level of academic success was demonstrated.

In a study focused purely on academic factors, Luce (2011) developed a prediction rule to identify at-risk PA students. Luce (2011) looked at a smaller sample than Utzman et al (2007), as his study was based on 228 physician assistant students spanning three academic classes from one university. His rule utilized undergraduate GPA, science GPA, and the three sections of the GRE and was able to accurately predict 92% of the students who experienced academic difficulty during their first year of PA school. Luce (2011) ranked the pre-admission factors for
each student and then broke each factor into quintiles, assigning each quintile a score from 1-5. The quintile score was then tallied for each student giving each student a score ranging from 5-25. Thirteen students had academic difficulty during their first year of the physician assistant program ranging from academic warning to programmatic dismissal. Twelve of these students had a preadmission quintile score of less than 12. All 13 of these students had a quintile score below the mean with nine of the 13 scoring a full standard deviation below the mean. The idea behind this study is that these admission factor-based numbers will be used to determine a “cut-off” quintile score for admissions to the physician assistant program.

A significant difference between the studies completed by Bruce et al. (2016), Luce (2011) and Utzman et. al., (2007) is regarding the use of predictive variables with their sample groups. Luce (2011) compared and ranked already admitted students based on their pre-admission criteria while Bruce et. al., (2016) and Utzman et. al., (2007) used specific criteria for each student independent of the rest of the admitted academic class. Luce’s (2011) method ranked each person based on the merits of their class, while Bruce et. al., (2016) and Utzman et. al., (2007) looked at each student individually. While there are positives and negatives of both methods, the goal for this project is to identify factors for each student that would be predictive of programmatic success or failure as opposed to being compared to their peers.

**Dual Degree vs Traditional Admission**

Dual degree programs are programs where high school students are admitted into the university on a track designed for direct entry into a professional program. Depending on the university, these programs may have different names. Two other names that are used for these programs beyond “dual degree” are “early assurance programs” (Chevan, Reinking, & Iversen,
and “dual acceptance programs” (DAP) (McLaughlin et al., 2017). For the sake of this paper, I will refer to these types of academic programs as dual degree programs.

In dual degree programs, students enter the undergraduate institution on a pathway to be directly admitted to a professional, master’s, or doctoral level program. These students often complete their undergraduate requirements in less than four years with their final “undergraduate” year being at the “graduate” level. While graduate level programs have a say in the academic requirements for these students, the dual degree student does not need to go through a full admission process following their undergraduate education to be admitted into a graduate level education program. These types of programs can be beneficial to both the student and the academic program.

Traditional admission methods refer to admission into a professional program after the student has already obtained a BA/BS degree from a college or university. These students go through a full admission process as outlined by the graduate academic program. When there is a dual degree program present, students admitted through traditional methods will be granted admission based on the number of seats left available once the dual degree students have been placed. Depending on the number of dual degree students in the pipeline and the number of programmatic seats available, this may result in a very competitive traditional admission process. Thereby highlighting one of the main benefits to the dual degree student, namely decreased competition for a place in a competitive graduate level program.

Overall, the literature for dual degree programs have been positive when it comes to student success. In 2010 Ruscigno, et al., did a retrospective study and looked at the graduate level GPA of physical therapy students admitted to the Doctor of Physical Therapy program through a 3 + 4 dual degree program versus students who were admitted into the doctorate
program after obtaining a BA/BS prior to admission. Ruscigno, et al. (2010), found that while controlling for other factors such as pre-admission GPA, the students who were part of the dual degree program had a first-year programmatic GPA that was higher than the students who were admitted through the traditional admission process.

The benefits of the dual degree program also seem to go beyond academic success. In a study done on pharmacy students, it was shown that the students admitted through the dual degree route were more likely to have a leadership role in their academic program versus the students who were admitted to the program through traditional means (McLaughlin et al., 2017). This pattern of higher interpersonal interactions was also seen by Chevran, et al (2017) who found that students admitted through the dual degree programs had higher confidence in their career paths and greater comfort in the profession. The authors attributed this to student comfort with the profession, as well as with the faculty and the development of professional behaviors that comes with prolonged exposure to the physical therapy field. The increased comfort as a result of regular interaction with programmatic personnel through the undergraduate years supports Astin’s theory of involvement as well as Tinto’s theory of retention. Both of these factors were explored earlier in the chapter.

While the handful of published studies on this area have shown positive results with the dual degree program, the implantation of these programs may still be a gamble. Academic programs are guaranteeing professional level academic placements to high school students if they meet certain academic standards during their undergraduate career. Considering these academic programs have a limited number of competitive seats, guaranteeing these limited seats to high school students has the potential to be problematic. However, if the program is having difficulty filling its classes this may be an excellent way to build a cohort. Depending on the
rigor of the undergraduate academic program, established admission standards to the graduate
program, and number of students in this academic pipeline, a dual degree program has the
potential to be either beneficial or harmful to a graduate programs’ attrition numbers.

Determining whether a dual degree program would be beneficial to an athletic training
professional master’s program is an important factor when setting admission standards for a
newly established program. Is this method of admission one that could be successful to the PM,
or is it a detractor from admitting more qualified students from the outside? This is a factor that
will be analyzed during this dissertation when looking at establishing a prediction rule for PM
admittance.

Gaps in Literature

Almost every study reviewed have shown consistency in the predictive nature of GPA. Age at admission, race, gender, and certain GRE scores have also been shown to be correlated
with student success with a high level of regularity. However, significant gaps in literature exist
when studying graduate level admissions and predictive factors of attrition. While there have
been some studies completed on various allied healthcare programs such as physical therapy,
physician assistant, occupational therapy, and nursing, there has been only one completed on
athletic training education programs.

The use of a dual degree method of admission has also been shown to have positive
results regarding retention. The development of a personal connection to the profession or the
academic program has been theorized and proven through research to improve student retention
in at least small groups. However, there has not been a lot of work done on this area of research,
and nothing has been done in the field of athletic training education. This study seeks to fill the
gaps in research and to apply some of the knowledge already determined from other allied health
fields to the growing field of athletic training. This study is also timely as it is happening at a pertinent time in the evolution of athletic training education. As a growing allied healthcare field and one that is moving the minimum academic degree from the bachelor’s level to the master’s, it is important that the gap in research around the predictive nature of admission criteria for athletic training education programs is filled. Athletic training education programs need to be as prepared as possible when determining admission criteria and admitting graduate level students. This preparation is imperative in order to ensure student and programmatic success.

**Conclusion**

In conclusion, within this chapter the groundwork has been set for this dissertation to begin to fill the gaps in the existing admission and retention literature. Producing research that allows PMs to develop an admission portfolio based on specific predictive criteria will be beneficial towards decreasing student attrition in PMs. Decreasing early program attrition and thereby bringing athletic training’s retention numbers in line with their peer allied health professions is necessary to meet the growing demand for certified athletic trainers.
Chapter 3

Research Design and Methodology

The selection of appropriate candidates from a large applicant pool is a difficult yet essential process to graduate school admissions (Bruce et al., 2016; Luce, 2011; Schmalz et al., 1990; Utzman et al., 2007). The goal of this study was to identify criteria that can be used to preemptively flag applicants who were more likely to leave a PM during the first six months of the academic program. This information will allow programs to develop an objective method of applicant assessment geared towards decreasing student attrition.

This dissertation evaluated students that were admitted into one PM between the years of 2009 and 2017 (class of 2011-2019). The cohort studied is from a private, not for profit, medium sized, primarily residential, 4-year institution. The institution is Carnegie classified as a moderate research activity institution that is professionally dominant at the graduate level. The overall university profile is balanced arts & sciences/professions with some graduate level work (The Carnegie Classification of Higher Education; n.d.).

The PM at this institution was established in 2000 and received its initial accreditation in the spring of 2003. It was one of the first professional master’s in athletic training programs in the country and as such has one of the longest records of admitted students. Due to university policy, the files for students who entered the program prior to 2009 and were not retained by the program were destroyed. As such, I was only able to access complete class records starting with the graduating class of 2011, resulting in a sample that spanned from the graduating class of 2011 to the graduating class of 2019. This provided nine years of admission and student data and resulted in a N = 183. Statistical analysis for this data showed a six-month attrition rate of 13.1% (Table 1). This rate is line with the national average attrition rate for PMs of 11.3% as
determined by Bowman, Pitney, Mazzarolle and Dodge (2015). As such, in this regard, the results of this dissertation have generalizability beyond the program studied.

**Data Collection**

Appropriate permissions from the PM department, the school in which the PM is housed, and the university institutional review board (IRB) were obtained in order to access all relevant data. General information regarding overall number of applicants, program acceptance numbers, and student enrollment numbers were obtained from the Dean of Admissions for the college. This data helped to provide a picture of the applicant pool, as well as the selectivity of the PM. Applications to the PM during the class of 2011-2019 time frame totaled 503 with an acceptance rate of 70.8%. Fifty-one percent (183) of those students who were accepted went on to enroll in the program. Eighty-six-point nine percent of those students were retained past the first six months of the program (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Admission and Retention Data for Classes 2011-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>Applied</td>
</tr>
<tr>
<td>Total</td>
<td>507</td>
</tr>
<tr>
<td>Percentage</td>
<td>70.8%</td>
</tr>
</tbody>
</table>

**Research Variables**

Data was collected through the blind analysis of admission applications and PM program files. All information was de-identified by a non-researcher prior to collection. There is one dependent variable and twelve independent variables that were utilized in this study (Table 2). The dependent variable was determined by information found in the student’s academic file, and the independent variables were derived from information provided in the student’s initial program application.
Table 2

*Description of Research Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classification</th>
<th>Description</th>
<th>Continuous or Categorical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Program Attrition</td>
<td>Dependent Variable</td>
<td>Retained past 6 months or Not Retained past 6 months</td>
<td>Categorical</td>
</tr>
<tr>
<td>Age on Admission</td>
<td>Demographic</td>
<td>Full year</td>
<td>Continuous</td>
</tr>
<tr>
<td>Gender</td>
<td>Demographic</td>
<td>Male or Female</td>
<td>Categorical</td>
</tr>
<tr>
<td>Race</td>
<td>Demographic</td>
<td>Represented or Underrepresented</td>
<td>Categorical</td>
</tr>
<tr>
<td>Undergraduate GPA</td>
<td>Academic</td>
<td>≥3.0 or &lt;3.0</td>
<td>Categorical</td>
</tr>
<tr>
<td>Science GPA</td>
<td>Academic</td>
<td>≥3.0 or &lt;3.0</td>
<td>Categorical</td>
</tr>
<tr>
<td>Social Science GPA</td>
<td>Academic</td>
<td>≥3.0 or &lt;3.0</td>
<td>Categorical</td>
</tr>
<tr>
<td>Calculus</td>
<td>Academic</td>
<td>Calculus or No Calculus</td>
<td>Categorical</td>
</tr>
<tr>
<td>Score on Personal Essay</td>
<td>Academic</td>
<td>Tenth of a point</td>
<td>Continuous</td>
</tr>
<tr>
<td>Score on Letter of</td>
<td>Academic</td>
<td>Tenth of a point</td>
<td>Continuous</td>
</tr>
<tr>
<td>Recommendations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation Hours</td>
<td>Academic</td>
<td>50 or &gt;50</td>
<td>Categorical</td>
</tr>
<tr>
<td>Method of Admission</td>
<td>Academic</td>
<td>Traditional or 3+2</td>
<td>Categorical</td>
</tr>
<tr>
<td>Barron’s Selectivity</td>
<td>Academic</td>
<td>Low Rated vs High Rated</td>
<td>Categorical</td>
</tr>
<tr>
<td>Rating – UG</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The twelve independent variables were decided on through analyses of the literature as well as discussing this project with admission personnel and program administration at the home institution to gather their opinion on the causes of early program attrition. Considering the lack of research done on this topic, especially in the field of athletic training education, discussing the topic with the department chair and head of the admissions committee for the PM was one of the best sources of information available. This is a method of variable determinacy that was effectively used to determine predictive variables by the one other comparable study that I found on PMs and predictions of success (Bruce et al., 2016).
Admission Protocol – Development of Data Set

Students can gain admission to the PM in one of two ways: a traditional admission process (requires graduation from an undergraduate institution and then application into the graduate program) and a 3+2 direct admission route. The current traditional admission protocol for this program requires that all applicants meet the following requirements:

- completion of a general graduate school application
- baccalaureate degree from an accredited institution
- preferred overall cumulative GPA of 3.0 on a 4-point scale
- completion of prerequisites (anatomy and physiology, biological or exercise science, physics, chemistry, college math or statistics, English, social sciences) with a grade of a “C” or better
- preferred prerequisite science, and social science GPA of 3.0 or better
- proof of at least 50 observation hours with a certified athletic trainer
- three letters of recommendation (one of which needs to be from a certified athletic trainer)
- personal essay

All admission requirements are mandatory except for the preferred GPAs. There is some leeway in the GPA requirements based on the strength of the remaining application components. However, it is a programmatic goal for the applicant to have either the overall GPA, prerequisite science GPA, or prerequisite social science GPA be over a 3.0. The letters of recommendation (LOR) include a series of Likert scale questions as well as a narrative section for the recommender to complete. The LORs and personal essay are graded by two members of the
admissions committee on a scale of 1-4 to a level of .1. There is no minimum score required on the LORs or personal essay.

3+2 Direct Admission Applications

The 3+2 students have a significantly truncated application process that requires them to maintain a 3.0 GPA while completing the requirements for a degree in either Biology or Social and Behavioral Sciences within three years. They also need to complete 50 observation hours with a certified athletic trainer. Due to the truncated nature of their application it contains limited information outside of basic demographics. As a result, significant amounts of researcher interested data were absent from these applications. The data points that were regularly available were: retention status, gender, age, and race. All the 3+2 students included in this study attended the host institution resulting in college selectivity being the same for this population. Due to the high level of missing data points, I was unable to use these students in the logistic regression portion of the statistical analysis. However, these students were used in the demographic breakdown of the student body as well as the overall retention statistics (Tables 1 and 5). Tables 3 and 4 break down the frequency and descriptive statistics for all variables utilizing both the full data set as well as the data set omitting the 3+2 students.

<table>
<thead>
<tr>
<th>Table 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retention Numbers by Traditional vs. 3+2 Admission</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale</th>
<th>Traditional Total Admitted</th>
<th>Traditional Retained</th>
<th>Traditional Not Retained</th>
<th>3+2 Total Admitted</th>
<th>3+2 Retained</th>
<th>3+2 Not Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>151</td>
<td>131</td>
<td>20</td>
<td>32</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>Percentage</td>
<td>86.75% Retention</td>
<td>13.25%</td>
<td>87.5% Retention</td>
<td>12.50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Categories</td>
<td>Full Data Set N = 183</td>
<td>No 3+2 n = 151</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>-----------------------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>Percentage</td>
<td>n</td>
<td>Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Retention</td>
<td>Retained</td>
<td>159</td>
<td>86.9</td>
<td>131</td>
<td>86.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Retained</td>
<td>24</td>
<td>13.1</td>
<td>20</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Method of Admission</td>
<td>Traditional</td>
<td>151</td>
<td>82.5</td>
<td>131</td>
<td>86.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 + 2</td>
<td>32</td>
<td>17.5</td>
<td>20</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>White/Asian</td>
<td>137</td>
<td>74.9</td>
<td>112</td>
<td>74.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All Others</td>
<td>46</td>
<td>25.1</td>
<td>39</td>
<td>25.8</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>91</td>
<td>49.7</td>
<td>74</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>92</td>
<td>50.3</td>
<td>77</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Barron's Score</td>
<td>Low rated</td>
<td>111</td>
<td>60.1</td>
<td>79</td>
<td>52.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High Rated</td>
<td>72</td>
<td>38.8</td>
<td>72</td>
<td>47.7</td>
<td></td>
</tr>
<tr>
<td>Calculus in Undergrad</td>
<td>No</td>
<td>90</td>
<td>49.2</td>
<td>87</td>
<td>57.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>69</td>
<td>37.7</td>
<td>64</td>
<td>42.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>24</td>
<td>13.1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Observation Hours</td>
<td>50</td>
<td>41</td>
<td>22.4</td>
<td>30</td>
<td>19.9</td>
<td></td>
</tr>
<tr>
<td>Reported</td>
<td>&gt;50</td>
<td>131</td>
<td>71.6</td>
<td>120</td>
<td>79.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Missing**</td>
<td>11</td>
<td>6</td>
<td>1</td>
<td>99.3</td>
<td></td>
</tr>
<tr>
<td>Undergraduate GPA</td>
<td>&gt;3.00</td>
<td>83</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;3.00</td>
<td>68</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science GPA</td>
<td>&gt;3.00</td>
<td>82</td>
<td>54.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;3.00</td>
<td>68</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Science GPA</td>
<td>&gt;3.00</td>
<td>135</td>
<td>89.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;3.00</td>
<td>15</td>
<td>9.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>1</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Once the issues with unavailable data became obvious it was decided to run the logistic regression statistics on the “No 3+2” group (n = 151). When the analysis involved science GPA, social science GPA, letter of recommendation, or personal essay score, one additional student was omitted thereby leaving the final n at 150. Even with the decreased sample size, the literature supports that this n is large enough for statistically significant results. The literature states that to run a logistic regression two conditions need to be met: there needs to be a minimum sample size of 100, and the observation (subject) to predictor (independent variable) ratio needs to be at least 10:1. I have 150 subjects and a total of 12 possible independent variables so even with the omitted subjects, this sample size is sufficient for statistical analysis (Bursac, Gauss, Williams, & Hosmer, 2008; Peng, Lee, & Ingersoll, 2002).

**Description of Variables**

**Dependent Variable**

The dependent variable for this project is operationally defined as whether the athletic training graduate student dropped out of the PM for any reason during the first six months of the
academic program. The first six months of the program was used as the benchmark for this study as it reflects the academic setup of this PM and the most common time for students to leave. First year PM students begin their studies in the middle of July and are continuously enrolled throughout the academic year. By having the retention cut-off set at six months the attrition numbers include any student who left during the summer session as well as the fall semester. Data analysis supported the six-month time frame as the cutoff as only two students during the studied time frame left the PM after the first six months of the program, and they did so for non-program related personal reasons. Data derived from department meetings and personal experience corroborates the historical data and indicates that students who persist through the first six months usually always persist through to graduation.

Students who were retained past the first six months were coded as 1 and those who were not retained were coded as 0. Any student who decelerated (left after the first semester and then returned to the program with the new class, essentially taking a one-year break) was coded by their final programmatic outcome. There were 10 students who decelerated during the study period. If they were retained past the first six months of their return they were counted as retained and coded as 1. Any student who attempted to come back and was not retained in the first six months of their return was counted as not retained and coded as 0.

**Independent Variables**

The independent variables that were used are broadly classified as either demographic or academic in nature. In regards to demographic variables, attrition, and retention studies have shown gender (Anderton, 2017; Baum & Steele, 2017; Stetto et al., 2004), age (Baum & Steele, 2017; Dockter, 2001; Ruscingno et al., 2010; Utzman et al., 2007), and race/ethnicity (Stetto et
al., 2004; Utzman et al., 2007) to be associated with academic performance on the graduate level, either positively or negatively.

The academic category of independent variables include: undergraduate GPA (Bruce et al., 2016; Luce, 2011; Utzman et al., 2007), science prerequisite GPA (Luce, 2011; Utzman et al., 2007), social science prerequisite GPA, number of observation hours completed, method of admission (3+2 or traditional) (Chevran et al., 2017; Ruscigno et al., 2010), calculus (Aintablain & Ghirmai, 2017; Bruce et al., 2016), personal essay, letter of recommendation (Kuncel et al., 2014, Hall et al., 2017; Naylor et al., 2008; Stohl et al., 2011), and selectivity of the undergraduate university (Bruce et al., 2016; Eide et al., 1998; English & Umbach, 2015; Park et al., 2018; Posselt, 2017; Utzman et al., 2007; Zhang, 2005).

**Gender**

According to the US Census Bureau (n.d.), women have shown a significant increase in educational attainment at the bachelor’s and advanced degree levels as compared to their male counterparts. The Baccalaureate & Beyond data show that women are attending and graduating from graduate school at numbers that are significantly higher than their male counterparts and the differences are growing. In 2003 men and women were enrolling in graduate school and graduating with a degree at essentially the same rate. In 2012, those differences were 5% for graduate program enrollment and 3% for attainment within 4 years of undergraduate completion. During this time frame, females enrolled and attained graduate degrees at higher numbers than their male classmates. These numbers indicate that being female is a predictive factor of overall graduate school success.

Enrollment in PMs by gender follow this pattern of increase. According to the 2017-2018 CAATE Analytics Report, women made up 62.6% of students enrolled in PMs across the
country (CAATE, 2019). Retention data is not yet available by the CAATE for further comparison. The PM being studied had a gender breakdown of 49.7% male and 50.3% female, the “No 3+2” sample had a gender breakdown of 49% male and 51% female. Both numbers indicate a more equal distribution of gender than the national average for CAATE accredited PM’s as well as graduate school in general (Table 5).

Gender is a categorical variable. Gender was coded as male = 0, female = 1.

**Age on Admission**

As age of bachelor degree attainment increases, the chance of enrolling and obtaining a graduate degree decreases. (Baum & Steele, 2017; Dockter, 2001; Ruscigno et al., 2010; Utzman et al., 2007). The B & B data supports these researchers’ findings indicating that students older than 22 have a decreased chance of completing their graduate degree.

The age of the current sample ranged from 20 to 37 with the mean being 22.99 for the full data set and 23.30 for the “No 3+2” set (Table 5). Age on admission is a continuous variable calculated by full year.

**Race/Ethnicity**

Race/ethnicity has also been shown to be a factor in graduate school enrollment and graduate degree attainment (English & Umbach, 2015; Stetto et al., 2004; Utzman et al., 2007). The national Baccalaureate & Beyond data for the 2008/2012 sets show that non-whites with a bachelor’s degree seek out graduate degrees at a higher percentage than their white counterparts. However, after four years of graduate school enrollment the completion rate by race is as follows: White 59%, Black 50%, Hispanic/Latino 56%, Asian 60% and other 61%. These statistics illustrate that even though a higher percentage of black students are enrolling in
graduate than any other race, these same students also have the lowest completion rate (by percentage) of any race.

For analysis, I decided to use represented (white and Asian) and underrepresented populations (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016) instead of separate racial/ethnic groups. This decision was made to reflect the literature indicating that white and Asian students have the highest graduate school completion rates of the races (Baum & Steele, 2017). As such using represented versus underrepresented populations as a variable to determine early program attrition has benefits versus just using race. As such this variable was coded as represented populations (White and Asian) = 1 and underrepresented populations (all others) = 0.

According to the 2017-2018 CAATE Analytics Report (CAATE, 2019), represented populations make up 82.6% of the PM student population across the country while underrepresented populations make up only 17.4% of the national PM student population. Represented populations in the current data set made up 74.9% of the total sample and underrepresented populations made up 25.1%. The “No 3+2” group had a breakdown of 74.2% represented populations and 25.8% underrepresented populations (Table 4). This indicates that the population at the studied institution is more diverse than other PMs across the country.

Undergraduate GPA, Science GPA, Social Science GPA, and Calculus

GPA is a well-known and studied predictive variable for academic success or failure (Bruce et al., 2016; Luce, 2011; Utzman et al., 2007). Science prerequisite GPA was used to determine if proficiency in science has a greater predictor for success in an allied health field than overall GPA or social science GPA (Luce, 2011; Utzman et al., 2007). Undergraduate GPA, science prerequisite GPA, and social science GPA were coded as dichotomous variables where 0 = <3.0 and 1 = ≥3.0. In the original model for this study, GPA was coded as both continuous and
dichotomous. Due to a high level of multicollinearity between these variables, I decided that the dichotomous version of this variable would be the one utilized. The cut-off GPA of 3.0 was decided on because that is the required GPA to be admitted into the PM without being placed on academic probation.

The studied PM does have a math/statistics requirement but does not specify which course needs to be taken. Bruce et al., (2016) found calculus to be associated with programmatic success in a PM. In addition, calculus is well regarded across the medical and STEM fields as being a “gatekeeper” course of sorts where students who do well in calculus tend to be successful in future courses (Aintablian & Ghirmai (2017), Avraham & Kowlowsky, 1988; Moreno & Muller, 1999). As such I decided to look at the calculus association as well. This was coded as no calculus = 0 and calculus = 1.

The academic variables of GPA and calculus were unavailable for the 3+2 students. These students were required to maintain a 3.0 GPA throughout their undergraduate studies in order to be accepted into the PM and as such were not required to submit their transcripts or specific GPAs so this information could not be determined. Even though it is a preferred admission criterion 45% of the traditional applicants had a UG GPA and science GPA of lower than 3.0. The traditional applicants had a social science GPA of 3.0 or better in 89.4% of the cases. In the “No 3+2” group calculus was taken by 42.4% of the population (Table 4).

**Observation Hours**

Number of observation hours completed is categorical and was recorded as 50 = 0 and > 50 = 1. The baseline of 50 was used as this is the minimum number of observation hours required for admission into the PM. This purpose of this variable was to determine student knowledge of the profession with the underlying focus that the more knowledge of the profession
a student has prior to program admission the more likely they are to persist (Dodge et al., 2009; Mazerolle & Dodge, 2014). The issue with this variable is that the student was only required to submit proof of 50 observation hours. Whether or not the student submitted more was up to them and as such students who only submitted 50 hours may have completed more hours and simply did not submit them. However, for the total student group including the 3+2 students 71.6% of the students indicated that they completed more than 50 observation hours. From the “No 3+2” group this number increased to 79.5% (Table 4).

**Letter of Recommendation Score and Personal Essay Score**

Strength of letter of recommendation has been shown to be related to performance in allied healthcare fields (Kuncel et al., 2014, Hall et al., 2017; Naylor et al., 2008; Stohl et al., 2011). This variable along with personal essay score were used to determine student knowledge of the profession with the same underlying focus as observation hours. It is thought that through the analysis of LORs and student essays, the evaluator can help ascertain the students’ knowledge level of themselves, the profession, and the student’s aptitude towards the profession. The assumption being that the more knowledge of the profession a student has prior to program admission, the more likely they are to understand the demands of the profession, whether they want those demands, whether they have the capability to meet the demands, and ultimately if they will persist in the program (Dodge et al., 2009; Mazerolle & Dodge, 2014).

For this PM each LOR and personal essay is graded by two admission committee members on a scale of 1-4. The raters can score in .1 intervals. The average of the two admission committee members was used for analysis and was recorded as a continuous variable to a tenth of a point. Neither of these variables are a requirement for the 3+2 applicants so this variable could only be assessed for the traditional applicant pool. The average personal essay score for
these applicants was 3.14 with a range of 1.45 to 4 (Table 4). The average LOR score for these applicants was 3.47 with a range of 2.22 to 4 (Table 4).

**Method of Admission**

Ruscigno, et al. (2010), found that while controlling for other factors such as pre-admission GPA, the students who were part of the physical therapy dual degree program had a first-year programmatic GPA that was higher than the students who were admitted through the traditional admission process. The researchers concluded that these results indicated that 3+2 students have a higher chance of academic success than traditional applicants.

During the time frame of the cohort currently being studied, 82.5% of the admitted students were admitted through the traditional application process with the remaining 17.5% of the admitted students were admitted through the 3+2 program (Table 5). Analysis of the retention data showed that traditionally admitted students were retained at a rate of 86.75% while 3+2 students were retained at a rate of 87.5%. Using a chi-square test at a significance level of p < .05, there was no significant difference in these two admission groups as pertaining to program retention/early program attrition. This finding is different from previous studies which showed that 3+2 students were more likely to succeed in an academic program (Chevran et al., 2017; Ruscigno et al., 2010). For this study, method of admission was coded as traditional admission = 0 and 3+2 = 1.

**Barron’s College Selectivity Rating**

The selectivity ratings from the 2016 version of Barron’s Profiles of American Colleges were used to classify the selectivity of each applicant’s undergraduate institution. The quality of undergraduate institution has been shown to affect graduate student enrollment and graduate degree attainment (Eide et al., 1998; English & Umbach, 2015; Park et al., 2018; Posselt, 2017;
Utzman et al., 2007; Zhang, 2005). This variable is being utilized to help determine the selectivity of the university and thereby give a level of insight into the educational preparation of the applicant. Barron’s classifies the selectivity of the university based on criteria such as: GPA, high school class rank, and test scores of their admitted students. The 2016 version has six classifications ranging from noncompetitive through most competitive. This variable was coded as 0 = noncompetitive, less competitive and competitive (low rated), while 1 = very competitive, highly competitive, and most competitive (high rated).

When using the full N of 183, 60.1% of the accepted students came from the low rated Barron’s grouping with 38.8% coming from the high rated grouping. There were also two students who attended international universities that were not Barron’s rated. In order to include these students in the analysis I researched both international institutions. One was found to be ranked in the top 500 colleges/universities in the world (“World University Rankings 2019 | Times Higher Education (THE),” n.d.) and as such was coded as a 1. The second institution was found to be unranked and have around a 30% graduation rate (“US News Education | Best Colleges | Best Graduate Schools | Online Schools,” n.d.), and as such this institution was coded as 0.

The home institution where the study was conducted is Barron’s classified as a competitive institution and as such falls into the low rated category. When the 3+2 students were removed from analysis, the groups evened out percentage wise with 52.3% of the students coming from the low rated group and 47.7% of the students coming from the high rated group (Table 4).

**Methods**

Once the data was coded per the outline in Table 2, I ran demographic data which is illustrated in Tables 3 and 4 and discussed in the above sections. After the demographic data I
ran a series of two-tail Pearson correlations to identify which independent variables were either positively or negatively correlated with the dependent variable, as well as with each other. Table 6 shows the variables that were significantly correlated with the dependent variable. A 95% confidence interval was utilized for all statistical analysis. The variables with significant correlations to student retention were Barron’s score (.217), calculus (.217), and letter of recommendation (.243).

In order to determine multicollinearity, I viewed the correlations between the independent variables. While a statistically significant level of correlation was shown between several variables, a correlation statistic of at least .5 was needed to eliminate a variable from being used in the logistic regression. A correlation statistic of .5 or greater has been shown to cause statistical issue when running logistic regression (“Correlation (Pearson, Kendall, Spearman),” n.d.). If variables are too highly correlated, they can cause the model not to properly reflect the effect of each independent variable on the dependent variable. In the original data set, I coded all three GPA variables as both continuous and dichotomous. As could be expected, when the correlations were run there was significant correlation, and therefore multicollinearity, found between the dichotomous and continuous version of each GPA variable (Table 7). As such it was determined that only one of each GPA variable should be used. It was decided that the dichotomous version of each variable would be used since the PM admission procedure has a 3.0 GPA as the preferred GPA for admittance.

Other significant correlations that were below the .5 cut-off included science GPA (both regular and dichotomous), which was correlated with applicant age, and whether the applicant took calculus. Barron’s score was correlated with calculus, and undergraduate GPA was correlated with essay score.
Table 6

*Independent Variables Correlated with the Dependent Variable per Pearson Correlation Statistic*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Barron’s Score 2016</th>
<th>Whether or not the applicant took calculus in undergrad</th>
<th>Letter of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whether or not the student was retained past the first six months of the AT Professional Master’s Program</td>
<td>.217*</td>
<td>.217**</td>
<td>.243**</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 7

*Independent Variables with Pearson Correlation Statistic > .5*

<table>
<thead>
<tr>
<th></th>
<th>UG GPA Dichotomous</th>
<th>Science GPA Dichotomous</th>
<th>Social Science GPA Dichotomous</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG GPA Continuous</td>
<td>.787**</td>
<td>.296**</td>
<td>.286**</td>
</tr>
<tr>
<td>Science GPA Continuous</td>
<td>.251**</td>
<td>.806**</td>
<td>.205*</td>
</tr>
<tr>
<td>Social Science GPA Continuous</td>
<td>.301**</td>
<td>.170*</td>
<td>.661**</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The enter method of logistic regression was utilized as the next step of statistical analysis. This method is completed by entering all the selected independent variables at one time and then running the regression (Ranganathan, Pramesh, & Aggarwal, 2017). This method ensures that all chosen variables are utilized in the model, as opposed to the forward or backward stepwise regressions which add or eliminate variables based on goodness of fit. A potential issue with either of the stepwise methods is that either of those methods may result in a model that is
“overfit” and therefore does not provide accurate results (Babyak, 2004). In the case of this study, the stepwise regression methods were explored, but they eliminated large amounts of variables and resulted in predictive models that focused on only one or two variables which did not result in a beneficial admissions model. All models were run at a 95% confidence interval.

Following the elimination of the highly correlated continuous GPA variables, logistic regression models were run on various combinations of independent variables depending upon programmatic admission procedures, literature, and researcher findings. Three main models were utilized for comparison purposes.

The first model (Model 1) contained only the five scored variables used in the PMs admission procedure. These variables included: UG GPA, sci GPA, social science GPA, essay score, and LOR score. Even though observation hours are a requirement of the PM, that variable was not used in this model because for the PM the requirement is 50 observation hours, which all applicants must meet, and no additional “credit” is given for submitting more. I used the observation hours variable in a different manner than the admissions committee and as such did not feel that it was appropriate to use it here. Model 1 when compared to the null model had a chi-square score of 9.145 and a p value >.05. As such it was determined that this model did not have significant predictive capabilities to determine early program attrition (Table 8).

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>9.145</td>
<td>5</td>
<td>.103</td>
</tr>
<tr>
<td>Model 2</td>
<td>21.536</td>
<td>7</td>
<td>.003**</td>
</tr>
<tr>
<td>Model 3</td>
<td>23.623</td>
<td>11</td>
<td>.014*</td>
</tr>
</tbody>
</table>

* Significant at p < .05
** Significant at p < .01
The second model run included seven dependent variables: UG GPA, sci GPA, social science GPA, essay score, LOR score, Barron’s score 2016 (Barron’s), and whether the student took calculus in UG (Calculus). This grouping included the variables that the PM’s admission committee uses for admission decisions plus Barron’s and Calculus both of which had a high correlation with the dependent variable. The chi-square score of this variable combination was 21.536 with a p value < .01 indicating that this variable combination was statistically significant (Table 8).

The final model (Model 3) included all the independent variables except for method of admission resulting in 11 variables being entered into the equation. These included: UG GPA, sci GPA, social science GPA, essay score, LOR score, Barron’s score 2016 (Barron’s), and whether the student took calculus in UG (Calculus), observation hours, age, gender, and race. This model when compared to the null model had a chi-square score of 23.623 and a p value < .05. As such it was determined that this model also has significant predictive capabilities for early program attrition (Table 8).

Further analysis of the logistic regression results for all three models will be explored in Chapter 4.

Limitations

There are several limitations for this study that need to be addressed. The most significant limitation is that this study only utilized admission and six-month retention data for one PM over a 9-year time frame. As such there will be generalizability issues to other programs across the country. The results of this study will be most generalizable to PMs that have both a traditional and direct admission route to acceptance into the program or to programs with just a traditional
admission route. Those PMs that are strictly 3+2 direct admission may have some difficulty using these results as most of the predictive variables were found in the traditional application.

Another possible limitation is that this PM does not use the GRE as part of their application process. An internet search that included researching approximately 35 PMs revealed that about half of the 35 programs required the GRE. This wasn’t an exhaustive research effort but was enough to inform me that the GRE is a requirement by PMs across the country. The GRE has been shown in other studies to be significantly correlated with retention (Bruce et al., 2016; Luce, 2011; Stock et al., 2006; Utzman et al., 2007). As such PM’s that utilize GRE’s may not have the reliance on the non-academic factors that I saw in this study and may be able to use GRE scores as a successful academic predictor.

The size of the study turned out to be smaller than anticipated. It was thought that all files were retained by the university, but I came to find out that for classes before the graduating class of 2009 only the files of the students who persisted were retained thereby limiting our n. The n used in the logistic regression was further limited because I failed to consider the differences in the 3+2 application and the traditional application. These differences resulted in missing data points that required the elimination of those subjects for the final logistic regression models. Lastly, one application did not contain some GPA variables resulting in a final n of 150 that could be used for all logistic regression analyses. While this study and sample size still had significant power, adding more subjects from this institution or other institutions will result in even greater predictive power and potentially highlight other significant variables.

Lastly, socio-economic status was not looked at as a variable for this study. Research has shown socio-economic status to be a significant factor in graduate student attrition (Baum & Steele, 2017). Unfortunately, I was unable to find a way to determine this factor in the
application materials. Further research should explore this avenue in order to see the association between socio-economic status and early program attrition in a PM.
Chapter 4
Presentation of Findings

The priority of this dissertation was to determine what components of the admission portfolio had the greatest predictive ability of early program attrition in a PM. Early program attrition was defined as a student who withdrew for either academic or non-academic reasons during the first six months of the academic program. The ability of the PM to retain as many students as possible is important due to the significant impact that early program attrition can have on the student, the academic program, and the institution. Developing admission criteria that accurately predicts the success and failure of a student is a key component of an academic program’s success (Pinkston & Margolis, 1970). The current study has timely significance due to the current move of all athletic training programs to the graduate level and the lack of previous research linking graduate level admission criteria to programmatic success. This lack of information is particularly obvious in athletic training, where there is only one other study that has researched this topic (Bruce et al., 2016).

Data for this study was collected from nine years of admission applications spanning the graduation years of 2011-2019. Data was gathered through departmental and school wide admission files as well as individual admission and program files. Blinded data was utilized for analysis to avoid researcher bias in the evaluation and collection of data.

Data Analysis

As outlined in Chapter 3, I ran logistic regressions on three separate models of variables. Two of the three models were significant when compared with the null model (Table 8). The first model contained only the five variables used in the PMs admission procedure: UG GPA, science GPA, social science GPA, essay score, and LOR score (Table 9). As indicated previously, this
model, when compared to the null model, had a chi-square score of 9.145 and a p value >.05 and was determined not to have any significant predictive capabilities (Table 8).

<table>
<thead>
<tr>
<th>Model 1 - Current Admission Committee Variables n = 150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variables</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>UG GPA</td>
</tr>
<tr>
<td>Sci GPA</td>
</tr>
<tr>
<td>Soc Sci GPA</td>
</tr>
<tr>
<td>LOR Score</td>
</tr>
<tr>
<td>Essay Score</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

* Significant at p < .01

Regarding model 1, the only variable that was statistically significant was LOR score which had a positive beta coefficient of 2.126 and was significant at a level of p < .01. This beta coefficient indicates that in comparison to the other variables in this model LOR has the strongest relationship with whether the student was retained in the PM. For this variable this is a positive relationship indicating that, when all other variables are considered, for each point increase in LOR score the applicant was 8.38 times more likely to be retained in the program (Table 9).

Table 10 presents beta coefficients, significance values, and odds ratios for model 2. This sub-group of variables include the variables used in the current PM admission process as well as Barron’s score and calculus which were found to be significantly correlated with attrition in the Pearson Correlation test. The Omnibus Test of Model Coefficients indicated that this model was significant when compared to the null model, having a chi-square score of 21.536 and a p value < .01. The model also showed individual variable significance for LOR score (p = 0.010), Barron’s score (p < .05) and calculus (p < .05). These three variables all have positive beta
coefficients. For the continuous variable of LOR when all other variables are considered, the odds ratio indicates that for each point increase in LOR score, the applicant was 8.89 times more likely to be retained in the program. For the dichotomous variables of Barron’s score and calculus, after all other variables were considered, if a student attended a high-rated institution for their undergraduate education, they were 3.58 times more likely to be retained in the program and if they took calculus, they are 3.997 times more likely to be retained as opposed to having attended a low rated university or not having taken calculus (Table 10). As this is the model that shows the highest level of significance when compared to the null model, the results from this model are the results that will be reported on throughout the analysis sections of this paper. The only exception will be for demographic data and observation hours, which will refer to the information found in Table 11.

Table 10

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>B</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG GPA</td>
<td>.517</td>
<td>0.345</td>
<td>1.677</td>
</tr>
<tr>
<td>Sci GPA</td>
<td>-.045</td>
<td>0.934</td>
<td>.956</td>
</tr>
<tr>
<td>Soc Sci</td>
<td>-.620</td>
<td>0.524</td>
<td>.538</td>
</tr>
<tr>
<td>Essay Score</td>
<td>-.410</td>
<td>0.483</td>
<td>.663</td>
</tr>
<tr>
<td>LOR Score</td>
<td>2.185</td>
<td>0.010*</td>
<td>8.889</td>
</tr>
<tr>
<td>Barron's 2016</td>
<td>1.276</td>
<td>0.043*</td>
<td>3.581</td>
</tr>
<tr>
<td>Calculus in undergrad</td>
<td>1.385</td>
<td>0.040*</td>
<td>3.997</td>
</tr>
<tr>
<td>Constant</td>
<td>-4.782</td>
<td>0.087</td>
<td>0.008</td>
</tr>
</tbody>
</table>

* Significant at p < .05

Table 11 shows the results of the logistic regression model when all the independent variables (except method of admission) were entered into the model at one time. This table provides context of how the independent variables (IVs) affect the dependent variable (DV) when accounting for all variables. The Omnibus Test of Model Coefficients indicated that this
model was significant when compared to the null model with a chi-square score of 23.623 and a p value of .014. This indicates that the model has predictive abilities. However, even though the model is significant, using this variable combination, only LOR score has a significant individual p-value (p = .011). Calculus (p = .05) and Barron’s score (p = .056) were very close to being significant at the p < .05 level as well.

<table>
<thead>
<tr>
<th>Table 11</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model 3 – All Variables Except for Method of Admission n = 150</strong></td>
</tr>
<tr>
<td>Independent Variable</td>
</tr>
<tr>
<td>Age at admission</td>
</tr>
<tr>
<td>Race</td>
</tr>
<tr>
<td>Male vs Female</td>
</tr>
<tr>
<td>Barron’s 2016</td>
</tr>
<tr>
<td>UG GPA</td>
</tr>
<tr>
<td>Sci GPA</td>
</tr>
<tr>
<td>Soc Sci GPA</td>
</tr>
<tr>
<td>Calculus in undergrad</td>
</tr>
<tr>
<td>Observation Hours</td>
</tr>
<tr>
<td>Essay Score</td>
</tr>
<tr>
<td>LOR Score</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>* Significant at p &lt; .01</td>
</tr>
</tbody>
</table>

**Research Question 1: Academic Variables**

For research question 1, I failed to reject the null hypothesis as it pertains to the GPA variables, finding no significant relationship between the GPA variables and whether a student persisted through the first six months of the PM. Although prior research has shown that GPA has been known to be a successful predictor of academic success in allied health fields, the results of this study did not support that (Bruce et al., 2016; Luce, 2011; Utzman et al., 2007). The logistic regression model showed that for the PM studied, none of the three GPA variables analyzed were significant predictors of retention past the first six months, UG GPA (B = .517, p
= .345), sci GPA (B = -.045, p = .934) and soc sci GPA (B = -.620, p = .506) (Table 10).

Interestingly, even though not significant, UG GPA was the only GPA variable to have a positive beta coefficient, as both sci GPA and soc sci GPA showed a negative relationship with the dependent variable. This finding indicates that the higher the science and social science GPAs, the less likely the students were to be retained. The lack of predictive ability of the three GPA variables held true for all three variable models.

For the second part of the research question, I rejected the null hypothesis in its inclusion of whether the student took calculus during their undergraduate education, as this variable did show a positive significant relationship with the dependent variable (B = 1.385, p < .05). As indicated in model 2, if a student took calculus, they were 3.997 times more likely to be retained in the program past the first six months than a student who did not take calculus.

**Research Question 2: Demographic Variables**

I failed to reject the null hypothesis for all of research question 2. No significance was found between the demographic variables of age (B = -.071, p = 0.515), gender (B = -.175, p = 0.759), or race (B = .346, p = 0.569) and the dependent variable of early program attrition. While not significant, according to the direction of the beta coefficients, there was a slight trend showing that older students were less likely to be retained, men were more likely than women to be retained and represented populations were more likely to be retained than underrepresented populations. Finding no significance with these variables and early program attrition goes against current data which indicates that demographic variables such as the ones studied do affect educational attainment (Anderton, 2017; Baum & Steele, 2017; Dockter, 2001; English & Umbach, 2015; Ruscigno et al., 2010; Stetto et al., 2004; Utzman et al., 2007). Why I failed to
find correlation with any of the variables is unknown. Possible reasons for these findings will be explored in Chapter 5.

**Research Question 3: Student Knowledge of Profession**

Research question 3 had split results as I failed to reject the null hypothesis as it pertains to clinical observation hours ($B = 0.706, p = .245$) and personal essay ($B = -0.410, p = 0.483$) but rejected it as it pertains to letters of recommendation ($B = 2.185, p = 0.010$). No significant predictive ability was found between observation hours reported and essay score with the dependent variable of early program attrition. This held true for all three variable models.

Letters of recommendation (LOR) had the greatest predictive capability of all variables with a $p = .010$ (Table 10). The beta coefficient was 2.185 indicating a positive relationship with the dependent variable. The odds ratio was 8.889 indicating that for every one-point increase in LOR score the student was 8.889 times more likely to be retained by the program past the first six months. LOR was the only variable to be statistically significant in all three predictive models.

**Research Question 4: Method of Admission**

I failed to reject the null hypothesis of research question 4. Using a Chi-square test at a significance level of $p<.05$ there was no significant difference in these two admission groups as pertaining to program retention/early program attrition. Ruscigno, et al (2010) was the only other study that I found comparing 3+2 students and traditional admission students and their programmatic success in an allied healthcare master’s program. My results contradict Ruscigno’s results, which found that 3+2 students were more likely to be successful in a PT program than their classmates who entered through traditional admission routes.
**Research Question 5: Undergraduate University Rating**

I rejected the null hypothesis of research question 5 because Barron’s score had a p value significant at the p < .05 level. The beta coefficient was 1.276 indicating a positive relationship between Barron’s score and the dependent variable. The odds ratio of 3.581 indicated that students who studied at a high-rated institution were 3.581 times more likely to be retained past the first six months of the PM than a student who attended a low-rated institution. This supports current literature indicating that prior academic preparation can be linked to attrition/retention (English & Umbach, 2015; Park et al., 2018; Posselt, 2016; Utzman et al., 2007; Zhang, 2005)

**Conclusion**

The three variables that had the highest predictive ability of the dependent variable were LOR, Barron’s score 2016, and calculus. Letter of recommendation was shown to have the highest predictive capability, Barron’s score 2016 and whether the student took calculus were the other two. The correlation of LOR with success may indicate that a mentor’s analysis of a student’s strengths, weaknesses, and potential can be predictive of student success. These factors, paired with GPA not being correlated with success, may indicate that a student’s undergraduate academic path in course selection as well as selection of undergraduate institution indicates more about a student’s ability to succeed than their final GPA does. Considering these results, it can be concluded that the combination of taking calculus and attending a highly rated Barron’s institution shows a desire on the part of the student to reach for a higher level of academic achievement and curiosity which appears to outweigh actual grade achievement. These potential conclusions along with others will be explored more in Chapter 5.
Chapter 5
Discussion

The need for properly trained allied healthcare professionals, including athletic trainers, is growing as the population ages and people in general become more active (Flanigan, 2014). According to the Bureau of Labor Statistics athletic training is a field that is anticipated to grow by 23% by 2026 (Bureau of Labor Statistics, n.d.-a). In order to meet this growing demand, PMs need to accept and retain students that will be able to meet the academic demands of the program, pass the BOC certification exam, and become practicing athletic trainers upon graduation.

The purpose of this dissertation was to determine what predictive variables can be used to make educated admission decisions and flag students at danger of early program attrition. These variables were found in the students’ graduate school application as well as their program academic file. This study was done in order to help PMs and admission committees make knowledgeable admission decisions and/or flag students who have a high potential for early program attrition in order to implement preemptive remediation. The goal is for this information to assist PMs in identifying and admitting potentially successful students, decreasing programmatic attrition rates, and producing qualified and competent allied healthcare professionals.

The research questions for this project focused on how various admission and demographic variables contributed to early program attrition in a PM. The admission variables were broken into academic (GPA and calculus), demographic (age, gender, race), student knowledge of profession (LOR, essay, observation hours), method of admission (3+2 vs traditional), and undergraduate university rating (Barron’s score 2016). These variables were decided on through a study of current literature, the admission application for the PM and the
experience of the admissions committee. Specific details and background on the dependent variable as well as all twelve independent variables can be found in previous chapters.

Over a nine-year span, the studied PM demonstrated a six-month retention rate of 86.9%. While this appears to be high, it is not when compared to other allied healthcare fields, which average in the mid to upper 90s. As outlined in earlier chapters, prior research indicates that the focus of admission committees should be on GPA and other straightforward academic variables in order to choose who will be the most successful candidate for an academic program. In studies specifically looking at admission criteria as predictors of success in athletic training education, multiple studies have been done at the undergraduate level and have shown incoming GPA to be an accurate predictor of programmatic success (Keskula et al., 1995; Platt et al., 2001; Salvatori, 2001). This finding held true whether the researcher analyzed high school GPA (Platt et al., 2001), program pre-admission GPA (Salvatori, 2001), or undergraduate GPA (Keskula et al., 1995). Simply put, research has consistently shown that the higher a student’s incoming GPA, the more likely they are to succeed in a professional bachelor’s athletic training program. The one study done on a PM also indicated that undergraduate GPA is a successful predictor of programmatic success in a master’s program (Bruce et al., 2016).

**Significant Findings**

In direct conflict to conventional wisdom and prior research, my research shows that for the PM studied the three GPA variables showed no correlation with retention past the first six-months of the academic program. In fact, only three variables (Barron’s Score, calculus and LOR) out of the twelve potential independent variables were found to be correlated with the dependent variable for this sample. Out of these three, only LOR was a part of the application that the admission committee took into official consideration when scoring a candidate. I will
discuss the “unofficial” way that undergraduate institution is taken into consideration later in this chapter.

**Letters of Recommendation**

Letters of recommendation are frequently used in admission decisions, yet their actual efficacy is generally not well supported by the literature. However, in a meta-analysis study completed by Kuncel, et al (2014), the researchers indicated that letters of recommendation for graduate schools, particularly those in the medical field, have greater predictive value than letters written for non-medical professions. The researchers also found that letters of recommendation which are given a numerical value by the admissions committee have greater predictive ability than those that do not have a numerical score (Kuncel et al., 2014). These results are directly related to my findings, as athletic training is an allied healthcare profession and the PM studied uses a numerical grading system for analysis of the LORs.

The benefit of letters of recommendation for graduate level allied healthcare professions is further supported in the research by two studies that focused on letters of recommendation and residence placement for medical students. Both studies showed a strong correlation between letters of recommendation and success in the residency. The researchers determined that since these letters were written by prior supervisors within their field, they were able to speak to the resident’s strength and weaknesses as related to their ability to perform in the profession and as such had strong predictive ability of future success (Naylor et al., 2008; Stohl et al., 2011). Lastly, Hall and Cook (2017) found that letters of recommendation were the only successful predictor of a biomedical doctoral student’s future productivity. GPA, GRE, previous research experience, and interview ratings were found not to be predictors in the same doctoral program.
My study supports the findings of this research as the PM at hand is an allied health care profession and uses an evaluation sheet with a Likert scale grading system. The individuals who fill out the recommendation answer 11 Likert questions addressing applicant character, ability to work with others, leadership potential, maturity, as well as verbal and written communication skills. The admission committee takes the responses from these questions along with the written narrative to grade each LOR on a scale of 1-4. These grades are then averaged to come up with one LOR score that is used in the admission profile. Logistic regression analysis showed that for every 1-point increase in LOR score, the student was 8.89 times more likely to be retained in the program past the first six months. This is a highly significant difference that points to this variable as being key to determining student success at this PM.

Athletic training, like most allied healthcare fields, requires a level of focus and personal determination that goes beyond the pure academic skill set. Letters of recommendation are a good way to gather information regarding this still set. Even though LORs are written by people who are handpicked by the student, it appears from the results of this study and prior studies that the LOR form, as well as the way the admission committee analyzes the LORs, can help determine who will be a successful candidate in the PM.

The PM at hand requires that one of the three LORs submitted by the applicant be written by an athletic trainer. While the LOR written by an athletic trainer was not separated for analysis, I would anticipate that using that specific letter as its own variable, would potentially yield an even higher level of correlation than what is already found. This is an area that should be further researched in order to add to the knowledge base surrounding letters of recommendation and student persistence.
The second variable that showed a high level of predictive ability with early program attrition was Barron’s score 2016. Attendance at a high-rated Barron’s institution resulted in a student being 3.58 times more likely to be retained in the PM versus a student who attended a less highly rated school. While not an official component of the application, I would be remiss not to note the possible effect that the applicant’s undergraduate institution had on admission decisions. In a book written on doctoral admissions, Julie Posselt studied ten top-ranked doctoral programs and noted that in the programs studied the three strongest determinates of admission were grades, GRE scores, and reputation of undergraduate institution (Posselt, 2016). This work by Posselt was also supported by Park et. al. (2018) who studied a doctoral program in biomedical sciences and found that undergraduate GPA and the competitiveness of the undergraduate institution had the greatest correlation to student success (Park et al., 2018).

While the PM studied does not directly use reputation of undergraduate institution in admission decisions, it is not unusual for committee members to note the name and competitiveness of the undergraduate institution, particularly if the student does not meet the 3.0 minimum GPA. The admission committee may possibly push for a student to be admitted on probation if the undergraduate institution is noted to be of high repute, if number of program alumni graduated from that school, or if committee members have specific positive experiences with the institution. On the other hand a school with a poor reputation may not strike the same level of regard or influence when the committee decides on offering an applicant probationary admission.

My results regarding Barron’s score and the practices of the admission committee are in line with other research that has shown school selectivity can be correlated with student success
It is also logical to assume that if a student attended a higher rated school for their undergraduate preparation, they have probably been exposed to a history of academic rigor. The problem with overly focusing on academic pedigree is that it can lead to eliminating possibly successful candidates from lower rated schools as well as decreasing diversity within the graduate program (Park et al., 2018; Posselt, 2014). The importance of such a pedigree should not be understated when trying to predict future academic success. However, admission committees should be careful in over focusing on pedigree as it is not the sole indicator of student potential.

**Whether the Student Took Calculus**

The last part of the three significant variables was whether the student took calculus. The statistics showed that if a student took calculus, they were 3.997 times more likely to be retained in the program past the first six months than a student who did not take calculus (Table 9). This finding is in line with the one other study done on master’s level athletic training programs and would seem to indicate that taking calculus translates to a higher level of success in a PM (Bruce et al., 2016).

What is interesting about calculus is that it is not a requirement for this PM. Whether the student took this course was determined by the student’s undergraduate major, undergraduate institution requirement, and/or student course selection. Calculus is known to be a challenging course so it can be posited that taking calculus is an indication of a strenuous undergraduate academic program thereby also leading to a stronger academic preparation.

There have been several studies which support the rigor and predictive nature that calculus has with success in STEM fields (Aintablian & Ghirmai, 2017; Avraham et al., 1988;
Bowen et al., 2019; & Moreno & Muller, 1999). Moreno & Muller (1999) refer to calculus as a “gatekeeper” for high level math, science and engineering courses. The level of respect and predictive capabilities that calculus demands in STEM fields seems to translate to PMs as well. Whether a student took and passed calculus can be an interesting addition to the admission committee’s overview of an application and may assist in tipping the scales when a decision is not clear cut.

**Key Non-Significant Variables**

This study bucked trends and found several commonly predictive variables of success to be non-predictive. Grade point average (Bruce et al., 2016; Keskula et al., 1995; Luce, 2011; Platt et al., 2001; Salvatori, 2001; Utzman et al., 2007), age (Baum & Steele, 2017; Dockter, 2001; Ruscigno et al., 2010; Utzman et al., 2007), gender (Anderton, 2017; Baum & Steele, 2017; English & Umbach, 2015; Stetto et al., 2004; Utzman et al., 2007), race (Baum & Steele, 2017; English & Umbach, 2015; Utzman et al., 2007; Zhang, 2005), and knowledge of academic field (essay score, observation hours) (Mazerolle & Dodge, 2014) all were shown not to be significant in predicting early program attrition.

There was also shown to be no difference in attrition when a student was admitted into the PM through the 3+2 route or admission versus the traditional route. This finding goes against the one other study done by Ruscigno et al (2010) that showed that 3+2 students in a graduate level physical therapy program performed better than traditionally admitted students. These results are surprising across the board but are especially surprising considering how many research-documentated variables were shown to be non-significant. What is it about this PM that causes these traditional factors to be non-significant?
**Grade Point Average**

There are a variety of potential factors that make this PM unique and may lead to the unusual findings. The biggest overarching aspect that stands out is that across the board this PM admitted students with a wide range of UG GPA’s (range 2.48-3.82, mean = 3.06). Whether admitting students with GPAs below the GPA listed on the application is unusual for PMs across the country is difficult to ascertain from publicly available data. However, for this program, almost 45% of the admitted applicants had an undergraduate and science prerequisite GPA that was below the 3.0 threshold for admission. This means that the student must have shown a high enough aptitude in other areas of the application such as LOR, or GPA (science or social science) order to gain probationary status into the PM. This conclusion can be made because any applicant with a UG GPA of less than 3.0 needs to show aptitude elsewhere in order to gain acceptance from the admission committee and final dean approval.

Forty-five percent of the students admitted into this PM had a GPA below 3.0 yet 83.8% of these students were retained. This clearly illustrates that when all the other variables are considered, GPA simply does not mean much for admission into this PM.

**Demographics**

According to the 2017-2018 CAATE Analytics Report (CAATE, 2019), underrepresented populations made up 17.4% of the students enrolled in PMs across the country. In contrast, the PM studied was made up of 25.1% underrepresented populations. While still a high overall number, it does represent an almost 8% increase in diversity over the national average. Regarding gender the national average for PMs were 62.6% female and 37.4% male. The PM studied was 50.3% female and 49.7% male. While the exact reason is unknown, the
greater equality in race and gender found in this PM may have caused the lack of significance in findings regarding the predictive ability of these variables.

Bruce et al (2016), the only other study to look at predictive variables for a PM did not look at race or gender and as such there is no peer to peer comparison. The 2017-2018 CAATE Analytics report also did not breakdown retention by gender or race. Without means for comparison to other PMs, the results of this study are purely speculative as to how it may apply to other programs. It may be that this program’s increased diversity led to insignificant findings, or it may mean that athletic training programs do not see the gender and race differences in retention that are found throughout higher education. Future research in this area is needed to fully explore the reasons behind my findings.

**Knowledge of Profession**

Allied healthcare programs use a variety of ways to try and assess the applicants understanding of the profession they are applying to enter. The use of personal essays, interviews and documented observation hours are all common means of assessing applicant knowledge of the profession (Creech et al., 2018). The rationale is if the applicant has an in-depth knowledge of the field, then they are more likely to work hard to attain their goal of being a practicing professional and are less likely to leave the program because “the field isn’t for them” (Mazerolle & Dodge, 2014). This PM uses both personal essay and observation hours to try and assess this variable. Neither of these variables were found to be correlated with program attrition.

Dodge and Mazzarolle (2014) found that for undergraduate athletic training students, knowledge of the career field played a significant role in whether the student continued in the athletic training bachelor’s program. In this study, observation hours and personal essay score
showed no correlation to student retention past the first six months. In a study of graduate level nursing students, Creech, et. al., (2018) also failed to find a correlation between personal essay and graduate school success.

Regarding observation hours this could be potentially explained several ways. A simple explanation is that it may be a measurement issue with the way I chose to look at the data. Instead of recording the exact number of observation hours reported by the student, I chose to make this a categorical variable and only record if the student reported 50 or 50+ hours. This is potentially an issue in why I saw no correlation because most students (79.5%) submitted 50+ hours. I may have seen a correlation if I recorded the exact number of hours submitted since some applicants submitted 51 and others submitted well over 1000.

Another potential explanation would be that if a student is applying to graduate school for a future career in an allied healthcare field, he/she would have a good idea of what goes into being a professional in that field as opposed to an undergraduate student who may not have as much knowledge or experience. Graduate students tend to have more experience than an undergraduate student and as such have a better idea of the field that they are entering. While the PM studied has had some students leave during the first six months because they “changed their mind” or “athletic training wasn’t for them”, it was a small overall percentage of those students who left and as such did not play a significant role in the overall retention/attrition numbers of the PM.

**Method of Admission**

No significant differences were found between students admitted into the PM through the 3+2 route versus the traditional admission route. While a statistically insignificant finding, this is a helpful finding for this PM and potentially other PMs looking at making decisions on
programmatic and admission protocols. This finding indicates that the level of student preparation for the 3+2 student rivals that of the traditionally admitted student. The 3+2 program is a route of admission that the home institution has direct ability to build and grow in order to generate a stream of students into the PM. The home institution can theoretically put as much or as little effort into developing this route as the institution sees fit. There is also the ability to put academic parameters on these students in order to ensure that they are adequately prepared for the rigors of the PM.

Application to Higher Education

The results of this study may also have influence that goes beyond athletic training and across higher education. As mentioned earlier, letters of recommendation are universally used in admission applications but tend not to be well regulated. Perhaps higher education in general should move towards changing the way they look at LORs and put greater regulation on how LORs are written and analyzed. Implementing a Likert scale system and requiring that at least one letter be from a person with close professional knowledge of the applicant may help to ensure greater predictive capabilities of success in non-medical fields.

My findings regarding Barron’s ratings is a result that can also be used throughout higher education. Taking a student’s prior education into account when making admission decisions can be helpful but can also be a slippery slope. This factor needs to be used with great care in order not to eliminate potentially success candidates who attended a low-rated institution. Barron’s rating could be used as a component of the admission process but should not be looked at so heavily as to taint an otherwise strong application.

Calculus has a less obvious correlation across higher education and may not have a great direct application to non-medical or non-STEM fields. However, the idea of recognizing a
“gatekeeper” class may be applicable to other programs. This would need to be determined on a program by program basis as to what course is most relevant to their fields. This is a potential area of future research that can be explored.

**Conclusion**

With a six-month retention rate of 86.9% and few or no students leaving after six months, the admission committee and admission procedures for this PM does a good job of evaluating the entire student and identifying applicants who have a better chance of success irrespective of their GPA. Since letters of recommendation were shown to have the greatest correlation with student success this element of the application should continue to be used and potentially have greater weight put upon it by the admission committee.

The results of this study show that the admission committee can further improve their success rate by consciously considering the Barron’s rating of the undergraduate institution attended as well as whether the student took calculus when evaluating future applicants. Also, putting more emphasis on letters of recommendation will allow the admission committee to identify students who may not have the GPA to gain admission but have other factors that indicate that they would be successful in the program. These results show that there is more to PM applicants than their undergraduate GPA, and this additional information should be taken into consideration when making admission requirements and evaluating candidates.

The importance of evaluating the whole applicant beyond specific academic measures was highlighted by which variables were shown to be correlated with retention past the first six months of the program. These results show that there is an indication that predictive long-term success in a PM goes beyond the admission factors currently used by this PM. This is a lesson that may be learned by admission committees across the country and across higher education.
In order to achieve a higher level of retention it is suggested that this PM put more emphasis on letters of recommendation and consider using Barron’s rating and whether the student took calculus in their admission decisions. While the school may not be able to make final decisions based solely on these three factors, this study does give credence to the predictive nature of these variables. As a result of this, use of these variables may be beneficial especially when analyzing applicants who do not have a 3.0 UG GPA for admission on a probationary basis. On the flip side, students who have a 3.0 GPA but come from a low rated institution, did not take calculus, or have poor LOR’s may need to be flagged for additional oversight and possible early intervention to ensure that the student is retained in the program.

**Future Research**

Since this is only the second study done on the predictive factors of admission variables in PMs, there is a large potential for future research. As athletic training mandates that all programs move to the master’s level, this is an area of research with a lot of potential. Future studies in this realm should be done on multiple PMs so that a higher level of generalizability can be applied. Selecting programs from across the country and from a variety of colleges/universities will allow for a greater sample size as well as developing a sample that would be more reflective of the demographics of PMs across the country and athletic training in general. There were several non-significant variables found in this study that are historically significant in admission research. By studying more than one PM a research population can be generated that more closely mirrors that of the national enrollment resulting in greater generalizability and potentially significantly different outcomes.

Finding a method of evaluating socio-economic status would also be beneficial and would be an interesting follow-up study. The issues surrounding socio-economic status and
academic success is well documented (Baum & Steele, 2017) and deserves to be looked at as it relates to athletic training education. Master’s level programs are expensive, with yearly cost ranging from $12,038 to $40,480 (CAATE, 2019). A student’s socio-economic status can play a potentially large role in whether they are able to complete such a program due to financial strains.

An interesting future analysis would be to further tease out the predictive benefits of LORs, concentrating on just the LOR from the athletic trainer and comparing the predictive ability of that letter to the predictive ability of the other letters. This may allow for a greater focus on certain LORs or show that there is no difference in such evaluations. Comparing the LOR scoring across admission committee members would also be possible follow-up study.

A study looking at total number of observation hours completed by an applicant would give a better understanding of how this prior experience translates to programmatic retention/attrition. A study looking at actual hours will also help to generate a research-based cut-off for number of hours that an applicant should submit to a program when applying. This would help programs generate admission criteria based on research instead of speculation.

Another angle for future research would be to look at program admission as it compares to program capacity. According to the 2017-2018 CAATE Analytic Report the average PM can accommodate 30 students, but the average class size is only 15, thereby indicating that on average PMs across the country function at only 50% capacity. As a result of the low-class numbers, admission committees may look to push the boundaries with student admission and bring students in on a probationary status in order to fill seats. The need to accept students who may not meet the full application criteria may be a significant contributing factor to why PMs have a higher attrition rate than their allied healthcare peers. A qualitative study looking at how
program capacity plays a role in the admission committees’ decisions would be helpful in painting a broader picture of the admission landscape for PMs.

There is also potential research in broader higher education. A study can be done exploring the quantification of LORs for non-medical fields and researching how LORs are currently evaluated by admission committees. A study can be done looking at the predictive nature of Barron’s rating across graduate programs. Is there a greater predictive ability with certain programs than with others? Lastly, is there a “gatekeeper” course such as calculus that can be identified for non-STEM/medical fields? Perhaps a qualitative study asking professors in various fields what course(s) they think would fit this bill?

While this study has filled some gaps in the literature, it has opened the door to many more research questions and future thought. Admissions, retention, and predictive student success are topics, that will be ever present and relevant across higher education. The more we can understand these topics the better we can be at successfully serving the broader student population and continuing to develop higher education.
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Appendices

Appendix A: Seton Hall University IRB Approval

December 5, 2018

Dawn Maffucci

Dear Ms. Maffucci,

The Seton Hall University Institutional Review Board has reviewed your research proposal entitled “Determination of Predictors for Early Program Attrition in a Professional Master's Level Athletic Training Education Program” and has categorized it as exempt.

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

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

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

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

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

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

Sincerely,

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

Office of Institutional Review Board
Providence Hall • 400 South Orange Avenue • South Orange, NJ 07079 • Tel: 973.347.1000 • Fax: 973.377.2618 • setonhall.edu
Appendix B: School of Health and Medical Sciences Approval to Access Data

SCHOOL OF HEALTH AND MEDICAL SCIENCES
SETON HALL UNIVERSITY

TO: Institutional Review Board
   Seton Hall University

FROM: Patrick McDermott, M.A.

DATE: November 21, 2018

RE: Dawn Maffucci Dissertation Data Access

Please allow this memo, and my signature below, to serve as proof that I have given my permission for Dawn Maffucci to access the admission data for the Master of Science in Athletic Training program dating back to 2007. This data will be provided to her in full upon IRB approval for use in the completion of her dissertation.

[Signature]

Patrick McDermott, M.A. ‘11
Assistant Dean for Graduate Enrollment and Student Affairs
School of Health and Medical Sciences
Seton Hall University
Appendix C: Department of Athletic Training Approval to Access Data

SCHOOL OF HEALTH AND MEDICAL SCIENCES
SETON HALL UNIVERSITY

TO: Institutional Review Board
Seton Hall University

FROM: Vicci Lombardi, Ed.D, ATC
Department Chair, MSAT Program

DATE: November 21, 2018

RE: Dawn Maffucci Dissertation Data Access

Please allow this memo, and my signature below, to serve as proof that I have given my permission for Dawn Maffucci to access the archived admission files for the Master of Science in Athletic Training program. This files will be de-identified prior to her collecting data for completion of her dissertation.

Vicci Lombardi, Ed.D, ATC
Department Chair, MSAT Program
Seton Hall University