

2020

Predictors of Success on the National Board for Certification in Occupational Therapy Exam

Lesley Khan-Farooqi
Walden University

Follow this and additional works at: <https://scholarworks.waldenu.edu/dissertations>

This Dissertation is brought to you for free and open access by the Walden Dissertations and Doctoral Studies Collection at ScholarWorks. It has been accepted for inclusion in Walden Dissertations and Doctoral Studies by an authorized administrator of ScholarWorks. For more information, please contact ScholarWorks@waldenu.edu.

Walden University

College of Education

This is to certify that the doctoral dissertation by

Lesley Khan-Farooqi

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee

Dr. Briana Nicholson, Committee Chairperson, Education Faculty
Dr. Sherry Lowrance, Committee Member, Education Faculty
Dr. Kimberley Alkins, University Reviewer, Education Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2020

Abstract

Predictors of Success on the National Board for Certification in

Occupational Therapy Exam

By

Lesley Khan-Farooqi

OTD, Washington University in St. Louis, 2010

BS, Washington State University, 2007

BA, Washington State University, 2007

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Higher Education, Leadership, and Policy-Self-Designed

Walden University

November 2020

Abstract

To practice as an occupational therapist, an individual must complete an accredited occupational therapy (OT) program and pass the National Board for Certification in Occupational Therapy (NBCOT) exam. The NBCOT exam was developed to ensure entry-level occupational therapists have the necessary knowledge to make safe and competent decisions. The problem that compelled this study was that there is limited understanding of the predictors of first attempt success on the NBCOT exam. The purpose of this retrospective quantitative study was to examine the predictive ability of age, gender, ethnicity, undergraduate GPA, graduate record exam scores, and program GPA on first attempt NBCOT exam success. The theoretical framework of this study was Bandura's social cognitive theory, which examines the constructs of intentionality, forethought, self-reactiveness, and self-reflectiveness as they relate to student behaviors, goals, and learning outcomes. The overarching research question was to understand the extent one or more of the independent variables predicted first attempt NBCOT exam success. Retrospective data were analyzed for 208 masters of OT students using binomial logistic regression. Decreased age, GRE Verbal Reasoning score, and program GPA were statistically significant predictors of the first attempt NBCOT exam success. Results of this study promote positive social change by shedding light on the predictive nature of pre-admission and programmatic variables as they relate to students' ability to pass the NBCOT exam on the first attempt. Passing the NBCOT exam enables graduates to become independent OT practitioners who serve clients in need of their services and can reflect positively on the graduates' academic institution.

Predictors of Success on the National Board for Certification in Occupational Therapy

Exam

by

Lesley Khan-Farooqi

OTD, Washington University in St. Louis, 2010

BS, Washington State University, 2007

BA, Washington State University, 2007

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of Doctor of Philosophy

Doctorate in Philosophy

Higher Education, Leadership, and Policy-Self-Designed

Walden University

November 2020

Dedication

I would like to dedicate this study to my family, who have supported and encouraged me throughout this journey. To my parents Dorothy and Rob, for always encouraging me to pursue my educational dreams with determination and perseverance. To my late father Bob, who left too soon, but always has and will inspire me. You are my role model and you will always have an important and positive role in my life. To my husband Haumith: thank you for always being supportive, encouraging, and understanding throughout this process. I could not have completed this journey without your support and understanding. Finally, to my beautiful newborn son Zayn, you are my inspiration. I hope that you always pursue your dreams with passion and dedication.

Acknowledgments

I would like to acknowledge the excellent support and mentorship of Dr. Briana Nicholson and Dr. Sherry Lowrance.

Table of Contents

List of Tables	iv
List of Figures	v
Chapter 1: Introduction to Study.....	1
Background.....	5
Occupational Therapy Profession	7
Occupational Therapy Education.....	8
National Board for Certification in Occupational Therapy (NBCOT) Exam.....	9
Problem Statement	11
Purpose of Study	14
Research Questions and Hypotheses	14
Theoretical Framework.....	16
Nature of Study	18
Definitions.....	19
Assumptions.....	21
Scope and Delimitations	21
Limitations	22
Significance.....	25
Summary	26
Chapter 2: Literature Review	29
Introduction.....	29
Literature Search.....	30

Theoretical Framework.....	32
Predictors of Success	35
National Board for Certification in Occupational Therapy Exam	36
Grade Point Average (GPA) and Graduate Record Exam (GRE)	38
Application to Clinical Performance	43
Demographic Variables	45
Summary	47
Chapter 3: Research Methods	52
Introduction.....	52
Research Questions.....	52
Research Design and Rationale	53
Methodology.....	57
Population	57
Setting and Sample	58
Instrumentation and Materials	60
Data Collection	65
Data Analysis Plan.....	66
Assumptions of Logistic Regression	69
Threats to Validity	70
Ethical Procedures	72
Summary	72
Chapter 4: Data Analysis Results	74

Introduction.....	74
Data Collection	75
Demographic Characteristics	76
Univariate Analysis of Additional Covariates	77
Results.....	78
Assumption Testing.	78
Results of Hypothesis Testing	82
Summary	86
Chapter 5: Interpretations, Implications, Recommendations, and Conclusions	88
Introduction.....	88
Interpretation of Findings	88
Application of Theoretical Framework.....	89
Significant Independent Variables.....	90
Non-Significant Independent Variables.....	92
Limitations of Study	95
Recommendations.....	97
Implications.....	99
Conclusion	101
References.....	103

List of Tables

Table 1.	80
Table 2.	81
Table 3.	83

List of Figures

Figure 1.....	85
---------------	----

Chapter 1: Introduction to Study

To practice as an occupational therapist, an individual must complete an accredited entry-level degree in occupational therapy (OT) and pass the National Board for Certification in Occupational Therapy (NBCOT) exam (American Occupational Therapy Association [AOTA], 2018b; NBCOT, 2019). Once an occupational therapist successfully passes the NBCOT exam, he or she is eligible to apply for state licensure and practice as an independent practitioner (NBCOT, 2019). The purpose of the NBCOT exam is to ensure that entry-level occupational therapists have the necessary knowledge and clinical reasoning to make safe and competent decisions. The NBCOT exam is a high stakes exam for students, particularly after the time and financial investment that they have made in completing their OT degree (Novalis, Cyranowski, & Dolhi, 2017).

Students often report stress and anxiety as they await the outcome of the NBCOT exam results (Novalis et al., 2017). In 2019, the first attempt pass rate was 73%, with the total number of exam candidates including those retaking the exam being 10,697 (NBCOT, 2020). According to Novalis et al. (2017), if a student needs to retake the exam it often results in stress, anxiety, and a financial commitment. Because students typically make a substantial financial investment in the completion of their OT degree, the additional costs associated with having to retake the exam can be overwhelming (Novalis et al., 2017).

Student performance on the NBCOT exam often reflects on their academic institution as well. The goal of OT education is to graduate clinicians who are competent in the skills and knowledge needed to deliver entry-level OT services (Avi-Itzhak, 2015).

All OT academic programs are required to publicly display their NBCOT program data results by providing a direct link to the NBCOT website where they are displayed (AOTA, 2018b). When applying to OT academic programs, students often review these statistics and weigh the results as they make their decision of whether to apply to or attend that institution.

Admission committees at each OT program must also be able to select candidates from a pool of applicants who are most likely to be successful within the program (Avi-Itzhak, 2015). Success within the program indicates that the student has met the necessary academic and clinical requirements. These requirements are often measured through the student's grade point average (GPA) within the program and performance on the student's Clinical Level II Fieldwork experiences. However, the ability to ultimately be successful on the NBCOT exam is crucial to be able to practice as an independent occupational therapist.

Occupational therapists work with individuals to help them participate in their daily occupations. Occupational therapists work in a variety of settings with individuals who have chronic conditions, acute injuries, or sustained accidents that interrupt their ability to participate in their daily activities (AOTA, 2019d). When working with a client, an occupational therapist uses the client's occupations to design interventions that are motivating and meaningful for the client. The unique approach that occupational therapists take can improve an individual's quality of life by addressing his or her physical, social, cognitive, and environmental health.

The occupation-based approach used by occupational therapists can often be more engaging and automatic for a client, which can facilitate their ability to participate in desired tasks. The occupation-based approach can be particularly beneficial if the client is experiencing pain or anxiety due to an injury or condition. According to Weinstock-Zlotnick and Mehta (2018), clients who engaged in occupational-based activities following an upper extremity injury had better outcomes in patient-reported functional outcome measures, performance, and physical measures of the upper extremity. The findings by Weinstock-Zlotnick and Mehta support the utility of the unique occupation-based approach taken by occupational therapists.

In a study completed by Rogers, Bai, Lavin, and Anderson (2017), OT was found to be the only spending category where additional spending was statistically significant in reducing readmission rates in a hospital-based setting. Conditions studied included heart disease, pneumonia, and acute myocardial infarction. Rogers et al. examined 19 spending categories (including OT) across 2,791 hospitals for the heart disease data, 2,818 hospitals for the pneumonia data, and 1,595 hospitals for the acute myocardial infarction data. The only spending category that had an impact on both clinical and social aspects of health was OT; an investment in OT has the potential to improve the quality of care clients receive without significantly increasing hospital spending (Rogers et al., 2017).

The findings by Rogers et al. (2017) and Weinstock-Zlotnick and Mehta (2018) support the importance of the OT profession to promote positive social change for individuals who are currently having trouble participating in their daily activities due to physical, psychosocial, cognitive, or environmental barriers. Steps towards this positive

social change include facilitating OT students' ability to successfully pass their NBCOT exam on the first attempt, which will allow them to enter practice as independent OT practitioners who can work with clients in need. Academic institutions that offer OT programs can also benefit from the results of this study to modify or support their admission criteria, identify and develop appropriate student support services, and ensure that faculty are adequately prepared to assist students who may be at risk. Therefore, the implications and results of this study can be multifaceted to not only facilitate student success, but also the success of future clients and academic institutions.

Chapter 1 provides an overview of my research study including the background and the identified research gap, the problem that compelled this study, the purpose of this study, and the research questions. There have only been two previous studies in which researchers explored predictors of success on the NBCOT exam; both of these studies called for additional research to explore predictors (Novalis et al., 2017; Zadnik, Lawson, DeLany, Parente, & Archer, 2017). Thus, a limited understanding of the predictors of success on the NBCOT exam remains. In this retrospective quantitative study, I explored pre-admission and program variables as predictors of success across multiple campus locations at a single health science university.

This chapter also outlines the theoretical framework, nature of the study, pertinent definitions used in this study, assumptions, delimitations, limitations, and significance. Bandura's social cognitive theory was the theoretical framework that I used in this study. According to Bandura (2001), outcomes occur due to consequences, indicating that intentional planning before the NBCOT exam can influence the student's ability to

successfully pass the NBCOT exam on the first attempt. The ability to identify students who may be at risk for not passing the NBCOT exam on the first attempt through predictive variables can help admissions, student support services, and faculty identify students who may need additional support to successfully pass the NBCOT exam on the first attempt.

Background

Understanding predictors of success on health professional certification exams can be helpful to students, academic institutions, student support services, and involved faculty. Many health professions have conducted studies exploring predictors of success on their certifying exams. GPA was found to be a consistent predictor of future academic performance and board exam performance (Cripps, Stiltner, Walters, Fullenkamp, & Laurent, 2018; Novalis et al., 2017; Patzer et al., 2017; Roman & Buman, 2019; Zadnik et al., 2017).

In the two studies completed exploring predictors of success on the NBCOT exam, graduate OT program grade point average (PGPA) was found to be the most significant predictor of first attempt board exam success (Novalis et al., 2017; Zadnik et al., 2017). In a study completed by Tan, Meredith, and McKenna (2004), overall GPA was found to be the most important predictor of clinical performance, while undergraduate grade point average (UGPA) was found to be the most important pre-admission variable for student academic success (Lysaght, Donnelly, & Villeneuve, 2009). In several studies within the physical therapy literature, the Graduate Record Exam (GRE) was found to be a significant predictor of success on the National Physical

Therapy Exam (NPTE; Bayliss, Thomas, & Eifert-Mangine, 2017; Coleman-Salgado & Barakatt, 2018; Kume, Reddin, & Horbacewicz, 2019); the authors of these studies proposed that the test-taking skills needed on the GRE also can apply to the NPTE. However, the GRE has yet to be explored as a predictor of the NBCOT exam.

Recently the OT profession has emphasized the importance of expanding diversity within the OT profession. The expansion of diversity includes not only demographic diversity but also embodied diversity (Clark, 2013). The expansion of diversity within the OT profession was originally driven by the AOTA Centennial Vision, which was developed in anticipation of the 100th anniversary of the OT profession (AOTA, 2019c). The content of the Centennial Vision includes an overview of the importance of having a profession that is globally connected and has a diverse workforce to meet the diverse needs of our society (AOTA, 2019c).

The Vision 2025, which is based upon the Centennial Vision, includes a pillar focus on *equity, inclusion, and diversity*. The inclusion of this pillar supports the OT profession's goal of being inclusive, equitable, and diverse in all forms (AOTA, 2019c). Currently, the profession is fairly homogenous with 89% being female, and 80% identifying themselves as White (AOTA, 2018a). The results of the AOTA (2018a, 2019a) documents indicate the importance of exploring demographic variables, UGPA, GRE, and PGPA as predictors of success on the NBCOT exam. At the completion of this study, I will be the first to examine the combination of these variables as predictors of success on the NBCOT exam using a binary logistic regression.

Occupational Therapy Profession

The field of OT is rapidly growing with an expected increase of 18% between 2018 and 2028 (Bureau of Labor Statistics, 2019). Current entry-level requirements for an OT practitioner is a master's degree, with many programs moving towards an entry-level doctorate. According to the AOTA (2018a), there are currently a total of 162 masters degree programs. Among these programs, the total number of OT students preparing for entry-level practice is 21,348 (AOTA, 2018a). In 2018, there were 133,000 OT jobs available in the United States (Bureau of Labor Statistics, 2019).

Occupational therapists work with people to help them do the activities they want and need to do. OT practitioners work in multiple settings including acute care, inpatient rehabilitation, outpatient rehabilitation, private practices, home health, school districts, and within the community. OT practitioners work with individuals, groups, or populations to evaluate their unique situation while also integrating input from stakeholders, which may include the individual's family or caregiver (AOTA, 2019a). Occupational therapists work to develop goals with their clients to help them to resume or pursue their chosen occupations. Occupations are meaningful everyday activities, which can include roles such as being a parent, educator, or artist. If an individual has an injury, disease, or condition, an occupational therapist can work with the client to integrate and tailor the rehabilitation process to include the client's valued occupations. The occupational therapist will develop interventions based on the client's goals to maintain, improve, adapt, or compensate for the task and skills required to complete their chosen occupations. If an occupational therapist is working with a group or community, he or she

can complete a needs assessment to establish goals, and then work to develop programs or recommendations to promote healthy behaviors, prevent injuries, or increase participation in chosen occupations (AOTA, 2019d). Occupational therapists help clients live their lives to the fullest, regardless of the client's condition, disability, or injury.

OT practitioners include both occupational therapists and OT assistants (OTAs). Occupational therapists often complete their undergraduate degree and prerequisites before being admitted to a master or doctorate level program. OT graduate programs are typically 2-3 years in length and include two 12-week long Clinical Level II Fieldwork experiences (AOTA, 2019b). OTA programs are currently an associate or bachelor's degree. Occupational therapists are responsible for the supervision of OTAs and for completing the initial evaluation, developing the treatment plan, and overseeing the treatment plan if it is provided by an OTA. OT practitioners take a holistic perspective to evaluate physical, psychological, emotional, cognitive, and environmental factors that could impact an individual or group's occupational performance (AOTA, 2019d).

Occupational Therapy Education

The role of OT education is to prepare entry-level OT practitioners who can address the unique occupational needs of individuals, groups, and populations (AOTA, 2015). The education process involves both didactic coursework and an experiential component, referred to as a Clinical Fieldwork Level II experience. The development of clinical reasoning, professionalism, and cultural awareness are key aspects of OT education. These approaches prepare entry-level practitioners who can facilitate the

client's participation in daily life through engagement in chosen occupations (AOTA, 2018d).

Entry-level OT practitioners are required to have graduated from a program that is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the AOTA. ACOTE is recognized as the accreditation agency for OT education by the United States Department of Education (USDE) and the Council on Higher Education Accreditation (CHEA). The purpose of ACOTE is to establish, approve, and administer educational standards to evaluate OT and OTA programs to ensure quality OT education and competent entry-level practitioners (AOTA, 2018b).

According to the ACOTE standards, OT curriculums should prepare practitioners who are generalists with exposure to a variety of common practice settings, practice areas, and populations. Curriculum design should include course objectives and learning activities that are in alignment with ACOTE standards. Each program's curricular design should have identified curricular threads and educational goals to ensure student acquisition of practice skills, professional behaviors, and competencies. Programs must also participate in program evaluation methods which include measuring student's progression through the program, Clinical Level II Fieldwork performance, NBCOT exam performance, and job placement (AOTA, 2018c).

National Board for Certification in Occupational Therapy (NBCOT) Exam

All entry-level OT practitioners are required to successfully pass the NBCOT exam. NBCOT is the national certifying body for OT practitioners within the United States with a vision for certified OT practitioners to provide effective evidence-based

services in all areas of practice worldwide (NBCOT, 2020). NBCOT's mission is to serve the public interest by advancing client care and the professional practice of OT through evidence-based standards and the validation of knowledge to ensure effective OT services are provided. Practitioners in all 50 states, Guam, Puerto Rico, and the District of Columbia are required to sit for the NBCOT for initial certification and to obtain state licensure. The purpose of the NBCOT exam is to measure the entry-level competence of candidates by determining that they have the necessary knowledge to enter OT practice (NBCOT, 2019).

To sit for the NBCOT exam, candidates must successfully graduate from an entry-level OT program, including passing their two 12-week Clinical Level II Fieldwork experiences. The candidate must then submit their official transcript to prove documentation of their date of graduate and degree title (NBCOT, 2019). Once all information is received by NBCOT, an Authorization to Test letter will be issued to the candidate allowing them to register to sit for the exam. The NBCOT exam consists of 170 multiple-choice questions and three clinical simulation test items (NBCOT, 2019). The multiple-choice questions have one best correct answer choice and the candidate can change their answer choices before submission. The clinical simulation test items involve an opening client scenario with four sections for each client case. Candidates respond with either a "Yes" or a "No" to each option; each selection the candidate makes cannot be de-selected. When a candidate selects "Yes" feedback is provided about the results of their decision (NBCOT, 2019). However, it does not give the student feedback on whether their response was a positive or negative selection for the client scenario.

The NBCOT exam for occupational therapists consists of four domains: evaluation and assessment, analysis and interpretation, intervention management, and competency and practice management (NBCOT, 2019). The evaluation and assessment domain involves acquiring information that would impact occupational performance during the OT process and accounts for 25% of the exam content. Analysis and interpretation domain includes determining conclusions in regard to the client's needs to develop an intervention plan during the OT process and accounts for 23% of the exam content. The intervention management domain is the largest making up 37% of the exam and involving the ability to select client-centered interventions throughout the OT process. Finally, the competency and practice management domain makes up the smallest portion of the exam and involves managing professional activities, which are guided by evidence, regulatory compliance, and standards of practice to promote quality OT services (NBCOT, 2019). Students must receive a scaled score of 450 or higher to successfully pass the exam.

Problem Statement

The problem that compels this study is that there is a limited understanding of the predictors of success on the NBCOT exam, for entry-level OT students at a large multi-campus OT program. In 2019, the pass rate of the NBCOT exam for occupational therapists was 73% for the 10,697 exam candidates, indicating that 27% of OT graduates did not pass the NBCOT exam within one year of graduating (NBCOT, 2020). Understanding the predictors of success for the NBCOT exam can help to shape decisions regarding appropriate admission criteria for incoming OT students, and to

determine which students may benefit from additional support to facilitate their first attempt success on the NBCOT exam.

There are only two studies that have focused on determining the predictors of first attempt success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). The authors of these two studies emphasized the importance of additional research being completed to expand the generalizability of predictors of success for the NBCOT exam. Also explored in these two studies were demographic data, UGPA, PGPA, and Clinical Level II Fieldwork scores. In both of these studies, PGPA was found to be a strong predictor of success for the NBCOT exam.

In the study completed by Novalis et al. (2017), data were retrospectively collected from 144 MOT students. Independent sample *t*-tests and chi-square tests were conducted to compare the differences between the group that successfully passed the exam on the first attempt pass rate (82%) compared to the group that did not pass (18%). Independent variables used in the binomial logistic regression model included gender, letters of recommendation scores, writing sample scores, and PGPA. This model correctly identified 86.2% of the student outcomes, identifying 99.1% of students who would pass, and 28% of the students who failed correctly (Novalis et al., 2017).

Similarly, in the study completed by Zadnik et al. (2017), data were collected on 218 students who graduated from a single university MOT program or combined bachelors and MOT program between 2007 and 2010. The study included both a qualitative and a quantitative portion. The qualitative portion involved student and practitioner participants who participated in a focus group to identify courses that were

essential for their NBCOT exam preparation. For the quantitative portion of the study, PGPA and several of the intervention-based courses were found to be associated with successfully passing the NBCOT exam on the first attempt (Zadnik et al., 2017).

Novalis et al. (2017) and Zadnik et al.'s (2017) studies were conducted at single locations and involved independent variables that were program-specific, limiting the generalizability of the results. In this study, I examined demographic variables (age, gender, ethnicity), UGPA, GRE scores, and PGPA using a binomial logistic regression model from a single university that has multiple regional locations. Because a majority of programs collect demographic data, UGPA, and GRE scores as their pre-admission variables, and track PGPA, the results of this current study will be more generalizable to the general OT student population and profession. The use of these independent variables within a binomial logistic regression model will be able to determine which of the above independent variables are predictors of the dichotomous dependent variable of first attempt NBCOT exam success.

The purpose of the NBCOT exam is to ensure that OT graduates have the necessary knowledge to perform entry-level OT services. The NBCOT exam consists of four domains: evaluation and assessment, analysis and interpretation, intervention management, and competency and practice management (NBCOT, 2019). According to a study completed by Avi-Itzhak (2015), there was a statistically significant relationship between student understanding of tasks and skills related to OT interventions and a successful first attempt pass rate of the NBCOT exam. However, there have been no research studies examining the predictive ability of demographic variables, UGPA, GRE

scores, and PGPA on first attempt pass rates of the NBCOT exam using a binomial logistic regression model.

Purpose of Study

The purpose of this retrospective quantitative study was to determine the predictive ability of age, gender, ethnicity, UGPA, GRE scores, and PGPA on the first attempt success on the NBCOT exam. I used a binomial logistic regression model to determine which independent variables are predictive of successfully passing the NBCOT exam on the first attempt. Data for this study were retrospectively reviewed and analyzed for MOT graduates who attended a large multi-campus and multi-region health professional university.

Research Questions and Hypotheses

OT program administrators, student support services, and faculty hope for students to be successful following the completion of their degree, including passing their NBCOT exam on the first attempt. Exploratory research examining age, gender, ethnicity, GRE scores, UGPA, and PGPA as predictors of success on the NBCOT exam is required to fill the gap in practice within the local university and nationally, as these variables are commonly collected by OT programs. Increasing diversity has been emphasized within the OT profession; including ethnicity as a variable has the potential to determine if ethnicity is predictive of NBCOT success and to bring awareness to the continued need to expand diversity within the OT profession (AOTA, 2019a). Previous OT research has found gender and PGPA to be a predictor of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). While GRE scores are strong predictors

on the NPTE exam (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019).

The research question is designed to address the relationships between the independent variables and the dependent variable at the local level.

RQ: To what extent do one or more of the below variables predict students' success in the passing of the NBCOT exam on the first attempt:

- a) Gender;
- b) Age;
- c) Ethnicity;
 - i. Asian
 - ii. Black or African American
 - iii. Hispanic or Latino
 - iv. White
 - v. other
- d) UGPA;
- e) GRE Verbal Reasoning score;
- f) GRE Analytical Written score;
- g) GRE Quantitative Reasoning score;
- h) PGPA

H_0 : One or more of the above variables do not predict students' success in the passing the NBCOT exam on the first attempt.

H_a: One or more of the above variables do predict students' success in the passing the NBCOT exam on the first attempt.

Theoretical Framework

The theoretical base for this study was the social cognitive theory specifically the agent perspective (Bandura, 2001). Agency refers to actions that are done intentionally. The four core features of the agent perspective of the social cognitive theory include intentionality, forethought, self-reactiveness, and self-reflectiveness (Bandura, 2001). Social cognitive theory focuses on understanding how individuals acquire and maintain behavior, while also considering the unique aspects of the individual such as past experiences, internal factors, and the environment (Bandura, 2001). Bandura developed the social cognitive theory based on the model of causation, where multiple factors can interact to influence an individual's behaviors and life decisions (Bandura, 1989). The social cognitive theory implies that what people think, believe, and feel can affect their behaviors.

Each individual's expectations, beliefs, and competencies are developed and shaped over time from past experiences and their social environment. An individual's physical characteristics can also affect his or her behaviors in different social situations. According to Bandura (1989), individuals are influenced by and have the ability to influence their environment, and often select activities or pursue life paths based upon their acquired preferences and competencies. These concepts led Bandura to develop the agent perspective of the social cognitive theory, which includes the constructs of intentionality, forethought, self-reactiveness, and self-reflectiveness. These four core

constructs help to motivate behaviors and goals, which can give meaning and worth to an individual's personal decisions (Bandura, 1989).

Social cognitive theory applies to this study as often times individuals pursue a career in OT because they find a personal calling to the profession. They are often motivated to creatively problem solve to develop interventions based upon each client's unique needs and desired occupations. The decision to pursue a career in OT can be a long road. One starts with the completion of an undergraduate degree and pre-requisite courses, then must be admitted to and successfully complete an OT graduate program including the Clinical Level II Fieldwork experiences, and finally sits for the NBCOT. Success requires the use of each of the four core features of social cognitive theory: intentionality, forethought, self-reactiveness, and self-reflectiveness (Bandura, 2001).

Outcomes such as a student's performance on the NBCOT occur not as a characteristic of agentive acts, but rather as a consequence (see Bandura, 2001). Intentional planning can influence different outcomes and intentions occur based upon plans of actions. Individuals formulate intentions that are adjusted, revised, and refined as they gather new information (Bandura, 2001). As students enter an OT program, they become aware of the NBCOT exam and begin to develop a plan to prepare and successfully pass the exam throughout the program.

Forethought can motivate students and guide their actions in anticipation of future events. Forethought can provide direction to allow students to continue to plan, set priorities, and structure their lives in anticipation of desired outcomes (Bandura, 2001). Along with this process, students must also monitor their own behaviors, cognitive

conditions, and environmental conditions, which can be thought of as self-reactiveness. This process also involves self-evaluation to ensure that sustained effort is maintained until the goal is accomplished (Bandura, 2001). Self-evaluation can directly relate to the development of a study plan for the NBCOT exam and motivation to perform well within the OT program (PGPA) to demonstrate an appropriate understanding of concepts and materials. This process involves the ability to self-reflect upon one's own strengths and weaknesses too to understand appropriate strategies for success (Bandura, 2001).

Nature of Study

In this quantitative study, I used a binomial logistic regression analysis to examine pre-admission and program performance variables as predictors of first attempt success on the NBCOT exam. A binomial logistic regression model was used to examine the independent variables, which include age, gender, ethnicity, UGPA, GRE scores, and PGPA as predictors of the dichotomous independent variable. Using a binomial logistic regression analysis determined the likelihood that the independent variables were predictive of the dependent variable (see Menard, 2010).

Data for this study were collected from a large multi-campus health science university in the United States, which has multiple OT program locations. Data were collected from three different campuses and geographical locations including the West Coast, Gulf Coast, and East Coast. Data for demographic data, UGPA, GRE scores, PGPA, and the first attempt success on the NBCOT were collected and de-identified, the final data set was obtained from the university's executive director of institutional

research and assessment following Institutional Review Board (IRB) approval. The de-identified data were analyzed with SPSS data software.

Definitions

Clinical reasoning: A high-level cognitive process that integrates both professional and acquired knowledge to deliver OT services in various settings and with various client needs (Mattingly & Fleming, 1994). This definition comes from the first study published on clinical reasoning in the field of OT (Mattingly & Fleming, 1994).

Demographic variables: Refers to categories that individuals use to identify themselves (see Clark, 2013). These variables include age, gender, race, ethnicity, military status, etc. For the purposes of this study, when referring to demographic variables, I am referring to the variables of age, gender, and ethnicity.

Graduate Record Exam (GRE): Taken by prospective graduate applicants who plan to apply for a master's or doctorate program. The GRE consists of verbal reasoning, quantitative reasoning, and analytical writing question types. Content is developed to reflect the type of critical thinking an applicant may experience in a graduate program or professional school. The GRE score is commonly used as a supplemental admission criterion used by professional or graduate programs (Educational Testing Service [ETS], 2019b).

Intervention: A skilled activity developed by an OT practitioner in collaboration with the client to facilitate engagement and participation in the client's desired occupations (AOTA, 2014a).

Program grade point average (PGPA): The cumulative GPA of an individual obtained during the completion of their OT program.

Master of Occupational Therapy (MOT): Degree programs designed to prepare entry-level practitioners who are prepared to sit for the NBCOT Occupational Therapist Registered (OTR ®) examination (AOTA, 2015). During the program, students are taught to analyze human occupation and provide science-driven and evidence-based interventions. The goal of these interventions is to promote quality of life for the clients they serve. All entry-level OT programs must be accredited by ACOTE (AOTA, 2015).

National Board for Certification in Occupational Therapy (NBCOT) Exam: A not-for-profit organization that provides certification for OT practitioners. OT practitioners are required to initially become certified in all 50 states, District of Columbia, Guam, and Puerto Rico. NBCOT is responsible for developing, administering, and reviewing the OT certification exam, with the goal of serving the public interest (NBCOT, 2019).

Occupational therapy (OT): The therapeutic use of occupations, including the use of everyday life activities with individuals, groups, populations, and organizations (AOTA, 2014a). The goal is to support participation, performance, and function in client roles across a variety of settings. OT services are provided for habilitation, rehabilitation, and promotion of health and wellness for those who currently have or are at risk of developing an illness, injury, disease, disorder, condition, impairment, or disability. Occupational therapists work to address physical, cognitive, psychological, and sensory-perceptual aspects that could impact performance in a variety of settings and

environments, to support client engagement in their occupations to promote physical and mental health, well-being, and overall quality of life.

Undergraduate grade point average (UGPA): Refers to the cumulative GPA of an individual obtained during the completion of his or her undergraduate degree.

Assumptions

There were several assumptions that I made regarding the data that were obtained and analyzed in this study. The use of these assumptions ensured that the data could be analyzed and produced accurate study outcomes (Osborne, 2015). Below are the assumptions that were made about the data that were retrospectively collected and analyzed as part of this study.

1. The student data obtained from this study's health science university by the university's executive director of institutional research and assessment were true and forthright.
2. Data were recorded and maintained for all OT graduates.

Scope and Delimitations

The scope of this study included MOT graduates from a large multi-campus health science university's OT program with campus locations on the West Coast, Gulf Coast, and East Coast of the United States between January 2017 and August 2019. Pre-admission and program performance data were obtained from the university's executive director of institutional research and assessment. The data for the dichotomous dependent variable first-attempt success on the NBCOT exam were obtained and maintained by the university's vice president for OT accreditation and assessment.

Data for this study were examining MOT students and included data on the entry-level doctorate in OT students. This decision was made due to a limited amount of student data available for the doctorate in OT students at the time of this study, as the doctorate in OT program was initiated in the Spring of 2017 with a small initial cohort. The campus locations that will be used in this study are located in three regions of the United States including the West Coast, Gulf Coast, and East Coast. Thus, some regions of the United States are not represented in the sample. Additional campus locations have been opened for the local university in both Gulf Coast and East Coast, however, the necessary outcome data for this study were not yet available for these campuses. Because data from these campus locations could not be used, it limited the potential number of participants within this study and the generalizability of the results.

Limitations

All research studies will have limitations. Study limitations may exist due to constraints on the research design or methodology of the study (Burkholder, Cox, & Crawford, 2016). Researchers should identify the weaknesses in their study and describe the steps that were taken to overcome them. The identification of study limitations can strengthen the research study as it shows that researchers are aware of their study's limitations and how the limitations could potentially affect the results of the study (Burkholder et al., 2016). The potential limitations of my study included having a small sample size, a short time frame for data collection, and selection-history effects.

Sample size. The initial data set for this study included a total of 281 MOT student participants. However, due to missing data points and outliers, the final complete

data set included data on 208 MOT participants. Because the data being analyzed were a secondary retrospective data set missing data points could not be recovered. A limitation of this study was the number of participants that were not included due to having missing data points or being outliers. However, the decision to exclude these participants was made to be able to run the binomial logistic regression analysis and the potential effect these missing data points and outliers could have had on the final study results (see Portney & Watkins, 2015).

Time frame. Data were collected from MOT students across three different campus locations of a large multi-campus health science university OT program. The regional campus locations included were on the West Coast, Gulf Coast, and East Coast. The decision to include the three campus locations was made because a new curriculum was started at the local university in January 2017. An additional East Coast campus was not included due to it being a new program in January 2017, and another Gulf Coast location was not included due to it not enrolling students until 2019. Because there was a limited number of doctorate of OT students who started the program in January 2017, the decision was made to only include data on MOT students.

Selection-history effects. The main threat to internal validity for this study was selection-history effects due to having participants from three different campus locations. Selection-history effects occur when groups have different experiences when representing different geographical areas (Portney & Watkins, 2015). It is important to note that different faculty members teach at each of the three different campus locations. However, the local university in this study does took several steps to ensure the

curriculum is consistent across the three campus locations to reduce this internal validity threat.

Bias. Bias within a study design can affect internal validity and thus the study quality and outcomes (Portney & Watkins, 2015). Performance bias for this study refers to any differences that occurred in the student groups who did and did not pass the NBCOT exam on the first attempt. There were several steps taken to protect against performance bias in this study. These steps included using data only from MOT students who received the same curriculum across multiple campus locations and receiving a complete de-identified data set from the local university executive director of institutional research and assessment following IRB approval from both Walden University and the local university.

Detection bias occurs if an outcome assessment varies across comparison groups (Portney & Watkins, 2015). The outcome assessment for this study was the first attempt NBCOT exam. The NBCOT exam is accredited by the National Commission for Certifying Agencies and the American National Standards Institute, to ensure that the NBCOT meets specific assessment standards (NBCOT, 2020). Attrition bias relates to the loss of participants across comparison groups (Portney & Watkins, 2015). Missing data points were analyzed to determine if NBCOT exam outcome data were missing for the study participants, which could affect the study results. The NBCOT exam outcome data was only missing for three student participants, two of which withdrew from the program and one who remained active in the program at the time of data collection.

Significance

This study will make an original contribution to the field of OT by identifying predictors of success on the NBCOT exam. There have only been two previous studies in which the researchers examined predictors of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017); both sets of researchers called for the expansion of the literature on this topic. The NBCOT exam is a high stakes certification exam for occupational therapists to become a registered and independent practice in the field of OT. Understanding the predictors of success can be important for current students, admissions staff, OT program directors, leadership, faculty, and potential students.

The results of this study can help to identify OT applicants who will be successful within a MOT program and identify students who may require additional support before sitting for their NBCOT exam. Researchers have found UGPA to be a strong pre-admission variable to predict academic success for OT students (Lysaght et al., 2009). The pre-admission variables of UGPA and GRE Written scores were also found to be significant predictors of Clinical Fieldwork Level II outcomes (Bathje, Ozelie, & Deavila, 2014), while PGPA was found to be the strongest predictor of first attempt pass rate on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). However, there have been no studies yet in which researchers explore the relationship between GRE scores and first attempt pass rate on the NBCOT exam, despite GRE scores being well documented in the physical therapy literature as a significant predictor of board exam success (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019).

If OT students are unable to pass their NBCOT exam, they will be unable to secure state licensure and practice OT. Students make a significant investment of time and resources to complete their OT degree. Therefore, programs should strive for a 100% pass rate on the NBCOT exam. Through determining predictors of success on the NBCOT exam, there is the potential for programs to identify students who may be at risk for not passing the NBCOT exam on the first attempt. The results of this study can help to identify predictive variables before admission, during coursework, and following the Clinical Level II fieldwork experiences.

Summary

This chapter provided an introduction to the study, including an explanation of the problem being investigated and the purpose of this study. Background information was provided on the OT profession and the importance of OT educational programs adequately preparing graduates to sit for the NBCOT exam. The OT profession is expected to grow by 18% between 2018 and 2028 (Bureau of Labor Statistics, 2019). The growth of the profession along with the OT Vision 2025, calls for the expansion of diversity within the profession to meet the needs of our society (AOTA, 2019c). Currently, the OT student population is approximately 89% female, and 80% White (AOTA, 2018a).

This present study included demographic variables of age, gender, and ethnicity. The inclusion of these independent variables with this study may be useful for future OT literature, students, and academic programs as the profession strives to increase diversity within the profession. The student population at this study's large multi-campus health

science university was more diverse compared to other programs. Thus, this study has the potential to demonstrate an increasingly diverse OT student population as it relates to performance on the NBCOT exam.

The purpose of this retrospective quantitative study was to explore demographic variables, UGPA, GRE scores, and PGPA as predictors of first attempt success on the NBCOT exam. There have only been two previous studies in which researchers have explored predictors of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). The expansion of literature regarding predictors of success on the NBCOT is crucial for the OT profession. The results of this study can help to shape decisions about admission criteria, student support services, curriculum, and the best methods to adequately prepare faculty to support students who may be at risk for not passing the NBCOT exam.

This study will make an original contribution to the OT profession. The NBCOT exam is a high stakes exam for OT graduates and is one of the final steps to practice as an independent OT practitioner. The results of this study can help to identify students who may be at risk for not passing the NBCOT exam and ensure that they get the needed support. The results of this study can be important for current and future OT students, admission staff, program directors, faculty, and academic leadership. While this study specifically focuses on the field of OT, the results of this study can be applied to other health professions, thus having a broader societal impact.

Chapter 2 provides an overview of the literature to support the reasoning behind my selection of demographic variables, UGPA, GRE scores, and PGPA as independent

variables. The background will also be provided on the OT profession including current trends in OT education. The application of Bandura's social cognitive theory to this present study will also be discussed.

Chapter 2: Literature Review

Introduction

The problem that compelled this study was that there is a limited understanding of the predictors of success on the NBCOT exam for entry-level OT students. Understanding the predictors of success for the NBCOT exam can help to shape decisions regarding admission criteria for incoming OT students, and to determine which students may benefit from additional support to facilitate their first attempt success on the NBCOT exam. The purpose of this quantitative study was to determine the predictive ability of demographic variables (age, gender, ethnicity), UGPA, and PGPA on the first attempt pass rate of the NBCOT exam. I used a binomial logistic regression model to determine which independent variables were predictors of success for passing the NBCOT exam on the first attempt. Data for this study were retrospectively reviewed and analyzed for MOT graduates who attended a large multi-campus and multi-region health professional university.

Few researchers have examined predictors of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). Literature supports the use of UGPA and PGPA as predictors of first attempt pass rate on the NBCOT exam. There are mixed findings in regard to age, gender, ethnicity, and GRE scores as predictors of success on other health professional board exams and for the NBCOT exam. Determining predictors of success for the NBCOT exam can help to determine admission criteria for programs, necessary student support services, and provide awareness to students and faculty on necessary steps to successfully pass the exam on the first attempt. Early identification of students

who may be at risk can help with the financial and emotional toll that can be associated with having to retake the exam. Additionally, all OT programs are required to publicly report their student pass rates, and often times a high student pass rate is associated with the perceived academic quality of the program. Student applicants may perceive programs that have a lower NBCOT first attempt pass rate as a weaker academic program (Novalis et al., 2017).

Previous literature discussing the predictors of success on the NBCOT exam and other health professional board exams will also be discussed. Bandura's social cognitive theory is described and applied to this study. The four principles of Bandura's theory include intentionality, forethought, self-reactiveness, and self-reflectiveness; all of which are essential components needed for an OT student to successfully be admitted to an OT program, successfully pass their coursework, complete their Clinical Level II Fieldwork experiences, and finally successfully passing the NBCOT exam (see Bandura, 2001; Bandura, 2004).

Literature Search

The research articles selected for this literature review focused on understanding predictors of success for the NBCOT exam and other health professional board examinations. Literature related to understanding predictors of success in regard to admission criteria, academic program success, and Clinical Level II Fieldwork outcomes will also be explained. The following online journals were reviewed for research articles: *American Journal of Occupational Therapy*, *Australian Journal of Occupational Therapy*, *British Journal of Occupational Therapy*, *Canadian Journal of Occupational*

Therapy, The Open Journal of Occupational Therapy, Occupational Therapy in Health care, Journal of Allied Health, and the Journal of Physical Therapy Education. The databases explored included CINAHL Plus, ERIC-Educational Resource Information Center, ProQuest Dissertations and Theses, and PubMed. I strived to review current literature, therefore the range of dates for supportive literature was between 2010 and 2019, except for older research studies that were directly applicable to this current study or supported the theoretical framework.

The keywords used to search the above databases and websites included: *occupational therapy, board exam, National Board for Certification in Occupational Therapy, National Physical Therapy Exam, predictors of success, allied health, physical therapy, nursing, education, educational measure, probability, logistic regression, licensure success, and certification.* Additional articles were also located through the reference lists of currently applicable publications. Only two articles were directly related to predictors of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017).

Past researchers have examined factors such as UGPA, PGPA, gross anatomy grade, emotional intelligence, and GRE Analytical Writing score to predict Clinical Level II Fieldwork success (Bathje et al., 2014; Brown, Williams, & Etherington, 2016). Evenson, Kaldenberg, Barnes, and Ozelle (2015) explored perceptions of OT practitioners who oversee students during their Clinical Level II Fieldwork experiences, which highlighted the importance of OT education programs to adequately prepare students. Demographic variables were also explored in several studies highlighting the importance of increasing diversity within the field of OT. Currently, almost 90% of OT students identify as female

and 80% as White (AOTA, 2018a). The AOTA has made it an initiative to increase the diversity within the field of OT.

Theoretical Framework

The theoretical base for this study was the social cognitive theory, which focuses on four core features of human agency (Bandura, 2001). These features include intentionality, forethought, self-reactiveness, and self-reflectiveness. Intentionality refers to actions that are done intentionally, such as OT students intentionally studying, planning, and preparing for their courses, Clinical Fieldwork Level II experiences, and the NBCOT exam. According to Bandura (2004), individuals form intentions that involve action plans and strategies for accomplishing them. Forethought involves setting goals and anticipating consequences of one's actions, such as OT students striving for a high GPA or studying to successfully pass their NBCOT exam (see Bandura, 2004). By anticipating the outcomes of an individual's actions this can help to guide and motivate his or her plans and decisions. This process involves self-reflection, which allows an individual to make conscientious decisions that bring satisfaction and self-worth into the individual's life pursuits.

Self-reflectiveness includes actions such as self-monitoring, personal standards, and corrective self-reactions, which are all key aspects of producing high-quality coursework and safely delivering OT services. Self-reflectiveness also involves reflecting upon a one's own motivators, values, and goals, such as the decision to pursue a career in OT (Bandura, 2001). Social cognitive theory focuses on understanding the unique way that individuals acquire and maintain behavior, while also considering past experiences

and the social environment in which these behaviors occur (Bandura, 2001). The ability to acquire and maintain certain academic behaviors may contribute to higher UGPA, PGPA, Clinical Fieldwork Level II performance scores, and the ability to successfully pass the NBCOT exam on the first attempt.

The social cognitive theory was founded based on the model of causation (Bandura, 1989). Traditionally, human behavior has been described in a unidirectional way, with behavior occurring because of environmental factors or internal factors of the individual. However, in this particular model, behavior, cognitive, personal factors, and environmental factors all can interact and influence one another. The influences of multiple factors do not imply that all sources have equal strength, nor do all reciprocal influences have to occur at the same time. According to Bandura (1989), an individual's expectations, beliefs, self-perceptions, goals, and intentions help to give shape to their behaviors. Therefore, this model implies that what people think, believe, and feel can affect how they behave.

An individual's expectations, beliefs, and cognitive competencies are developed over time by social influences (Bandura, 1989). Physical characteristics such as age, size, race, gender, and appearance can also affect an individual's reactions in different social situations. The current homogeneity that exists within many OT programs indicates the importance of increasing diversity within these programs and the profession. According to Bandura (1989), individuals are both products and producers of their environment. Indicating the people tend to select activities based on their acquired preferences and competencies.

Despite there being many other developmental theories, few can be used to examine what determines an individual's life path. When taking a lifespan perspective, many variables can have varying power of influence over the direction that an individual's life takes (Bandura, 1989). An important aspect of an individual selecting a certain life pursuit is the age at which certain life events occur and the social influences by family, educational, and institutional systems. Bandura (1989) discussed the importance of fortuitous encounters, which can sometimes affect significant events in a person's life such as career decisions and deep, meaningful relationships. The direction that an individual's life takes can involve both planned and fortuitous events; however, on a personal level, an individual must establish certain competencies, self-beliefs, and self-regulation to motivate one's own actions. Accomplishing personal goals requires self-directedness but also social support, which can help give incentive, meaning, and worth to an individual's personal decisions (Bandura, 1989).

Bonsaksen, Brown, Lim, and Fong (2017) used the Approaches and Study Skills Inventory for Students (ASSIST) measure to understand students' study approaches and their relationship to GPA. Bonsaksen et al. found that higher scores of *seeking meaning* and *achieving*, and lower scores on the *fear of failure* ASSIST subscales were associated with a higher GPA. The study involved a diverse cross-cultural student population with over 712 students from four different countries: Australia, Hong Kong, Norway, and Singapore.

A higher score of seeking meaning indicates that the student is motivated to increase his or her own understanding. This subscale is part of the deep approach to

studying category, with past literature also supporting that students who used deep learning approaches often had better academic performance than students who used surface learning approaches (Salamonson et al., 2013). The achieving subscale was the strongest predictor of having a higher GPA. According to Bonsaksen et al. (2017), the combination of being motivated to receive good grades (achieving), dedicating time to self-study activities, and studying for the purpose of understanding the material (seeking meaning) can be particularly helpful for OT students to be successful in their academic studies. These results are also in alignment with Bandura's social cognitive theory, emphasizing the importance of intentionality, forethought, self-reactiveness, and self-reflectiveness as one is working to complete their OT degree, Clinical Level II Fieldwork experiences, and preparing for the NBCOT exam.

Predictors of Success

The following sections address the current literature related to key variables and concepts. The predictors of success that I examined within this study include demographic factors, UGPA, GRE scores, and PGPA. Several authors have explored the predictive value of GPA to predict board exam performance and academic performance (Cripps et al.; Novalis et al., 2017; Patzer et al., 2017; Roman & Buman, 2019; Zadnik et al., 2017). Tan et al. (2004) also found GPA to be a predictor of clinical performance, which is an important outcome for OT student graduates. The OT student Clinical Level II Fieldwork experiences are captured because they are part of each student's PGPA. GRE scores have been documented within the physical therapy literature as a predictor of

the NPTE, thus making this variable a worthwhile predictor to explore for the NBCOT exam (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018).

National Board for Certification in Occupational Therapy Exam

Several researchers examined predictors of success on other certification exams, however, there are limited studies that focus on determining predictors of first attempt success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). According to Novalis et al. (2017), the NBCOT exam is a high stakes exam with students frequently reporting stress and anxiety in regard to the implications they may face if they do not pass the certification exam. While there is an emotional toll with taking the exam, there is also a financial cost associated with taking the exam and having to repeat the exam if a failure does occur. Student performance can also have implications for their academic institution. Administrators at each institution must demonstrate that they can retain students, produce students who successfully pass the NBCOT exam, and to demonstrate an appropriate pass rate to maintain accreditation status (Zadnik et al., 2017). All institutions' pass rates are available on the NBCOT website and many potential students consider the pass rate to reflect the reputation and academic quality of the program. To practice as an occupational therapist, the student must successfully pass the exam, thus adding to the importance for the student to pass the exam to find successful employment following the completion of their OT degree (Novalis et al., 2017).

In the study completed by Novalis et al. (2017), the authors explored demographic variables, preadmission factors, and program performance variables related to NBCOT performance. The data were retrospectively collected from 144 MOT students.

Demographic variables included age, gender, and ethnicity, while preadmission factors included UGPA, letters of recommendation score, interview score, and a writing sample score. The program performance factors included the PGPA, FWPE score, and students' Clinical Level II Fieldwork self-evaluation score. The students who passed on the first attempt compared to those who failed did not differ in regard to age, marital status, or ethnicity. When examining gender, men were found to be more likely to fail on their first attempt (42%) compared to women (16%; Novalis et al., 2017). There was no difference found between the two groups regarding UGPA and interview scores, however, students who did fail tended to have lower scores on their letters of recommendation and their writing samples. In regard to program variables, students who passed tended to have a higher PGPA, and those who failed also were more likely to have been placed on a modified academic plan while within their OT program. There was no significant difference in regard to fieldwork scores provided by clinical supervisors, however, students who failed tended to self-rate themselves higher compared to those who passed on the Clinical Level II Fieldwork self-evaluation (Novalis et al., 2017).

In a mixed-methods study completed by Zadnik et al. (2017) students' perceptions of coursework, age, gender, Clinical Level II Fieldwork score, and PGPA were analyzed relative to the first attempt pass rate of the NBCOT exam. The qualitative portion of this study was obtained from focus groups with 12 OT students and 7 recent graduates. The quantitative portion included the analysis of 200 MOT students between the years of 2007 and 2010. The average age for this sample was 29 years of age, with 96% being female. Zadnik et al. found that PGPA had a significant relationship to first attempt

NBCOT success, while age and Clinical Level II Fieldwork score did not. OT courses found to be related to first attempt NBCOT performance included intervention courses that covered performance-skills required to deliver effective OT services. According to Zadnik et al., these courses covered content relative to Domain 1 and 2 of the NBCOT exam, which are obtaining information on occupational performance, understanding client needs, and developing an intervention plan.

Grade Point Average (GPA) and Graduate Record Exam (GRE)

Several health professional studies have used 4-point scale GPA as a predictor of both future academic performance and board exam performance (Cripps et al., 2018; Novalis et al., 2017; Patzer et al., 2017; Roman & Buman, 2019; Zadnik et al., 2017). PGPA has been found to be a predictor of the first attempt pass rate of the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). Tan et al. (2004) found that GPA was the most important and consistent positive predictor of clinical performance. Other factors explored included age, anxiety level, and the completion of a preclinical practical course. Tan et al. supported cumulative PGPA as a predictor of clinical success, rather than examining single courses. While Lysaght et al. (2009) found that UGPA was the single most important pre-admission variable to predict student academic success.

In a recent study exploring predictors of the first attempt pass rate on the Board of Certification Exam for athletic trainers, cumulative and major GPA were found to be predictors of success (Cripps et al., 2018). Cripps et al. (2018) supported the importance of monitoring student GPA throughout the program and offering remediation when necessary, as higher PGPA was associated with a higher likelihood of first attempt pass

rate. Additionally, students who sat for their exams close to the completion of their program had a higher first attempt pass rate.

In a study examining predictors of success in nursing school, Patzer et al. (2017) found that UGPA, nursing course GPA (pre-requisite GPA), and GPA at the admission to the program were all predictors of graduate program GPA (PGPA). While nursing is a different specialty with different requirements, Patzer et al. did find that a student's GPA at the time of graduate school admission was twice as powerful of a predictor for PGPA as nursing course GPA (pre-requisite GPA) and four times as powerful as undergraduate science GPA. These studies (Cripps et al., 2018; Novalis et al., 2017; Patzer et al., 2017; Roman & Buman, 2019; Zadnik et al., 2017) indicate that UGPA and PGPA are both worth exploring as predictors of first-attempt success on the NBCOT exam. In a study completed by Johnson, Sanderson, Wang, and Parker (2017) examining performance on the NCLEX-RN, the researchers found that students who performed well on Health Education Systems, Inc exit examination were more likely to pass the NCLEX-RN on the first attempt. The authors' findings of this study indicate the use of practical examinations throughout the OT curriculum to prepare for students' Clinical Level II Fieldwork experiences, and that PGPA including successfully passing the Clinical Level II Fieldwork experience could potentially predict performance on the NBCOT exam.

In an article by Roman and Buman (2019) PGPA was found to be a predictor of the NPTE. Additionally, the authors of this study found that UGPA and the student's admission interview were able to predict PGPA. The authors of this study did not find pre-admission science GPA to be a predictor of PGPA. Regarding additional

considerations for admission criteria, Roman and Buman did find that the verbal score on the GRE and a reflective admission essay were predictors for graduation success, but they did not have a direct effect on NPTE performance. UGPA was a predictor of first attempt pass rate and ultimate three-year pass rate of the NPTE when over fourteen predictive variables were examined using multivariate regression analysis by Cook, Engelhard, Landry, and McCallum (2015). Variables that were not statistically significant included items such as characteristics of the university, student diversity, class size, and program length and design.

Kume et al. (2019) found that PGPA was a strong predictor of NPTE performance, with first-year graduate GPA and combined second- and third-year graduate GPA both being predictors of first attempt NPTE performance. Interestingly, in Kume et al.'s study, pre-admission variables such as UGPA did not correlate to first-year graduate GPA, and minimally correlated to second- and third-year graduate GPA. The first-year graduate GPA was a strong predictor of second- and third-year graduate GPA. The results of this study were consistent with the results from Meiners and Rush (2017) who also concluded that first-year PGPA was a significant predictor of NPTE performance. The authors' assumption was that much of the foundational knowledge is taught during the first term and courses taught later in the program build upon this foundational knowledge to progressively become more complex.

Despite mixed findings in the literature, Kume et al. (2019) did find that the GRE Quantitative and GRE Verbal Reasoning scores were predictors of first attempt NPTE scores. While Meiners and Rush (2017) found a small significant predictive relationship

(14.7%) with the model of UGPA, GRE Quantitative Reasoning, and GRE Verbal Reasoning as it relates NPTE performance, but with the addition of first-year PGPA, the model accounted for 38.8% of the variability in the NPTE score. The results found by Kume et al. and Meiners and Rush could be due to the test-taking skills required to complete both the GRE and the NPTE. These studies suggest that there may be utility in using GRE scores as part of admission criteria and that early identification and remediation of students struggling within the program can improve NPTE performance (Kume et al., 2019; Meiners & Rush, 2017).

Coleman-Salgado and Barakatt (2018) examined data over an 11-year period at a master of physical therapy program to determine if prerequisite GPA, GRE Verbal Reasoning score, GRE Quantitative Reasoning score, gender, or English as a second language (ESL) were predictors of first attempt NPTE board performance. The authors of this study found that prerequisite GPA, GRE Verbal Reasoning score, and GRE Quantitative Reasoning score were all predictors of first attempt NPTE board performance. ESL was explored in more detail as the program placed value on second language fluency, which is consistent with a national trend to increase diversity within health professional programs. Coleman-Salgado and Barakatt found that ESL students were more likely to have difficulty with passing the NPTE exam, with 91% of non-ESL students passing on the first attempt compared to 77% of ESL graduates. On the second-attempt 70% of non-ESL students passed, compared to 39% of ESL students. However, when Coleman-Salgado and Barakatt created a multiple factor model to include the ESL and GRE Quantitative Reasoning score, ESL was no longer a predictor of NPTE

performance. The GRE Quantitative Reasoning score predicted NPTE performance, rather than the ESL variable (Coleman-Salgado & Barakatt, 2018).

Similar findings were concluded by Bayliss et al. (2017) who also examined multiple predictors of first-attempt success on the NPTE. This study used a multiple regression with retrospective data to determine that foundational courses within the physical therapy program, PGPA, and GRE Verbal Reasoning and Quantitative Reasoning scores were all predictors of success on the NPTE. The GRE Verbal Reasoning and Quantitative Reasoning scores were the biggest predictors of success on the NPTE (Bayliss et al., 2017). Bayliss et al. emphasized the importance of researching the first attempt pass rate as many doctor of physical therapy students are accruing debt up to \$100,000 and are only able to practice after successfully passing the NPTE exam. MOT and doctor of OT students are also in a similar situation in regard to debt accrued while they are pursuing their degree and the importance of passing to begin working as a registered OT practitioner.

Moneta-Koehler, Brown, Petrie, Evans, and Chalkley (2017) explored the extent to which GRE scores could predict outcomes in the biomedical Ph.D. program. The authors of this study found that GRE scores did not predict graduation rate or performance, including the Ph.D. qualifying exam within the program. However, GRE Verbal Reasoning and Quantitative Reasoning scores were found to moderately predict first semester GPA and GRE Verbal Reasoning score was the only subtest to minimally predict PGPA (Moneta-Koehler et al., 2017). Moneta-Koehler et al.'s findings suggest

that other variables besides GRE scores can be predictors of graduate school success and that admissions criteria should consider multiple variables in addition to GRE scores.

Application to Clinical Performance

The use of pre-admission GPA or UGPA has been well documented in the literature as a good predictor of PGPA in many healthcare professions (Jones, Simpkins, & Hocking, 2014; Roman & Buman, 2019; Salvatori, 2001). However, the relationship between GPA, performance in the clinic, and certification examination performance remains unclear (Jones et al., 2014; Salvatori, 2001). In a pilot study, that was presented at the AOTA Conference Haber et al. (2015) found that UGPA and GRE were both predictors of Clinical Level II Fieldwork performance scores, despite the relationship being significant, it was weak.

A pilot study completed by Bathje et al. (2014) was the first to explore the relationship between admission criteria and the Clinical Level II Fieldwork score. The study used a convenience sample of 108 students from a private university in the Midwest. Variables explored included GRE Verbal Reasoning score, GRE Quantitative Reasoning score, GRE Analytical Writing score, and UGPA. This study found that UGPA was correlated to the first Clinical Level II Fieldwork experiences, while the GRE Analytical Writing score was found to be correlated with the second Clinical Level II Fieldwork experience. According to ETS (2020a), the purpose of the GRE is to test the potential for graduate school success by examining factors such as verbal and quantitative reasoning, critical thinking, and analytical writing. Since the GRE is standardized and objective, it allows programs to compare students from a variety of backgrounds and past

experiences. It is important to note that the GRE cannot offer insight into all attributes of an applicant nor are they an exact measure of someone's knowledge, skills, or abilities (ETS, 2019b). Therefore, it is recommended that the GRE be utilized as a part of multi-dimensional admissions criteria.

The field of OT requires graduates to demonstrate clinical reasoning, problem-solving, integration of evidence-based practice, and leadership abilities (Brown, Crabtree, Mu, & Wells, 2015). The goal of completing an accredited OT programs' coursework, including successfully passing student Clinical Level II Fieldwork experiences is to prepare students to sit for the NBCOT exam. Clinical Level II Fieldwork experiences allow the student to apply the theories and techniques learned during didactic coursework to deliver OT services under the supervision of a licensed occupational therapist. The Clinical Level II Fieldwork experiences are a crucial portion of the OT education program (AOTA, 2018c).

The purpose of the NBCOT exam is to ensure that OT graduates have the necessary knowledge to perform entry-level OT services. The NBCOT exam consists of four domains: evaluation and assessment, analysis and interpretation, intervention management, and competency and practice management (NBCOT, 2019). According to a study completed by Avi-Itzhak (2015), there was a statistically significant relationship between student understanding of tasks and skills related to OT interventions and a successful first-attempt pass rate of the NBCOT exam. However, there have been no previous research studies examining the predictive ability of demographic variables, UGPA, GRE scores, and PGPA on the first attempt pass rates of the NBCOT exam.

Demographic Variables

There is a limited understanding of the demographic variables that contribute to OT academic performance. However, over the last several years there has been an increase in literature in this area. In an article published by Bonsaksen and Ellingham (2018), the author found that an increase in age was associated with better academic performance while having previous academic experience prior to entering an OT program was associated with decreased academic performance. This may indicate that the life experiences associated with increased age may contribute to success within the OT program, while student expectations formed in other discipline's programs, may be different than the realities of being enrolled in an OT program (Bonsaksen & Ellingham, 2018).

There were similar findings in a small study (n=123) completed by Bonsaksen (2016). In this study, students who were older lived with a partner or spouse and had previous higher educational experience had higher academic performance compared to participants who were younger, single, and didn't have prior higher education experience. An interesting finding of the authors was student satisfaction was higher among students who did not place their OT program as their highest priority upon entering the program. The author of this study suggested that older students tend to form more stable relationships and also tend to also have previous higher education experience (Bonsaksen, 2016). The authors did not find that the occupations of students' parents, average hours of paid work, and gender to be associated with academic performance.

A prior research study completed by Bonsaksen et al. (2017) also found that increased age was associated with higher academic performance. Additionally, the female gender and the amount of time spent in self-study activities were associated with a higher OT PGPA. An interesting conclusion made by the authors was that it was not the type of studying that an individual engaged in, but the amount of time. This indicates that regardless of how a student studies if the student spends more time studying it will often result in higher academic achievement.

The Bonsaksen et al. (2017) study included 712 students from Norway, Australia, Hong Kong, and Singapore, with over 50% of the students being between the ages of 20-24 years and a majority being female at almost 85%. According to the AOTA (2018a), approximately 89% of MOT students are female. Since traditionally most OT students are female, it is hard to differentiate if being female is a true predictor of success. Miro, Young, Dedrick, and Highsmith (2017) were the first to explore predictors of success on the prosthetics certification exam. This study did not find gender or institution to be predictors of success for this certification exam.

It should be noted that Bonsaksen et al. (2017) was examining undergraduate OT students, with 28% between the ages of 15-19 and almost 87% were under the age of 25 years. In the United States, all OT degrees are graduate-level with 90% being masters degrees and 10% doctorate level (AOTA, 2018a). However, these numbers do show the importance of increasing diversity in the field of OT. In addition to only 11% of MOT students being male, 80% of students identified as White, while only 7% identified as Asian, 5% of African American, and 8% as other. Indicating the importance of increasing

the diversity within the OT field (see AOTA, 2018a). Recently the Allied Health Workforce Diversity Act (H.R. 3637) was developed to help increase the racial and ethnic diversity in the field of OT, physical therapy, and speech therapy by providing grant and funding opportunities to college and university programs to assist with tutoring, mentoring, scholarships, and grants (AOTA, 2019a).

Summary

In summary, there are limited studies where researchers have explored predictors of first attempt success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). The ability to successfully pass the NBCOT exam is high stakes for OT students to allow them to enter clinical practice following the completion of their didactic coursework and Clinical Level II Fieldwork experiences. Because there are limited studies specifically where the predictors of first attempt NBCOT exam success are examined, additional research will help to enhance the awareness of predictive factors for students and institutions. The results of my study have the potential to help students modify their approach to sitting for the NBCOT exam, while also helping institutions to potentially redefine admission criteria and student support services. My study outcomes may also better prepare faculty to advise and counsel students to improve their potential to pass the exam on the first attempt.

Novalis et al. (2017) discussed the importance of conducting additional research to explore predictors of first attempt success on the NBCOT exam. Emphasizing that while they were the first to explore many of these variables, there may be a lack of generalizability due to the study being completed at a single university and a lack of

diversity within their student subset. Using univariate analyses Novalis et al. did not find a difference in the first attempt pass rate for the variables of age, marital status, or ethnicity. However, they did find that males were more likely to fail on their first attempt (42%) compared to females (16%; Novalis et al., 2017). In Novalis et al.'s study, neither UGPA nor Clinical Level II Fieldwork outcomes were found to be statistically significant, but students who had a higher PGPA were found to be more likely to pass the NBCOT exam on their first attempt.

Zadnik et al. (2017) suggested that future studies should include students from a variety of different regions to expand the generalizability of the results. Zadnik et al.'s study was a mixed-methods study in which they retrospectively explored data from a focus group, faculty data related to curricular content areas, and registrar data. The quantitative data included OT specific course GPA, PGPA, Clinical Level II Fieldwork scores, age, and gender. Among these variables, only PGPA was found to be a predictor of success for the first attempt NBCOT exam performance. The qualitative data of this study showed that courses focused on the OT evaluation, interventions, and client outcomes were associated with being important for preparing for the NBCOT exam (Zadnik et al., 2017).

PGPA has been well documented within the literature to be correlated to first-attempt board exam success across multiple health professions (Bayliss et al., 2017; Cripps et al., 2018; Kume et al., 2019; Novalis et al., 2017; Roman, & Buman, 2019; Zadnik et al., 2017). Some studies indicated that PGPA is the most important predictor of first-attempt board exam success (Kume et al., 2019; Roman & Buman, 2019). While UGPA has been

found to also be related to board exam performance, Clinical Level II Fieldwork performance, and PGPA (Lysaght et al., 2009; Patzer et al., 2017; Roman, & Buman, 2019). All of the authors' results within this paragraph support the utility of both PGPA and UGPA variables within this current study.

Bathje et al. (2014) were one of the first to explore the relationship between admission criteria and Clinical Level II Fieldwork performance. Bathje et al. found a relationship between UGPA and Clinical Level II Fieldwork performance. The limited past research that has used the first attempt NBCOT exam performance as their dependent variable, did not find a significant relationship with Clinical Level II Fieldwork scores (Novalis et al., 2017; Zadnik et al., 2017). Clinical Level II Fieldwork performance scores will be captured within this study as part of the PGPA variable, as each student receives a letter grade during their Clinical Level II Fieldwork experiences based upon their performance at the Clinical Level II Fieldwork site and their participation in the online material (AOTA, 2018c).

Surprisingly, the GRE was found to have a strong predictive relationship to first attempt board exam success, particularly within the physical therapy literature (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019). The authors of these studies (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019) found a relationship between the GRE Quantitative Reasoning and GRE Verbal Reasoning scores, and NPTE performance. The GRE was not used as a variable in past studies exploring predictors of success on the NBCOT exam (Novalis et al., 2017; Zadnik et al., 2017). Since the nature of an OT program tends to be more focused on written

work, admission criteria for OT programs tend to focus on the GRE Analytical Writing score. There is evidence from past literature that the GRE Analytical Writing score does have a relationship to Clinical Level II Fieldwork scores (Bathje et al., 2014; Haber et al., 2015). The authors' results from past health professional literature, make the GRE Analytical Writing score a variable that is worth exploring as a potential predictor of success on the NBCOT exam.

For this study, I examined demographic variables of gender, age, and ethnicity as predictors of first attempt NBCOT success, particularly with the current statistics from the AOTA (2018a). In 2017, there were only 11% of MOT students who identified as male and 80% identify as being White. Ethnicity has not been found to be a predictor of success on the NBCOT exam, or other research studies predicting success on other health professionals' board exams. However, understanding the demographic make-up of this study's student population will assist with the generalizability of the results. Particularly with the emphasis of expanding diversity within all health care professionals, including OT. Male gender has been found to be associated with a higher likelihood of not passing on the first attempt (Novalis et al., 2017). Therefore, gender was also worth exploring to understand its relationship to first attempt NBCOT exam success for this study's student population.

Chapter 3 provides an overview of the research design and rationale, methodology, and potential threats to validity. A discussion of the data collection and analysis procedures used for my study is provided within the chapter. An overview of the study methodology includes information on the student population, study setting, and study

variables. Chapter 3 closes with a discussion on how potential threats to validity were addressed and the ethical procedures followed throughout the completion of this study.

Chapter 3: Research Methods

Introduction

The purpose of this retrospective quantitative study was to examine predictors of first attempt success on the NBCOT exam for MOT students who attend a 24-month program at a large multi-campus university. The independent variables for this study included age, gender, ethnicity, UGPA, PGPA, and GRE scores. In this study, I examined the predictive nature of the identified independent variables on the dependent variable, of first attempt success on the NBCOT exam. In this chapter, I outline the research design, setting, and population, procedures for archival data set preparation and access, planned statistical analyses, and measures taken to protect participants' identity.

Research Questions

In this study, I examined the predictive nature of pre-admission and program performance variables on student first-attempt performance on the NBCOT exam. The archival data that I used included data from MOT students who attended a large multi-campus health science university between January 2017 and August 2019. The following overarching research question guided this study.

RQ: To what extent do one or more of the below variables predict students' success in the passing of the NBCOT exam on the first attempt:

- a) Gender;
- b) Age
- c) Ethnicity;
 - i. Asian

- ii. Black or African American
 - iii. Hispanic or Latino
 - iv. White
 - v. Other
- d) UGPA;
 - e) GRE Verbal Reasoning score;
 - f) GRE Analytical Written score;
 - g) GRE Quantitative Reasoning score;
 - h) PGPA

H₀: One or more of the above variables do not statistically significantly predict students' success in the passing the NBCOT exam on the first attempt.

H_a: One or more of the above variables do statistically significantly predict students' success in the passing the NBCOT exam on the first attempt.

Research Design and Rationale

I selected a quantitative approach using a retrospective exploratory analysis design for this study. The design included the analysis of non-experimental, cross-sectional cohort data. Data for my study were retrospectively collected from MOT student cohorts who enrolled in the trimester start dates of January 2017, May 2017, and September 2017. These student cohorts expected graduation dates were December 2018, April 2019, and August 2019. The start of this time period was selected because the OT program being examined initiated a new curriculum across all campus locations in January of 2017.

The design included the analysis of the three different student cohorts across three different campus locations, West Coast, Gulf Coast, and East Coast, for the university. These campus locations were included in the study because they were all established programs in January of 2017 with similar student cohort sizes. Two additional university campus locations were not included in this study, due to their programs being new or starting after January 2017.

Data were excluded from an additional East Coast campus location because this program was recently established at the time of data collection. Data were excluded from an additional Gulf Coast campus because it began enrollment in May of 2019, and only offers a doctorate in OT program. Due to the small number of doctorate of OT students across the three included campus locations and the variability in the start of enrollment for this new program, only data from the MOT program was used in this study.

My study used a binomial logistic regression analysis to determine predictors of success on the NBCOT exam. A binomial logistic regression analysis allows the researcher to predict the probability of an outcome occurring (Portney & Watkins, 2015). According to Burkholder et al. (2016), logistic regression is a statistical method that explains one variable based on one or more variables. The variable being explained is referred to as the dependent variable. A primary feature of logistic regression is the predicted mean, which is the probability ranging from 1 to 0, with 1 being a perfect prediction (Burkholder et al., 2016).

Understanding predictors of success for the NBCOT exam can be helpful to admissions committees, students, and faculty at OT programs across the country. This

information can be used to help determine appropriate admissions criteria and identify strategies to facilitate first attempt success on the NBCOT exam (Novalis et al., 2017). I chose to use a binomial logistic regression statistical approach in this study to determine which independent variables were predictors of success on the NBCOT exam. By using a binomial logistic regression, I was able to determine the probability of first attempt success on the NBCOT exam based upon the independent variables. An odds ratio can be interpreted as the effect of one unit of change in X in the predicted odds ratio, with other variables held constant (Portney & Watkins, 2015). Therefore, an odds ratio determines the odds of an outcome occurring.

All data for this study were de-identified and obtained from the university's executive director of institutional research and assessment following IRB approval from Walden University and the local university. Independent variables included demographic variables of age, gender, and ethnicity which were self-reported by the student participants at the time of enrollment. Each participant's UGPA and GRE scores were confirmed by admissions at the time of program application. Confirmation was made by the local university's admission team through examining official student transcript and official score reports on the GRE. The university registrar maintains the students' PGPA. The decision to not include the Clinical Level II Fieldwork experiences was made due to the high degree of variability of the scores based upon each student having a different Clinical Level II Fieldwork supervisor at each clinical site. Students receive a letter grade from their university's fieldwork coordination following these experiences, therefore, the

Clinical Level II Fieldwork experiences were captured as part of the PGPA variable. The dependent variable for this study was first-attempt success on the NBCOT exam.

The university's data on each student's first attempt success on the NBCOT exam were obtained and maintained by the university's vice president for OT accreditation and assessment. The data were obtained directly from the NBCOT entity and indicates whether the student passed on his or her first attempt, or if he or she needed additional attempts to pass the examination. Due to this reporting format, if a student does not pass on the first attempt, there is no way to know how many subsequent attempts were needed for the student to successfully pass the exam. Additionally, NBCOT does not provide university reports for students who take longer than one-year post-graduation to sit for the NBCOT exam.

A potential limitation of this study design was that some student participants were lost to follow up. According to the standards of the local university, student participants who withdrew from a course or received a letter grade of a "D" within a course are required to retake the course and would ultimately drop into the next cohort. Students were dismissed from the program if they receive a letter grade of "F" in any course, two grades of "D", or if they receive a failing grade during their Clinical Level II Fieldwork experiences. Students were not allowed to withdraw from a course more than once and are limited to three withdrawals during their time in the program. Students in the MOT program were expected to complete their degree in 6 trimesters, with the maximum recommended time frame for completion being 9 trimesters for full-time students and 12 trimesters on a reduced course load.

Methodology

Population

The population of this study consisted of entry-level MOT students at a large multi-campus health science university that enrolled in January 2017, May 2017, and September 2017. In this study, I used a convenience sample of full-time residential students across three different campuses, with locations on the West Coast, Gulf Coast, and East Coast. The MOT curriculum was consistent across all three campus locations. Each course within the curriculum having a course coordinator who oversees the course and ensures that the course objectives and assignments are in alignment across each campus. Data from each course coordinator report are reviewed by the campus program directors each trimester to ensure that there was consistency in the curriculum across each campus location.

The expected graduation dates for each of the cohorts were December 2018, April 2019, and August 2019 respectively. The initial data set for this study included 281 participants across the three included campus locations. Students are eligible to sit for the NBCOT exam once they have graduated from an entry-level OT program and have submitted an official final transcript that includes the date of graduation and degree title (NBCOT, 2019). The final data set for this current study was obtained following IRB approval from both Walden University and the local university. Therefore, students who sat for the NBCOT exam after the data set was obtained were not included in the study outcomes.

Setting and Sample

The setting of this study was a large multi-campus health science university. The population (N) includes past students from an OT program who were members of the MOT degree program who were admitted in January 2017, May 2017, and August 2017. There were initially a total of 281 MOT graduates across the three campus locations included in this study, however, due to missing data sets and outliers, the final sample was 208 participants. Each cohort has approximately 30 to 50 students across the three campus locations and there are three admit dates per year, therefore there were a total of nine cohorts included in this present study. A limitation of this study was that if a student drops into the next cohort due to withdrawing from a course or receiving a D in the course he or she may be lost to follow up. These students are likely the same students who may have increased difficulty passing the NBCOT exam on the first attempt. Additionally, these same students who drop into the next cohort may be lost to follow up if they sat for the exam after the data was obtained.

I used G-power to complete the power analysis for this study. I completed a G-power analysis using both a χ^2 tests and the z tests family. First, I completed a binomial logistic regression in G-power. The probability of the student being successful was set at .7, therefore the probability of failure was set at .3, providing an odds ratio of 5.44 (University of California Los Angeles, 2020). The probability rate was based upon the NBCOT (2020) statistics that 73% of students passed their NBCOT exam on the first attempt. The power of the analysis was set at .8 and a margin of error was set to .05. A .05 margin of error indicates that there would be a 5% chance of a Type 1 error

occurring. A Type 1 error occurs when the null hypothesis is rejected when in fact it is true. The R^2 other x value was placed at $R = .5$ because the covariates were expected to have a moderate association with one another. The x distribution was selected to be binomial because the dependent variable is dichotomous (Portney & Watkins, 2015). The power (80%) was selected because I expected demographic variables, UGPA, GRE scores, and PGPA to strongly predict first attempt success on the NBCOT exam. A power of 80% indicates that there is an 80% chance of the statistical test having significant results. This calculation indicated that the minimum number of participants needed to complete my study was a sample size of 100.

To ensure that the sample size was large enough, I next calculated a power analysis using the χ^2 test family. The χ^2 test family includes chi-squared tests, I selected a goodness-of-fit test for the statistical test. A χ^2 goodness-of-fit was selected because this statistical test allows the comparison between observed frequencies with a known or theoretical distribution (Portney & Watkins, 2015). A χ^2 goodness-of-fit was appropriate because my theoretical distribution was expected to be a 73% first attempt pass rate and a 27% not pass rate. The assumptions of a χ^2 goodness-of-fit statistical analysis were appropriate for my data as frequencies represent individual counts and categories were mutually exclusive (Portney & Watkins, 2015). Unlike the z test family binomial logistic regression, χ^2 test family allowed me to enter the number of independent variables included in my model, which was 11.

To calculate the χ^2 goodness-of-fit power analysis the effect size was set at .3 which is a medium effect size, the alpha error probability at .05, the power at .8, and

number of independent variables at 11. This calculation indicated that the minimum number of participants needed to complete this study was 187. The total number of participants in this study was initially 281, however, due to missing data points and the exclusion of outliers, the final number of participants was 208. The final number of 208 participants was larger than the G-power analysis values of 100 from the z test family binomial logistic regression and 187 for χ^2 test family chi-squared power analysis.

Instrumentation and Materials

A decoded complete data set was obtained from the executive director of institutional research and assessment following IRB approval from both Walden University and the local university. The demographic variables were obtained by student self-report at the time of enrollment. GRE scores and UGPA were obtained by admissions and confirmed with official score reports and transcripts. PGPA was obtained by the registrar. These data were then submitted and maintained by the executive director of institutional research and assessment. The first-attempt success on the NBCOT exam was obtained and maintained by the vice president for OT accreditation and assessment.

The NBCOT exam data were obtained and reported to the vice president for OT accreditation and assessment using the student's name. To protect the students' identity and to ensure that a complete decoded data set was obtained following IRB approval from both Walden University and the local university, the NBCOT outcome data were integrated into one data set by the executive director of institutional research and assessment. This process allowed me to receive a complete de-identified data set while protecting the identity of the student participants who are involved in the study.

Instrumentation reliability and validity. Reliability refers to a measurement being consistent and free of error (Portney & Watkins, 2015). To control reliability within this study, pre-existing archival data were used. Data were extracted directly from the local university's registrar and the admissions team and is maintained by the university's executive director of institutional research and assessment. Validity refers to the concept of truth and whether the data are trustworthy (Burkholder et al., 2016). The data in this study should be considered valid because they were collected and confirmed by official transcripts, official GRE score reports, and maintained by the university's executive director of institutional research and assessment.

The GRE is a reliable predictor of success (ETS, 2019b). Reliability indexes can range from 0 to 1, with 1 being a perfectly reliable test. The GRE Verbal Reasoning and GRE Quantitative Reasoning measures have reliabilities of at least .90, while the reliability of the GRE Analytic Writing score is influenced by the consistency of rankings, with rankings being consistent 89% of the time (ETS, 2019b). The combination of the GRE scores and GPA contributes to the predictability of graduate school success and first attempt success on several health science certification exams (Bayliss et al., 2017; Cripps et al., 2018; Kume et al., 2019; Novalis et al., 2017; Roman, & Buman, 2019; Zadnik et al., 2017). Kuncel, Hezlett, and Ones (2001) found that GRE scores and UGPA were valid predictors of graduate PGPA, first-year graduate PGPA, comprehensive exam scores, publications, and faculty ratings. In a more recent study, GRE scores were found to be a strong and valid predictor of first-year law grades (Klieger, Bridgeman, Tannenbaum, Cline, & Olivera-Aguilar, 2018).

NBCOT takes several steps to ensure the validity and reliability of the NBCOT exam. NBCOT is accredited by the National Commission for Certifying Agencies and the American National Standards Institute, these agencies ensure that NBCOT meets specific assessment standards (NBCOT, 2020). These agencies also require NBCOT to perform practice analysis studies to ensure that the exam is constructed based upon current OT practice. The NBCOT exam includes a combination of scored and non-scored or field-test items (NBCOT, 2020). The scored items have been previously field-tested by a large sample to ensure they meet the appropriate level of psychometric statistics. Content validity is maintained by developing the NBCOT exam using the same outline across all exam versions. A committee of subject matter experts also validates each exam item. A passing score on the exam is determined through a rigorous statistical process called the Modified Angoff method to ensure candidates meet the necessary performance standard (NBCOT, 2020).

Each variable included in the study is identified and defined in the paragraphs below.

Demographic variables. For this study, demographic variables included age, gender, and ethnicity. Gender and ethnicity are considered nominal data, while age is handled as ratio data. Age is collected as the student's chronological age in years at the time of admission to the program. It is an interval level variable. Gender is a dichotomous variable defined as male or female. Past research has shown that older chronological age and female gender are associated with a higher likelihood of OT program success (Bonsaksen, 2016; Bonsaksen et al., 2017; Bonsaksen & Ellingham, 2018).

Student-reported ethnicity was reported to the local university in the following categories: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, White, two or more races, nonresidential alien, and unknown. For the purposes of this study, I dummy coded four dichotomous ethnicity categories including the reference category: Asian, Black or African American, Hispanic or Latino, White, and other. The other category consisted of the following American Indian and Alaska Native, Native Hawaiian or Other Pacific Islander, two or more races, nonresidential alien, and unknown. I used dummy coding to code the newly created ethnicity variables into four different dichotomous variables. Dichotomous variables can be used within a regression model, while categorical variables must be dummy coded to be meaningfully interpreted (Portney & Watkins, 2015). Limited research has been conducted on OT student ethnicity, indicating the need to fill this gap in relation to performance on the NBCOT exam.

Undergraduate GPA. The university's registrar's office obtains and maintains each student's official transcript. The registrar's office identifies that each student has completed the necessary required prerequisite courses. Only the cumulative UGPA was considered in this study. Higher UGPA is associated with board exam performance, clinical performance, and PGPA (Lysaght et al., 2009; Patzer et al., 2017; Roman & Buman, 2019). UGPA is a continuous variable, reported on a 4-point scale.

Graduate Record Exam. Students are required to submit their GRE scores including their GRE Analytic Writing score, GRE Verbal Reasoning score, and GRE Quantitative Reasoning score via official documentation from ETS (2019b). The GRE

scores are reviewed by the admission team and admissions committee, as part of the admissions process to the program. The GRE Verbal Reasoning and GRE Quantitative Reasoning scores on the GRE are reported on a scale of 130-170 in 1-point increments. The GRE Analytical Writing score is on a scale of 0-6 in half-point increments, by taking the average of scores provided on the two essays (ETS, 2019b). There were a total of three GRE score variables in this study, including the GRE Verbal Reasoning score, GRE Quantitative Reasoning score, and GRE Analytic Writing score. All GRE scores were entered as interval data for this study.

Program GPA. Each student's PGPA is maintained by the registrar's office throughout the student's enrollment within the MOT program. At the local university, coursework consists of 93 credits, which occurs over 6 trimesters. PGPA is a continuous variable, reported on a 4-point scale.

NBCOT Success. The dependent variable was first attempt success on the NBCOT and was treated as a dichotomous variable with categories of a pass or fail. For this study, only the first attempt test results were considered. The NBCOT exam results are provided to each OT program and for the university in this study, the results are maintained by the vice president for OT accreditation and assessment. All OT programs are required to post their NBCOT performance data by year on their websites so that applying students can have access to program performance (NBCOT, 2019). In 2019, the pass rate for the NBCOT exam was 73% including first attempt and retakes with a total number of candidates being 10,697 (NBCOT, 2020).

Data Collection

Before any data collection, local university site IRB approval and Walden University IRB approval were needed. A reliance agreement was developed by Walden University and signed by representatives from both the local university where data were obtained and Walden University. A reliance agreement is an agreement between two or more institutions that allows one institution's IRB to rely on the other's for IRB approval. Walden University served as the IRB of record for my study, while the local university ceded oversight of the research activity to Walden's IRB. The Walden University IRB approval number for this study is 05-18-20-0799387.

The local university's executive director of institutional research and assessment maintained the MOT program data required to conduct this study. The university's executive director of institutional research and assessment de-identified the data set to maintain student confidentiality. The NBCOT outcome data are obtained by the university's vice president for OT accreditation and assessment and were provided to the executive director of institutional research and assessment following IRB approval from both Walden University and the local university.

A complete de-identified dataset was obtained from the executive director of institutional research and assessment following IRB approval. After the data set was received, I coded and imported the data set into IBM's Statistical Pack for the Social Sciences (SPSS) for management and analysis. After the data set was obtained, I stored the data set on a password protected computer with an additional password required to access the data set. The data were stored in a password-protected file on a password

protected computer for 5 years. After the 5 years, electric files will be erased to destroy the data.

Data Analysis Plan

After the data set was received, the variables were identified and coded in preparation for entry into SPSS. The interval variables included age, GRE scores, UGPA, and PGPA. Dummy variables were created for each of the ethnicity categories including Asian, Black or African American, Hispanic or Latino, White, and other. The other categorical variables were coded as gender (female = 0, male = 1) and first attempt success on the NBCOT exam (fail = 0, pass = 1). Once the data were imported into SPSS, an assessment for missing cases and outlying values was completed. An outlier is defined by having a value that falls more than ± 2 standard deviations from the mean (Menard, 2010). It is important to examine outliers as they can affect the outcome of a regression (Portney & Watkins, 2015).

The data analysis procedures were designed around the study's research question.

RQ: To what extent do one or more of the below variables predict students' success in the passing of the NBCOT exam on the first attempt:

- i) Gender;
- j) Age
- k) Ethnicity;
 - i. Asian
 - ii. Black or African American
 - iii. Hispanic or Latino

- iv. White
- v. Other
- l) UGPA;
- m) GRE Verbal Reasoning score;
- n) GRE Analytical Written score;
- o) GRE Quantitative Reasoning score;
- p) PGPA

The research question involves the predictive relationship between student demographic variables, pre-admission variables, and program performance and the ability to predict first attempt success on the NBCOT exam. I initially conducted descriptive statistics on each variable. I then conducted a binomial logistic regression to address the overarching research question. Binomial logistic regression analysis is an appropriate statistical test to assess for a predictive relationship between the independent variables and the dichotomous dependent variable (Menard, 2010; Osborne, 2015; Portney & Watkins, 2015). This statistical analysis determined the probability that a particular student will fall into the dependent variable category of passing or not passing on the first attempt based upon the independent variables.

The initial analysis of the data included descriptive statistics to determine the frequency data for each of the study's independent and dependent variables. Descriptive statistics were used to describe the data in the study. This included providing a summary of the sample. Descriptive statistics allow the researcher to simplify large amounts of data in a sensible format, that will allow comparisons across populations (Portney & Watkins,

2015). Descriptive statistics can provide a summary of numerical measurement, but they do not describe the variability that occurs in each student's experience. Despite this limitation, descriptive statistics enable powerful comparisons across student cohorts and campuses (see Portney & Watkins, 2015).

Descriptive statistics were used to understand each of the independent variables and the dependent variable. The three major characteristics that were examined with each variable included mean, minimum and maximum values or range, and the standard deviation. Frequency distributions were completed for each categorical variable to understand the distribution of the data and cumulative percentages (Portney & Watkins, 2015). The nominal variables in this study included gender, ethnicity, and the dependent variable first attempt success on the NBCOT exam. The continuous variables of this study included age, GRE scores (verbal, quantitative, written), UGPA, and PGPA. Mean, minimum and maximum values, and standard deviation was also completed for each continuous variable to determine the average UGPA, GRE scores, and PGPA among the participants (see Portney & Watkins, 2015).

By using a binomial logistic regression statistical analysis I was able to predict the probability of an outcome falling into a dependent variable category based upon the included independent variables. Logistic regression is used to assess the odds of one of the two outcomes occurring due to the combination of the identified predictor variables (Menard, 2010; Osborne, 2015; Portney & Watkins, 2015). The p -values were used to assess the statistical significance of the binomial logistic regression. The confidence interval was set at 95% and the p -value was set at .05 (Portney & Watkins, 2015).

Assumptions of Logistic Regression

Several statistical assumptions must be met to conduct a binomial logistic regression model. The first assumption is that there is one dependent variable that is dichotomous, meaning it has two outcomes. In the case of this study, the outcomes were passing or not passing the NBCOT exam on the first attempt. A binomial logistic regression assumes that there are one or more independent variables that are measured on a continuous or nominal scale (Menard, 2010; Osborne, 2015). Examples of continuous variables in this study include age, GRE scores, UGPA, and PGPA.

The next assumption of using a binomial logistic regression analysis is that there is independence of observations on the outcome variable (Menard, 2010; Osborne, 2015). This indicates that each participant can only fall into one category for each of the independent and dependent variables. For this study, students could either successfully pass or not pass the NBCOT exam on the first attempt. Thus, indicating that the categories are mutually exclusive and exhaustive (Menard, 2010; Osborne, 2015).

The number of participants is also important when completing a binomial logistic regression. There should be a minimum of 15 cases per independent variable (Menard, 2010; Osborne, 2015). This study had 208 participants, which was well above this limit based upon the 12 independent variables in the study. Another assumption is that there is a linear relationship between the continuous variables. For this study, I assumed there is a linear relationship between UGPA, GRE scores, PGPA, and the NBCOT first attempt outcome. A Tidwell-Box assumption test ensures that there is a linear relationship

between the continuous independent variables and the logit of the dependent variable outcome (Menard, 2010; Osborne, 2015).

The final assumption of a binomial logistic regression is that there should be no significant outliers or highly influential data points (Menard, 2010; Osborne, 2015).

Having a variable that is a significant outlier can change the results of a binomial logistic regression. If a case has a standardized residual value that is ± 2.5 it should be inspected to determine if the outlier should be removed or remain in the analysis (Menard, 2010).

Any values within the data set that were found to be outliers and kept in the data set were reported in the results.

Threats to Validity

In all research projects, reliability and validity must be ensured. Every effort was made in the completion of this study to minimize threats to internal and external validity. Internal validity focuses on the cause and effect relationships in research, including the degree to which extraneous variables are acknowledged or controlled. To ensure internal validity, I must be able to document that the cause occurs before the effect (Portney & Watkins, 2015). Potential threats to internal validity within this proposed study include selection-history effects. Selection-history effects occur when different groups or cohorts may have different experiences before taking the NBCOT exam. Selection-history effects may have occurred because each student cohort across the different campuses had different professors and experiences, despite completing the same curriculum. In this research study, the selection-history effects would have occurred before this study, and therefore I had no control over their effect (Portney & Watkins, 2015).

The faculty at the local university strive to meet the same course and program learning outcomes, however, there can be some variability in each student's experience (see Portney & Watkins, 2015). There are different faculty on each of the campuses, which can lead to a slightly different learning experience. The local university faculty take several steps to protect validity, such as having the same lectures available online to all students and the same signature assignment. A signature assignment is an assignment that meets the course learning outcomes and is the same across each campus. A course coordinator also oversees the course to ensure course consistency across all campuses.

A potential threat to external validity is the ability of this study's student participant population to be generalizable to other OT student populations. Because my study included students from a single multi-campus university, it is hard to determine if the results truly can be applied to other OT programs. The student participants within this study ($n = 208$) were slightly larger than past studies where researchers examined predictors of success on the NBCOT exam (see Novalis et al., 2017; Zadnik et al., 2017). However, a larger number of student participants in this study and the three regional campus locations help to improve the external validity of my study (see Portney & Watkins, 2015).

Factors that do improve validity include the researcher being blind to those who did or did not pass on the first attempt. The variables used in this study were also consistent across each campus location and cohort. This study is also replicable with other OT programs because the variables are commonly collected as part of admissions

and required program outcomes. The ease of replication of this study improves external validity (Portney & Watkins, 2015).

Ethical Procedures

Before data collection, Walden IRB approval (Approval No. 05-18-20-0799387) and IRB approval from the local university were obtained. Following IRB approval, the integration of the independent and dependent variables took place to allow for a complete de-identified data set to be received. There were no active human or animal participants in this study. The data do not contain any personal or identifying information. The local university and personnel working to manage and prepare the data set were not identified. Every effort was made to maintain confidentiality and security of records at all times during the completion of this research study. When I received the data set it was completely de-identified to protect confidentiality. The de-identified complete data are stored on a password-protected computer for 5 years before being destroyed and required a password to access the data set.

Summary

In this study, I used a quantitative non-experimental approach using retrospective data from a large multi-campus university. The purpose of this study was to examine the predictive ability of age, gender, ethnicity, UGPA, GRE scores, and PGPA on first attempt success on the NBCOT exam. Participants included MOT graduate students from a large multi-campus university in three different regional campus locations in the United States. There were 208 student participants in this study. The retrospective data consisted of student cohorts across the three campuses who were admitted in January 2017, May

2017, and September 2017. These student cohorts expected graduation dates were December 2018, April 2019, and August 2019.

Data were received from the local university's executive director of institutional research and assessment following IRB approval from Walden University and the local university. When the data set was received it was a completely de-identified data set. The data were examined, and descriptive statistics were completed. A binomial logistic regression was completed to determine which independent variables were statistically significant in predicting success on the NBCOT exam. This statistical test is appropriate and in alignment with the research question to determine which independent variables were predictive of the independent variable (Menard, 2010; Osborne, 2015; Portney & Watkins, 2015). Every effort was made to maintain the confidentiality of participants throughout this study. In Chapter 4, the procedures for data collection, management, and the results of the data analyses will be provided. Chapter 4 will provide an overview of the descriptive statistics of all variables, procedures for assumption testing, and the results of the binomial logistic regression analysis.

Chapter 4: Data Analysis Results

Introduction

The purpose of this retrospective quantitative study was to determine the predictors of first attempt success on the NBCOT exam. Independent variables included in my study were age, gender, ethnicity, UGPA, GRE scores, and PGPA. My overarching research question for this study was as follows:

RQ: To what extent do one or more of the below variables predict students' success in the passing of the NBCOT exam on the first attempt:

- a.) Gender;
- b.) Age;
- c.) Ethnicity;
 - i. Asian
 - ii. Black or African American
 - iii. Hispanic or Latino
 - iv. White
 - v. other
- d.) UGPA;
- e.) GRE Verbal Reasoning score;
- f.) GRE Analytical Written score;
- g.) GRE Quantitative Reasoning score;
- h.) PGPA

H_0 : One or more of the above variables do not statistically significantly predict students' success in the passing the NBCOT exam on the first attempt.

H_a : One or more of the above variables do statistically significantly predict students' success in the passing the NBCOT exam on the first attempt.

In this chapter, I provide an overview of my data collection procedures and the results of my data analysis. This chapter includes an overview of my data analysis procedures including the data preparation, descriptive statistical analyses, and binomial logistic regression analysis. I obtained the results of my data analysis using the IBM SPSS version 26. All original data released to me, as well as my analyzed data, were de-identified and in a password-protected document. A summary of my findings for these analyses is included at the end of this chapter.

Data Collection

Retrospective data were obtained following IRB approval. Data for this study were a secondary analysis of retrospective data collected by the admissions team and registrar at a multi-campus health science university. All data except for this study's dependent variable were maintained by the local university's executive director of institutional research and assessment. The first attempt NBCOT exam outcomes for the university's OT program was maintained by the university's vice president for OT accreditation and assessment. To complete this study, the NBCOT data were provided to the executive director of institutional research and assessment so that a complete de-identified data set could be obtained. Data used for this study included students admitted to three different regional campus locations including the West Coast, Gulf Coast, and

East Coast. Data were obtained for MOT students admitted in the 2017 calendar year with the admission dates of January 2017, May 2017, and September 2017. The MOT program at the local university is approximately 24 months in length, therefore anticipated graduation dates were December 2018, April 2019, and August 2019.

Demographic Characteristics

There were data on a total of 281 MOT graduates across the three campus locations available for this study. However, data were missing on some participants, and outliers were identified through assumption testing; therefore, the number of included participants in the data analysis was 208. There were a total of 17 participants missing their GRE Quantitative Reasoning, GRE Verbal Reasoning, and GRE Analytical Writing scores. There were an additional 42 participants missing only their GRE Analytical Writing scores. There were three participants who did not have results for their NBCOT exam scores; two of these individuals withdrew from the program and one remains active within the program. A total of four participants did not have data available for their undergraduate GPA. Because data were missing on these participants they were excluded from the final data set. An additional seven participants were identified as outliers with standard residential values being higher than ± 2.5 .

The student population included in this study was 90.2% female and 9.8%, male. The average age at the time of enrollment into the program was 24.87 years of age. Student self-reported diversity was coded into the following categories: Asian, Black or African American, Hispanic or Latino, White, and other. The other category included students who self-identified as American Indian and Alaska Native, Native Hawaiian or

other Pacific Islander, two or more races, nonresidential alien, and unknown. Participants included within this study self-reported as 57.2% White, 24.7% other, 9.3% Asian, 7.9% Hispanic or Latino, and .9% Black or African American.

The Academic Programs Annual Data Report for 2017-2018 provides demographic data on all OT students who were enrolled in the 2017-2018 year across all OT programs (AOTA, 2018a). This report specified that there was a total of 7,327 MOT students admitted in 2017. The self-identified gender of all MOT students was 89% female and 11% male, which is consistent with this study (AOTA, 2018a). Data on student reported age were not included in the 2017-2018 report by AOTA. Student self-reported diversity for MOT students was 80% White, 8% other, 7% Asian, 5% Black or African American, <1% American Indian or Alaska Native, and <1% Native Hawaiian or Other Pacific Islander (AOTA, 2018a). These data show that the student population included in my study was more ethnically diverse than the general MOT student population in the 2017 calendar year.

Univariate Analysis of Additional Covariates

Additional covariates included in this study were student UGPA, GRE scores, PGPA, and NBCOT exam pass rate. The average UGPA was found to be 3.33 and the average PGPA was 3.72 for the participants within my study. These values are comparable to the UGPA (3.42) and the PGPA (3.88) which was reported by Novalis et al. (2017) who also examined first attempt success on the NBCOT exam. Both UGPA and PGPA were reported on a 4-point scale, with GPA values of 4.0, 3.0, 2.0, 1.0, and 0.0 indicating letter grade averages of A, B, C, D, or F respectively.

Student average GRE scores at the time of program admittance were 148.06 for GRE Quantitative Reasoning, 149.32 for GRE Verbal Reasoning, and 3.68 for GRE Analytical Writing for participants within this study. GRE Quantitative Reasoning and Verbal Reasoning scores are reported on a scale of 130-170 in 1-point increments. GRE Analytical Writing scores are reported on a scale of 0-6 in half-point increments (ETS, 2019b). This variable has not been previously explored within the OT literature as it relates to the first attempt NBCOT exam success.

The first attempt pass rate success for the participants within this study was 74.9% indicating that 25.1% of students within the data set did not pass on the first attempt, did not ever pass the exam, or did not sit for the exam. Nine participants did not attempt or pass the exam at the time of data collection. Forty-five participants within this study required more than one attempt to successfully pass the exam. The average first attempt pass rate reported by NBCOT (2020) was 73% in 2019. The national percentage provided by NBCOT of the first attempt pass rate is consistent with my study's student population first attempt pass rate.

Results

Several assumptions must be met prior to running a binomial logistic regression analysis.

Assumption Testing.

The first assumption is that the dependent variable must be measured on a dichotomous scale (Menard, 2010; Osborne, 2015; Portney & Watkins, 2015). The dependent outcome of the first attempt NBCOT exam success was recoded to be a

dichotomous variable (first attempt pass = 1; did not pass, did not attempt, or did not pass on the first attempt = 0).

The next assumption is that there are one or more independent variables included in the model, which can be continuous or categorical. There were a total of eight independent variables included in the final binomial logistic regression analysis. These included age, gender (male and female), ethnicity (White and non-White), UGPA, GRE Verbal Reasoning Score, GRE Analytical Writing Score, GRE Quantitative Reasoning Score, and PGPA. Continuous variables included age, UGPA, GRE scores, and PGPA. Categorical variables included gender and ethnicity. Due to such small numbers of non-White student participants, the ethnicity variable was recoded to a dichotomous variable of non-White = 0 and White = 1 to allow it to be interpreted.

Another assumption of a binomial logistic regression model is that there must be independence of observations and that the dependent variable should have mutually exclusive categories (Osborne, 2015). Independence of observations means each participant is only accounted for once. Data for this study were obtained from the executive director of institutional research and assessment, who aggregated the data from the admissions team, registrar, and vice president for OT accreditation and assessment at the local university for students admitted in the 2017 calendar year. All student reports were confirmed via official score reports and transcripts sent directly to the local university. The dependent variable has two categorical mutually exclusive categories of (a) passing on the first attempt or; (b) requiring more than one attempt, not attempting, or never passing the NBCOT exam.

A binomial logistic regression analysis must also have a linear relationship between the included continuous variables and the logit transformation of the dependent variables (Menard, 2010; Osborne, 2015). A Box-Tidwell procedure can be used to check the assumption of linearity in the logit; where there is linearity of the continuous independent variables to the logit dependent variable (Menard, 2010). The Box-Tidwell procedure only needs to be completed on the continuous independent variables which include age, UGPA, GRE scores, and PGPA. The results from the Box-Tidwell statistical analysis are displayed in Table 1.

Table 1

Box-Tidwell Assumption Test for First Attempt NBCOT Exam Success and Independent Interaction Continuous Predictor Variables

Age	UGPA	GRE-Q	GRE-V	GRE-W	PGPA
.093	.672	.268	.206	.173	.010

Note: Significance level was found to be .004 ($.05 \div 14 = .004$). GRE-Q=GRE Quantitative Reasoning score, GRE-V=GRE Verbal Reasoning score, GRE-W=GRE Analytical Writing score

To complete the Box-Tidwell procedure, new interaction variables were created for all continuous independent variables. To calculate the significance level divide the statistical significance p -value of .05 by the number of independent variables included within the Box-Tidwell model, this is referred to as a Bonferroni correction (Menard, 2010). The total number of independent variables was 14 because it included all continuous variables within the model (6), the interaction variables (6), and the two categorical variables of gender and ethnicity. The p -values for the independent interaction continuous predictor variables are displayed in Table 1 for age, UGPA, GRE scores, and PGPA. All

independent interaction variables were not statistically significant therefore all continuous variables pass the assumption of linearity.

There also should be no significant outliers within the data set. To detect outliers a casewise diagnostic analysis was completed. It is important to investigate outliers as they have the potential to reduce the predictive accuracy and statistical significance of the binomial logistic regression model (Menard, 2010; Portney & Watkins, 2015). The results of the casewise diagnostics are displayed in Table 2.

Table 2

Casewise Diagnostic Test to Detect Outliers within Data Set

Case	ZResid
40	-3.72
43	3.44
48	-2.95
92	-4.34
166	-2.61
179	-2.66
199	-3.46
203	-2.45

Note: ZResid=Standard residuals. ZResid values ± 2 standard deviations are displayed.

Cases with standard residuals ± 2 standard deviations are included within Table 2, typically values greater than ± 2.5 should be investigated to determine if these cases

should remain in the model (Menard, 2010). Due to the standard residential values being higher than ± 2.5 in seven of the eight cases, the decision was made to remove these seven cases from the final model. This brought the final sample size for this study to 208 student participants. These cases were considered outliers that could have the potential to affect the final results of the binomial logistic regression model (Menard, 2010; Osborne, 2015; Portney & Watkins, 2015).

In summary, all assumptions were met to conduct the binomial logistic regression analysis. The dependent variable for this study was recoded to ensure that it was a dichotomous variable with the following two categories (a) first attempt pass = 1 and (b) did not pass, did not attempt, or did not pass on the first attempt = 0. All eight independent variables included within the study were either continuous or categorical. Each student participant within the study was only accounted for once to ensure there was independence of observations. The Box-Tidwell procedure was completed to ensure that all continuous variables passed the assumption of linearity. Finally, outliers were examined and seven out of eight were eliminated from the data set based upon a standard residential value being higher than ± 2.5 (Menard, 2010).

Results of Hypothesis Testing

The binomial logistic regression model was then conducted using the independent variables of age, gender, ethnicity, UGPA, GRE scores, and PGPA with the dichotomous first attempt success NBCOT exam outcome. The results of the binomial logistic regression are displayed in Table 3.

Table 3

*Binomial Logistic Regression Analysis Predicting the first-attempt NBCOT Exam**Outcome*

Predictor	<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	95% CI
Age	-.248	.080	.002*	.780	[.667, .913]
Gender	-1.18	.651	.071	.308	[.086, 1.10]
Ethnicity	-.363	.458	.428	.696	[.284, 1.71]
UGPA	.924	.742	.213	2.52	[.589, 10.77]
GRE-Q	.079	.065	.228	1.08	[.952, 1.23]
GRE-V	.169	.061	.006*	1.18	[1.05, 1.33]
GRE-W	-.355	.437	.417	.701	[.298, 1.65]
PGPA	7.89	1.45	.000*	2660.58	[155.85, 45419.64]

Note. CI=confidence interval for odds ratio (*OR*). GRE-Q=GRE Quantitative Reasoning score, GRE-V=GRE Verbal Reasoning score, GRE-W=GRE Analytical Writing score.

* $p < .05$

Upon examining the results of the binomial logistic regression, the *Nagelkerke R Squared* value was .518, which indicates that the variables within the model accounted for 52% of the observed outcome. I found the Hosmer and Lemeshow Test to have a non-significant value of .405. Within this binominal logistic regression model, I found a sensitivity of 92.5% and a specificity of 52.1% based upon the classification table of included predictor variables. A measurement of sensitivity refers to the rate of true positives or the actual number of positives that are correctly identified. A measurement of specificity measures the rate of true negatives or the actual number of negatives that are correctly identified

(Portney & Watkins, 2015). The percentage correct based on the classification table for this model was found to be 83.2%. The percentage correct value is the number of cases that were correctly classified by the binomial logistic regression model (Menard, 2010). The positive predictive value for the model, which is the percentage of correctly predicted true positive cases was 86.5%.

The Receiver Operating Characteristic (ROC) curve is a visual plot of true positive rate or sensitivity against the false positive rate (Bowers & Zhou, 2019). For this study, the true positive rate is the proportion of student participants who were correctly predicted to pass the NBCOT exam on the first attempt. The ROC curve can be used to calculate the overall measure of discrimination, which is the ability of the binomial logistic regression model to discriminate between participants who successfully passed the NBCOT exam on the first attempt and those that required more than one attempt, did not ever pass, or did not attempt to take the NBCOT exam (See Bowers & Zhou, 2019). The results of the ROC curve are displayed in Figure 1.

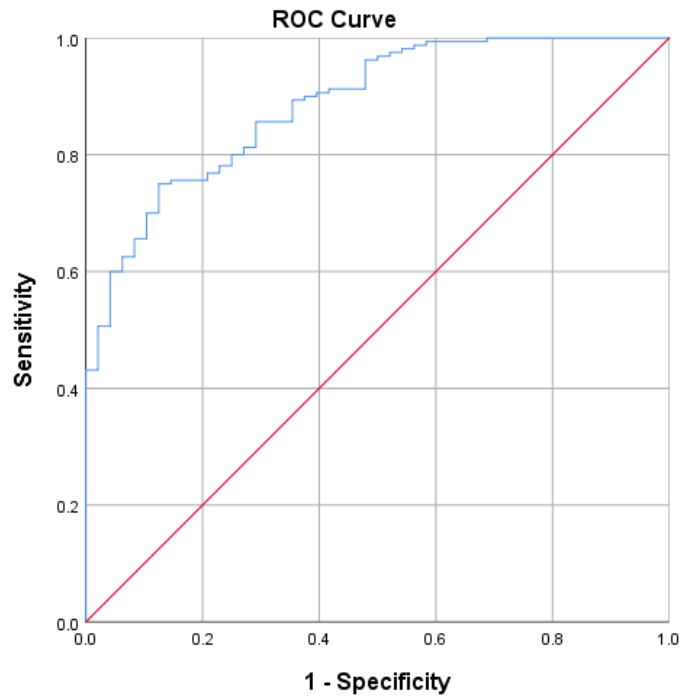


Figure 1. ROC Curve for Binomial Logistic Regression Correct Prediction of First-attempt NBCOT Exam Success

The area under the ROC curve is .886 (95% CI, .838 to .935), which is an excellent level of discrimination according to Hosmer, Lemeshow, and Sturdivant (2013).

Of the independent predictor variables, only three were statistically significant with a p -value $< .05$: age, GRE Verbal Reasoning score, and PGPA (as shown in Table 3). Decreased age at program entry was associated with an increased likelihood of passing the NBCOT exam on the first attempt. The odds ratio for the age variable was .780. To provide a more interpretable value one was divided by .780 which yields a value of 1.28. This indicates for every one year decrease in age a student is 1.28 times more likely to pass the NBCOT exam on the first attempt. Increased GRE Verbal Reasoning

score was associated with an increased likelihood of passing the NBCOT exam on the first attempt. The odds ratio of GRE Verbal Reasoning score was 1.18, indicating that for every 1-point increase in GRE Verbal Reasoning score the student is 1.18 times more likely to pass the NBCOT exam on the first attempt. The odds ratio for PGPA was 2660.58, which indicates that for each one-point increase in PGPA students were 2660.58 times more likely to pass the NBCOT exam on the first attempt. Based upon these results, I can reject the null hypothesis, as three independent variables were found to statistically significantly predict student success in passing the NBCOT exam on the first attempt.

Summary

The research question that guided this study was to what extent did one or more of the independent variables predict student success in the passing of the NBCOT exam on the first attempt. The independent variables examined included age, gender, ethnicity, UGPA, GRE scores, and PGPA. Variables that I found to statistically significantly predict the dichotomous dependent outcome of the first attempt NBCOT exam success were decreased age, GRE Verbal Reasoning score, and PGPA. I did not find gender, ethnicity, GRE Analytical Writing score, or GRE Quantitative Reasoning score to be statistically significant predictors of first attempt success on the NBCOT exam. Therefore, I can reject the null hypothesis and conclude that at least three of the independent variables statistically significantly predict the outcome of the first attempt NBCOT exam success.

In this chapter, I detailed the data collection process and procedures used for data analysis. In Chapter 5, I interpret and discuss my research findings, study limitations, future recommendations, and implications for social change.

Chapter 5: Interpretations, Implications, Recommendations, and Conclusions

Introduction

The purpose of this retrospective quantitative study was to examine predictors of first attempt success on the NBCOT exam. The purpose of the NBCOT exam is to ensure that entry-level occupational therapists have the necessary knowledge and clinical reasoning to make safe clinical decisions (NBCOT, 2020). This study was the first to explore the predictive nature of age, gender, ethnicity, UGPA, GRE scores, and PGPA on first attempt NBCOT success. The results show that gender, ethnicity, GRE Analytical Writing score, and GRE Quantitative Reasoning score did not statistically significantly predict the NBCOT exam outcome. The binomial logistic regression model found age, GRE Verbal Reasoning score, and PGPA to be statistically significant predictors of first attempt success on the NBCOT exam. In this chapter, I summarize the study results and present an interpretation of the study findings. Implications for social change and further study recommendations are also included.

Interpretation of Findings

Of the included independent variables within the binomial logistic regression age, GRE Verbal Reasoning score, and PGPA were found to be statistically significant predictors of first attempt success on the NBCOT exam. The theoretical base for this study, social cognitive theory (see Bandura, 2001, 2004), can be applied to the study results.

Application of Theoretical Framework

Bandura's social cognitive theory has four main constructs which include intentionality, forethought, self-reactiveness, and self-reflectiveness (Bandura, 2004). Intentionality refers to actions done intentionally such as intentionally studying, planning, and preparing prior to and during a student's time within their OT program in preparation to sit for their NBCOT exam and become an independent OT practitioner. Forethought relates to setting goals and anticipating the outcomes of one's actions, such as consistently studying to perform well on the GRE, receive a high PGPA, and ultimately pass the NBCOT exam. Self-reactiveness involves regularly monitoring one's own behaviors and actions while self-reflection directly relates to a student's decision to pursue a career in OT (see Bandura, 2004). Both of these constructs relate to this study as students are regularly monitoring their actions and behaviors to be successful within their respective OT program and self-reflecting on their decision to pursue a career as an occupational therapist. Intentionality, forethought, self-reactiveness, and self-reflectiveness help to motivate behaviors (Bandura, 1989), and it can be argued that the academic behaviors or actions necessary for performing well on the verbal GRE and achieving a high PGPA, variables found to be significant predictors in this study, are similar to the behaviors important to success on the NBCOT exam. Additionally, social cognitive theory focuses on understanding the unique way that individuals acquire and maintain behavior (Bandura, 2001). The ability to acquire and maintain certain academic behaviors may contribute to higher PGPA and in turn transfer to successfully passing the NBCOT exam on the first attempt.

Significant Independent Variables

Decreased age was a variable found to be a statistically significant predictor of first attempt NBCOT exam success in this study. The odds ratio value for age was .780. When this value is divided by one, the odds ratio becomes 1.28. This value indicates that every one year decrease in age, the relative odds of passing the NBCOT exam on the first attempt increase by 1.28 compared to a student who is one year older. This value is relatively small; however, it does indicate that older students may have a slightly harder time passing the NBCOT exam on the first attempt.

The average age for the student population included within my current study was 24.87 years of age at the time of enrollment. The researchers of the two previous studies examining predictors of first attempt NBCOT exam success did not find age to be statistically significant (Novalis et al., 2017; Zadnik et al., 2017). The average age in the Novalis et al. (2017) study was 26.55 years, while the average age in the Zadnik et al.'s (2017) study was 29 years. The student population groups in the research studies completed by Novalis et al. and Zadnik et al. had higher average ages compared to this current study. In past OT literature, higher age was associated with higher academic performance (Bonsaksen, 2016; Bonsaksen et al., 2017; Bonsaksen & Ellingham, 2018). However, in the Bonsaksen and Ellingham (2018) and Bonsaksen (2016) studies, the average student age was 24 years and in the Bonsaksen et al. (2017) study, 87% were under the age of 25. Their results may indicate that students who take a short break, such as a year or two off before beginning their graduate OT program, may tend to perform better academically (Bonsaksen, 2016; Bonsaksen et al., 2017; Bonsaksen & Ellingham,

2018). However, results from my study indicate that as students become older they may have a harder time passing the NBCOT exam on the first attempt. This result could be due to the adjustment it takes to perform in a graduate OT program after previously pursuing a different career or taking a break following the completion of their undergraduate degree. Further research is needed regarding age as it relates to the constructs of Bandura's social cognitive theory to determine if a student's intentionality, forethought, self-reactiveness, and self-reflectiveness changes as the student's age increases.

The independent variable of the GRE Verbal Reasoning score was found to be a statistically significant predictor of first attempt success on the NBCOT exam. The odds ratio was 1.18, which indicates for every one unit increase in the GRE Verbal Reasoning score at the time of admission the student is 1.18 times more likely to pass the NBCOT exam on the first attempt. By completing this study, I became the first researcher to explore GRE scores as predictors of success on the NBCOT exam. Past physical therapy researchers have found both GRE Verbal Reasoning score and GRE Quantitative Reasoning scores to be statistically significant predictors of first attempt NPTE success (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019; Meiners & Rush, 2017). The statistically significant finding of my study indicates that GRE Verbal Reasoning scores should be closely examined by OT admissions teams. According to ETS (2020b), the GRE Verbal Reasoning measure assesses a student's ability to analyze and evaluate written material and synthesize information obtained from it, analyze relationships among sentence components, and recognize relationships between words

and concepts. Therefore, students with higher GRE Verbal Reasoning scores may have been more likely to successfully pass the NBCOT exam on the first attempt due to their ability to analyze and evaluate the multiple-choice questions asked on the NBCOT exam.

The independent variable PGPA was also found to be statistically significant within the binomial logistic regression model. The odds ratio was 2660.58 indicating that every one-point increase in PGPA the relative odds of passing the NBCOT exam on the first attempt increased by 2660.58. This result indicates that a student who has a PGPA of 4.0 compared to 3.0 on a 4-point GPA scale is 2660.58 more likely to pass the NBCOT exam on the first attempt. This result indicates that higher PGPA is a strong predictor of first attempt success on the NBCOT exam. In research completed by Novalis et al. (2017) the authors' found an odds ratio of 90.23 for their PGPA variable. This result also supports that PGPA is one of the strongest predictor of the first attempt NBCOT exam success.

Non-Significant Independent Variables

The results of my study also yielded several important non-significant outcomes that can be pertinent to current and future students, faculty, admissions, administration, and student support services. Non-significant variables included gender, ethnicity, UGPA, GRE Quantitative Reasoning score, and GRE Analytical Writing score.

Demographic variables. Both gender and ethnicity were not found to statistically significantly predict the first attempt NBCOT exam outcome. The student population at the local university was 90.2% female and 9.8% male, which is consistent with the national demographic results from AOTA (2018a). In the Novalis et al. (2017) study,

male gender was found to be statistically significantly correlated with not passing the NBCOT exam on the first attempt. However, within the Novalis et al. study, the authors urged further research indicating that there were only a small number of men within their data set, which could have led to sampling bias. It should be noted that with the larger sample size ($n = 208$) found in my study gender was not statistically significantly predictive of first attempt NBCOT exam success. However, further research with larger student sample sizes should continue to be completed examining gender as a predictor of first attempt NBCOT exam success. This finding urges the importance of continued diversification of the OT field in regard to gender.

Ethnicity was not found to be statistically significant within the binomial logistic regression model. The p -value for ethnicity was .428 which is greater than a statistically significant p -value of .05. My study's population was found to be 57.2% White and 42.8% non-White, which is a more diverse population compared to the national average reported by AOTA (2018a). Ethnicity was also not found to be statistically significant as a predictor of success on the NBCOT exam within the Novalis et al. (2017) study and was not included as a predictor variable within the Zadnik et al. (2017) study. This indicates that ethnicity does not predict first attempt success on the NBCOT exam. Admissions teams should continue to track ethnicity and understand that ethnicity does not influence or predict first attempt NBCOT exam success. Additionally, a continued goal of all OT programs should be to increase diversity within the OT profession.

Pre-admission variables. The independent variables of UGPA, GRE Analytical Writing score, and GRE Quantitative Reasoning score were not found to be statistically

significant in the binomial logistic regression model. The p -value for UGPA for my study was .213. Novalis et al. (2017) also did not find UGPA to be statistically significant and Zadnik et al. (2017) did not include UGPA as an independent variable within their study. Patzer et al. (2017) found that UGPA was a predictor of nursing school PGPA. Further research could be done to investigate the relationship between OT UGPA and PGPA because PGPA was such a strong predictor of success on the NBCOT exam. In a study conducted by Cook et al. (2015) UGPA was a statistically significant predictor of success on the NPTE exam. However, Kume et al. (2019) did not find UGPA to statistically significantly predict NPTE exam performance. The findings from my study and past physical therapy literature indicate the UGPA should continue to be tracked as an admission variable, but it cannot predict whether an individual will pass the NBCOT exam on the first attempt.

The GRE Analytical Writing and GRE Quantitative Reasoning scores were not found to be statistically significant within my study. The p -values for GRE Analytical Writing and GRE Quantitative Reasoning were .417 and .228 respectively. GRE scores have not been previously explored as predictors of success within the OT literature. GRE Quantitative Reasoning scores are found to be a statistically significant predictor of success on the NPTE exam (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019; Meiners & Rush, 2017). Past OT researchers have found a statistically significant relationship between the GRE Analytical Writing score and Clinical Level II Fieldwork performance (Bathje et al., 2014; Haber et al., 2015). These results indicate that GRE Analytical Writing and GRE Quantitative Reasoning should be continued to

track by admissions teams and further research should be completed to determine if there is a statistically significant predictive relationship between them and the first attempt NBCOT exam success.

Limitations of Study

According to Burkholder et al. (2016), all studies have design and/or methodology weaknesses. It is important to identify these weaknesses and also describe the steps taken to overcome them. There were several potential limitations to my study. The main limitation of this current study was that data were only available on 281 MOT student participants from the 2017 calendar year across three regional campus locations. Due to missing data points, the student population was decreased to 215 and additional outliers resulted in the final data set including data on 208 MOT student participants. The participants included within the study were also primarily female (90.2%) and primarily White (57.2%), which could have lead to sampling bias and affect generalizability (see Portney & Watkins, 2015).

A post-hoc power analysis was completed using G-power. For the *z*-test logistic regression, an updated odds ratio of nine was used due to the first attempt pass rate of the student sample of my study being 74.9%. The margin of error was set to .05 and the R-squared value was set to .5. The post-hoc power was found to be .999. A power of .999 indicates that there is a 99.9% chance that a Type II error did not occur. A Type II error occurs when a null hypothesis is not rejected when it is false, it can also be referred to as a false positive (Portney & Watkins, 2015). Next, I calculated the χ^2 goodness of fit using an effect size of .3, a margin of error of .05, and the number of included

independent variables at eight. The number of independent variables was reduced to eight due to making the ethnicity variable dichotomous in the final statistical binomial logistic regression model. The post-hoc power was found to be .893. A power of .893 indicates that there is an 89.3% chance that a Type II error did not occur.

The results of my research study were sound as documented by meeting the necessary assumption testing criteria, having an excellent level of discrimination according to the ROC curve, and achieving high post-hoc power. Further research should be continued to be done examining predictors of first attempt success on the NBCOT exam. Future research studies on first attempt NBCOT exam success should include a larger sample size, multiple institutions, and multiple regional locations if possible.

Data for this study were a secondary analysis of retrospective data, therefore limited options were available when student data points were missing. The decision to not include participants with missing data points was made to eliminate bias and allow for the ability to run the binomial logistic regression analysis. The decision to exclude outliers with standard residential values being higher than ± 2.5 was made as they had the potential to affect the outcome of the binomial logistic regression analysis (Portney & Watkins, 2015).

The decision to only include MOT graduates from three regional campus locations for the calendar year of 2017 was made due to a new curriculum starting across all three campuses in January 2017. Additionally, only MOT students were included because the doctorate of OT program at the local university was a new program in January of 2017 with few students in the initial cohorts. The limited timeframe in this

current study is something that should be considered for future studies, as tracking student data over a longer period of time has the potential to increase the generalizability of the study results. Future researchers should look to include multiple campus or regional locations, include both MOT and doctorate of OT students, and include a larger more diverse sample size. These factors will help to facilitate the generalizability of the study results.

Recommendations

As the researcher of this study, I was the first to explore the predictive ability of age, gender, ethnicity, UGPA, GRE scores, and PGPA on first attempt success on the NBCOT exam. Results of this study indicate that decreased age, GRE Verbal Reasoning score, and PGPA were statistically significant predictors of the first attempt NBCOT exam success. The results of my study indicate that age and GRE Verbal Reasoning scores should continue to be tracked by OT admissions teams. Admissions teams, OT faculty, administration, and leadership should strongly consider the utility of GRE Verbal Reasoning score when making admissions decisions for future OT program applicants. PGPA was a strong predictor of success on the NBCOT exam, therefore OT faculty, student support services, and leadership should continue to explore the best methods to facilitate student success within their OT program. Current and future OT students should also understand the importance of achieving a high PGPA and its relationship to first attempt success on the NBCOT exam.

Further research is needed to examine GRE Quantitative Reasoning scores as a predictor of success on the NBCOT exam. While this variable was not found to be

statistically significant within my current study, past health science literature does support it may be worth tracking by admissions and could be considered as an independent variable in future studies. There have been several physical therapy studies that found GRE Quantitative Reasoning scores to be predictive of the NPTE (Bayliss et al., 2017; Coleman-Salgado & Barakatt, 2018; Kume et al., 2019; Meiners & Rush, 2017). According to ETS (2020b), quantitative reasoning measures the tester's ability to interpret and analyze quantitative information and solve problems using mathematical skills. The NBCOT exam consists of four domains: evaluation and assessment, analysis and interpretation, intervention management, and competency and practice management (NBCOT, 2019). Each of these four domains are used to assess the student's ability to acquire and assess information, formulate conclusions about client needs and priorities, select client-centered interventions, and manage professional activities. There are limited questions on the NBCOT exam that would specifically involve a student's quantitative reasoning skills, making this a variable that should be tracked by admissions teams but not heavily relied upon as a deciding factor for OT program student acceptance.

The GRE Analytical Writing score was also not statistically significant within my study as a predictor of first attempt success on the NBCOT exam. Past researchers did find GRE Analytical Writing scores to be a predictor of success on Clinical Level II Fieldwork (Bathje et al., 2014; Haber et al., 2015). According to ETS (2020b), a test taker's analytical writing score measures critical thinking and analytical writing skills. The NBCOT exam consists of 170 four- and three-option multiple-choice questions and three clinical simulation test items, which are also multiple-choice (NBCOT, 2019).

Therefore, the NBCOT exam does not require students to complete any writing during the exam. However, students are required to complete clinical documentation as Clinical Level II Fieldwork students and as OT practitioners.

Future researchers examining predictors of first-attempt success on the NBCOT exam should strive to increase the number of student participants, the timeline for data collection, regional locations, and include multiple institutions. The decision to include independent predictor variables within future studies should be made based upon past literature and the prevalence of the variable being tracked and applicable to multiple OT programs. Due to PGPA being a strong programmatic predictor of first attempt NBCOT exam success further research is also needed on the best methods to increase PGPA. Research topics to increase PGPA may include programmatic services that facilitate student understanding such as student tutoring, faculty teaching techniques, clinical simulation, and NBCOT exam preparation courses.

Implications

The field of OT has the potential to promote positive social change for individual clients, communities, and populations. Occupational therapists work across multiple clinical settings to improve their client's quality of life and ability to participate following an injury or due to a chronic condition by addressing physical, social, cognitive, and environmental aspects of health (AOTA, 2019d). The field of OT is expected to grow by 18% with 23,700 expected new jobs between 2018 and 2028 (Bureau of Labor Statistics, 2019). In 2017, there were a total of 21,348 OT students preparing to enter clinical practice (AOTA, 2018a). Following the completion of an OT program, a student must

successfully pass the NBCOT exam to practice as a licensed and registered occupational therapist (AOTA, 2018b; NBCOT, 2019).

Understanding the predictors of first attempt success can be beneficial for current and future OT students, admissions teams, student support services, faculty, administration, and program leadership. Through research to correctly identify predictors of success on the NBCOT exam, admissions teams can more heavily weigh certain admission factors when deciding between candidates. This study showed that GRE Verbal Reasoning score should be more heavily weighted in regard to future NBCOT exam success compared to the GRE Analytical Writing or GRE Quantitative Reasoning scores.

Faculty, administrators, leadership, and student support services should also consider the importance of student PGPA as a predictor of success on the NBCOT exam. PGPA was found to be a strong predictor of first attempt NBCOT exam success, indicating the students who have a lower PGPA should be offered additional student support services to ensure they are adequately prepared for the NBCOT exam. Administration and program leadership should also be aware of the importance of PGPA when making programmatic, policy, or budgetary decisions that could impact student learning and comprehension of course materials.

Self-report factors of age, gender, and ethnicity should continue to be collected by all OT programs. Decreased age was found to be a predictor of first attempt NBCOT exam success, indicating the older students may require additional support services during their time within the program and when preparing for the NBCOT exam. Gender

and ethnicity were not predictors of the first attempt NBCOT exam success. However, there continues to be a lack of diversity for both gender and ethnicity across all OT programs (see AOTA, 2018a). There has been a push to expand diversity for both ethnicity and gender within the OT profession by AOTA's Vision 2025 and this should be a priority for all OT programs as well (see AOTA, 2019a).

Therefore, the results of my study have the potential to promote positive social change at an individual, community, organization, cultural, and societal level. The ability to understand predictors of first attempt success on the NBCOT exam can facilitate current and future OT student success on their NBCOT board exam, which will allow them to enter the field as OT practitioners. OT practitioners promote positive social change by working with both individuals and populations to facilitate their participation and independence in their everyday activities (AOTA, 2019d). Understanding admission and program variables that influence first attempt student success on the NBCOT exam can help to shape and promote positive social change within OT programs across the country. These positive social changes can make a direct difference not only in the lives of OT students who are preparing to sit for the NBCOT exam but also in the clients' lives they will serve once they become OT practitioners.

Conclusion

As the researcher of this study, I was the first to explore the predictive nature of age, gender, ethnicity, UGPA, GRE scores, and PGPA. In this study, I found decreased age, GRE Verbal Reasoning score, and PGPA to be statistically significant predictors of the first attempt NBCOT exam success. Understanding which variables statistically

significantly predict or do not predict the first attempt NBCOT exam success can be important for students, faculty, student support services, administration, and university leadership. These findings have the potential to influence programmatic decisions such as admissions criteria, student support services, curriculum, policy development, and budgetary spending.

The field of OT is rapidly growing with growth above the national average (Bureau of Labor Statistics, 2019). Occupational therapists work with people of all ages to independently participate in their daily activities following an injury, chronic condition, or disability (AOTA, 2019d). This study promotes positive social change by shedding light on pre-admission and programmatic variables that are predictive of first attempt success on the NBCOT exam. Understanding these predictive variables can have a positive impact on current and future students to facilitate their ability to successfully pass the NBCOT exam on the first attempt. Passing the NBCOT exam on the first attempt allows the OT graduate to become an independent OT practitioner and also reflects positively on their academic institution (Avi-Itzhak, 2015; NBCOT, 2019).

References

- American Occupational Therapy Association. (2014a). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy*, 68(Suppl.1), S1– S48. <http://dx.doi.org/10.5014/ajot.2014.68200>
- American Occupational Therapy Association. (2015). *Frequently asked questions about the entry-level master's and doctoral degrees for occupational therapists*. Retrieved from [https://www.aota.org/~media/Corporate/Files/EducationCareers/Educators/COE/FAQ-on-Professional-Entry-Degrees-2015.pdf](https://www.aota.org/~/media/Corporate/Files/EducationCareers/Educators/COE/FAQ-on-Professional-Entry-Degrees-2015.pdf)
- American Occupational Therapy Association. (2018a). *Academic programs annual data report: Academic year 2017-2018*. Retrieved from <https://www.aota.org/~media/Corporate/Files/EducationCareers/Educators/2017-2018-Annual-Data-Report.pdf>
- American Occupational Therapy Association. (2018b). 2018 Accreditation council for occupational therapy education (ACOTE®) standards and interpretive guide (effective July 31, 2020). *American Journal of Occupational Therapy*, 72, 1-83. Retrieved from <https://www.aota.org/~media/Corporate/Files/EducationCareers/Accredit/StandardsReview/2018-ACOTE-Standards-Interpretive-Guide.pdf>
- American Occupational Therapy Association. (2018c). Fieldwork level II and occupational therapy students. *Journal of Occupational Therapy*, 72, 1-3. <https://doi.org/10.5014/ajot.2018.72S205>

American Occupational Therapy Association. (2018d). Philosophy of occupational therapy education. *Journal of Occupational Therapy*, 72(2), 1-2.

<https://doi.org/10.5014/ajot.2018.72S201>

American Occupational Therapy Association. (2019a). *Support diversity in occupational therapy: Allied health workforce diversity act of 2019—HR3637*. Retrieved from

https://www.aota.org/~/_/media/Corporate/Files/Advocacy/Federal/Hill-Day/2019/Allied-Health-Workforce-Diversity-Act-Talking-Points.pdf

American Occupational Therapy Association. (2019b). *Understanding the OT/OTA fieldwork performance evaluations*. Retrieved from

<https://www.aota.org/Education-Careers/Fieldwork/Supervisor/Inservice.aspx>

American Occupational Therapy Association. (2019c). *Vision 2025*. Retrieved from

<https://www.aota.org/AboutAOTA/vision-2025.aspx>

American Occupational Therapy Association. (2019d). *What is occupational therapy?*

Retrieved from

https://www.aota.org/~/_/media/Corporate/Files/Practice/Manage/Presentation-Resources/Brochure/What-Is-OT-brochure.pdf

Avi-Itzhak, T. (2015). Ability of the National Board for Certification in Occupational Therapy practice test to estimate the probability of first-time pass status on the

national certification exam. *American Journal of Occupational Therapy*, 69(2).

<https://doi.org/10.5014/ajot.2015.015024>

- Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development. Six theories of child development* (vol. 6, pp. 1-60). Greenwich, CT: JAI Press.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52(1), 1-6. <https://doi.org/10.1146/annurev.psych.52.1.1>
- Bandura, A. (2004). Swimming against the mainstream: the early years from chilly tributary to transformative mainstream. *Behaviour Research and Therapy*, 42, 613-630. <https://doi.org/10.1016/j.brat.2004.02.001>
- Bathje, M., Ozellie, R., & Deavila, E. (2014). The relationship between admission criteria and fieldwork performance in a masters-level OT program: Implications for admissions. *The Open Journal of Occupational Therapy*, 2(3). <https://doi.org/10.15453/2168-6408.1110>
- Bayliss, J., Thomas, R., & Eifert-Mangine, M. (2017). Pilot study: What measures predict first time pass rate on the National Physical Therapy Examination? *Internet Journal of Allied Health Sciences and Practice*, 15(4). Retrieved from <https://nsuworks.nova.edu/ijahsp/>
- Bonsaksen, T. (2016). Predictors of academic performance and education programme satisfaction in occupational therapy students. *British Journal of Occupational Therapy*, 79(6), 361-367. <https://doi.org/10.1177/0308022615627174>
- Bonsaksen, T., Brown, T., Lim, H., & Fong, K. (2017). Approaches to studying predict academic performance in undergraduate occupational therapy students: A cross-

cultural study. *BMC Medical Education*, 17(76), 1-9.

<https://doi.org/10.1186/s12909-017-0914-3>

Bonsaksen, T., & Ellingham, B. (2018). Factors associated with academic performance among second-year undergraduate occupational therapy students. *The Open Journal of Occupational Therapy*, 6(1), 14. <https://doi.org/10.15453/2168-6408.1403>

Bowers, A., & Zhou, X. (2019). Receiver operating characteristic (ROC) area under the curve (AUC): A diagnostic measure for evaluating the accuracy of predictors of education outcomes. *Journal of Education for Students Placed at Risk*, 24(1), 20-46. <https://doi.org/10.7916/d8-nc5k-3m53>

Brown, T., Crabtree, J., Mu, K., & Wells, J. (2015). The next paradigm shift in occupational therapy education: The move to the entry-level clinical doctorate. *American Journal of Occupational Therapy*, 69(Supplement 2). <https://doi.org/10.5014/ajot.2015.016527>

Brown, T., Williams, B., & Etherington, J. (2016). Emotional intelligence and personality traits as predictors of occupational therapy student's practice education performance: A cross-sectional study. *Occupational Therapy International*, 23(4), 412-424. <https://doi.org/10.1002/oti.1443>

Bureau of Labor Statistics. (2019). *Occupational therapists*. Retrieved from <https://www.bls.gov/ooh/healthcare/occupational-therapists.htm>

Burkholder, G., Cox, K., & Crawford, L. (2016). *The scholar practitioner's guide to research design*. Baltimore, MD: Laureate Publishing.

- Clark, F. (2013). As viewed from above: Connectivity and diversity in fulfilling occupational therapy's centennial vision. *American Journal of Occupational Therapy, 67*(6), 624-632. <https://doi.org/10.5014/ajot.2013.676003>
- Coleman-Salgado, B., & Barakatt, E. (2018). Identifying demographic and preadmission factors predictive of success on the National Physical Therapy Licensure Examination for graduates of a public physical therapist education program. *Journal of Physical Therapy Education, 32*(1), 8–16. <https://doi.org/10.1097/jte.000000000000020>
- Cook, C., Engelhard, C., Landry, M. D., & McCallum, C. (2015). Modifiable variables in physical therapy education programs associated with first-time and three-year National Physical Therapy Examination pass rates in the United States. *Journal of Educational Evaluation for Health Professionals, 12*, 44. <https://doi.org/10.3352/jeehp.2015.12.44>
- Cripps, A., Stiltner, S., Walters, E., Fullenkamp, A., & Laurent, M. (2018). Predictors of success on the board of certification exam. *Journal of Sports Medicine and Allied Health Sciences: Official Journal of the Ohio Athletic Trainers' Association, 4*(1). <https://doi.org/10.25035/jsmahs.04.01.01>
- Educational Testing Service. (2019b). *Reliability and standard error of measurement*. Retrieved from http://www.ets.org/s/gre/pdf/gre_guide_reliability_sem.pdf
- Educational Testing Service. (2020a). *Graduate record examinations (GRE): Guide to the use of scores 2019-2020*. Retrieved from http://www.ets.org/s/gre/pdf/gre_guide.pdf

Educational Testing Service. (2020b). *Overview of the verbal reasoning measure*.

Retrieved from https://www.ets.org/gre/revised_general/prepare/verbal_reasoning

Evenson, M., Kaldenberg, J., Barnes, M., & Ozelle, R. (2015). Brief report—national survey of fieldwork educators: Implications for occupational therapy education. *American Journal of Occupational Therapy, 69*(2), 1-5.

<https://doi.org/10.5014/ajot.2015.019265>

Haber, A., Fen, A., Perrine, K., Jin, J., Bathje, M., & Ozelle, R. (2015). Relationship of undergraduate grade point average (GPA) and graduate record examination scores with level II fieldwork performance. *American Journal of Occupational Therapy, 69* (Suppl. 1). <https://doi.org/10:5014/ajot.2015.69S1-PO5035>

Hosmer, D., Lemeshow, S., & Sturdivant, R. (2013). *Applied logistic regression*. (3rd ed.) Wiley, Honoken. <http://doi.org/10.1002/9781118548387>

Johnson, T., Sanderson, B., Wang, C., & Parker, F. (2017). Factors associated with first-time NCLEX-RN success: A descriptive research study. *Journal of Nursing Education, 56*(9), 542–545. <https://doi.org/10.3928/01484834-20170817-05>

Jones, P., Simpkins, S., & Hocking, J. (2014). Imperfect physician assistant and physical therapy admissions processes in the United States. *Journal of Educational Evaluation for Health Professionals, 11*(11).

<https://doi.org/10.3352/jeehp.2014.11.11>

Klieger, D., Bridgeman, B., Tannenbaum, R., Cline, F., & Olivera-Aguilar, M. (2018). The validity of GRE® General Test scores for predicting academic performance

- in U.S. law schools (*Research Report No. RR-18-26*). Princeton, NJ: Educational Testing Services. <https://doi.org/10.1002/ets2.12213>
- Kume, J., Reddin, V., & Horbacewicz, J. (2019). Predictors of physical therapy academic and NPTE licensure performance. *Health Professions Education*, 1-9. <https://doi.org/10.1016/j.hpe.2018.06.004>
- Kuncel, N., Hezlett, S., & Ones, D. (2001). A comprehensive meta-analysis of predictive validity of the Graduate Record Examination®: Implications for graduate student selection and performance. *Psychological Bulletin*, 127(1), 162-181. <https://doi.org/10.1037//Q033-2909.127.1.16>
- Lysaght, R., Donnelly, C., & Villeneuve, M. (2009). Factors predicting applicant outcomes in occupational therapy education. *Canadian Journal of Occupational Therapy*, 76(1), 38–47. <https://doi.org/10.1177/000841740907600110>
- Mattingly, C., & Fleming, M. H. (1994). *Clinical Reasoning: Forms of Inquiry in a Therapeutic Practice*. Philadelphia, PA: F.A. Davis
- Meiners, K. M., & Rush, D. K. (2017). Clinical performance and admission variables as predictors of passage of the National Physical Therapy Examination. *Journal of Allied Health*, 46(3), 164–170. Retrieved from <http://www.asahp.org/journal-of-allied-health>
- Menard, S. (2010). *Logistic regression: From introductory to advanced concepts and applications*. Thousand Oaks, CA: SAGE Publishing, Inc. <https://dx-doi-org.ezp.waldenulibrary.org/10.4135/9781483348964>

- Miro, R., Young, W., Dedrick, R., & Highsmith, M. (2017). Predictors of success on the American Board for Certifications prosthetics certification exam. *Prosthetics and Orthotics International*, *41*(1), 95-100.
<https://doi.org/10.1177/0309364616637953>
- Moneta-Koehler, L., Brown, A., Petrie, B., Evans, B., & Chalkley, R. (2017). The limitations of the GRE in predicting success in biomedical graduate school. *PLoS One*, *12*, <https://doi.org/10.1371/journal.pone.0166742>
- National Board for Certification in Occupational Therapy. (2019). *Certification exam handbook*. Gaithersburg, MD. NBCOT, Inc. Retrieved from https://www.nbcot.org/-/media/NBCOT/PDFs/Cert_Exam_Handbook.ashx?la=en
- National Board for Certification in Occupational Therapy. (2020). *Summary of certification activities*. Retrieved from <https://www.nbcot.org/Public/About-NBCOT>
- Novalis, S., Cyranowski, J., & Dolhi, C. (2017). Passing the NBCOT examination: Preadmission, academic, and fieldwork factors. *The Open Journal of Occupational Therapy*, *5*(4), 9. <https://doi.org/10.15453/2168-6408.1341>
- Osborne, J. (2015). *Best practices in logistic regression*. SAGE Publications, Inc. <https://dx-doi-org.ezp.waldenulibrary.org/10.4135/9781483388041>
- Patzer, B., Lazzara, E., Keebler, J., Madi, M., Dwyer, P., Huckstadt, A., & Smith-Campbell, B. (2017). Predictors of nursing graduate school success. *Nursing Education Perspectives*, *38*(5), 272-274.
<https://doi.org/10.1097/01.NEP.00000000000000172>

- Portney, L., & Watkins, M. (2015). *Foundations of clinical research: Applications to practice*, 3rds. F.A. Davis Company, Philadelphia, PA.
- Rogers, A. T., Bai, G., Lavin, R. A., & Anderson, G. F. (2017). Higher hospital spending on occupational therapy is associated with lower readmission rates. *Medical Care Research and Review*, 74(6), 668-686.
<https://doi.org/10.1177/1077558716666981>
- Roman, G., & Buman, M. (2019). Preadmission predictor of graduation success from a physical therapy education program in the United States. *Journal of Education Evaluation for Health Professions*, 16(5). <https://doi.org/10.3352/jeehp.2019.16.5>
- Salamonson, Y., Weaver, R., Chang, S., Koch, J., Bhathal, R., Khoo, C., & Wilson, I. (2013). Learning approaches as predictors of academic performance in first year health and science students. *Nurse Education Today*, 33(7), 729-733.
<https://doi.org/10.1016/j.nedt.2013.01.013>
- Salvatori, P. (2001). Reliability and validity of admissions tools used to select students for health professions. *Advances in Health Sciences Education*, 6, 159-175.
<https://doi.org/10.1023/a:1011489618208>
- Tan, K. P., Meredith, P., & McKenna, K. (2004). Predictors of occupational therapy students' clinical performance: An exploratory study. *Australian Occupational Therapy Journal*, 51(1), 25-33. <https://doi.org/10.1046/j.1440-1630.2003.00383>.
- University of California Los Angeles. (2020). *How do I interpret odds ratio in logistic regression?* Retrieved from <https://stats.idre.ucla.edu/stata/faq/how-do-i-interpret-odds-ratios-in-logistic-regression/>

Weinstock-Zlotnick, G., & Mehta, S. (2018). A systematic review of the benefits of occupation-based interventions for patients with upper-extremity musculoskeletal disorders. *Journal of Hand Therapy*. 32(2),141-152.
<https://doi.org/10.1016/j.jht.2018.04.001>

Zadnik, M., Lawson, S., DeLany, J. V., Parente, F., & Archer, K. R. (2017). Analysis of objective factors related to a successful outcome on the National Examination for Occupational Therapists. *Rehabilitation Research, Policy, and Education*, 31(1), 50–60. <https://doi.org/10.1891/2168-6653.31.1.50>