

12-2013

Predictive Admission Criteria in Graduate Programs in Speech-Language Pathology

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PREDICTIVE ADMISSION CRITERIA IN GRADUATE PROGRAMS
IN SPEECH-LANGUAGE PATHOLOGY

A Dissertation
Presented To
The Faculty of the Educational Leadership Doctoral Program
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

By
Mary Lloyd Moore

December 2013

**PREDICTIVE ADMISSION CRITERIA IN GRADUATE PROGRAMS
IN SPEECH-LANGUAGE PATHOLOGY**

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This dissertation is dedicated to my family: to my mother Montie Frazer, who has encouraged me throughout my entire life; to my husband Hamp Moore, who never waived in his support of this pursuit; to my daughter, Katherine Mathew and her husband Chris Mathew; to my son Hampton Moore; and to my son John Moore, his wife Abigale, and their daughters Lois Caroline Moore and Elisabeth Moore. I hope that my children and grandchildren will continue to pursue their dreams and aspirations throughout all of their lives

ACKNOWLEDGEMENTS

This dissertation is the result of much inspiration, guidance, support, motivation, loving criticism, persistence, and encouragement on the part of many people. I express my deepest gratitude to Dr. Barbara Burch, dissertation chair, for her steadfast commitment to excellence and ability to find the truth when not always obvious. Her keen intellect, leadership, and inspiration have propelled me through the entire dissertation process, and I am forever grateful. I appreciate the wisdom and guidance of Dr. Reagan Brown and Dr. Joseph Etienne and their generous participation on this dissertation committee. Their confidence in me to complete this study has motivated me throughout the process.

I also express my most sincere appreciation to Mr. Bob Cobb for his significant knowledge, expertise, and guidance through the data analysis process of the study. His intelligence, wit, and ability to cut to the chase were invaluable in navigating the waters of stepwise regression. I am grateful to Dr. Sam Evans for his assistance in the data collection phase of the study. I also express appreciation to the graduate programs at other comprehensive universities in Kentucky for their willingness to share their data to make this study possible. I am indebted to Gaye Pearl for her endless patience and grace. I appreciate the keen editing skills of Cathie Bryant.

I thank fellow members of Cohort IV for their camaraderie and validation throughout the journey. I am particularly grateful to Kay Combs and Rhonda Simpson for their friendship, encouragement, support, and humor. I will carry the memory of this entire group with much fondness and appreciation.

Finally, many thanks go to the entire faculty and staff of the Communication Sciences and Disorders Department for their generosity and support. Dr. Richard Dressler was instrumental in obtaining the student records from our department that were necessary for the study. I am particularly grateful to Caroline Hudson and Leisa Hutchison for their generosity, support, and encouragement. Many thanks go to Bridgette Gray and Kim Cairo for their assistance.

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PREDICTIVE ADMISSION CRITERIA IN GRADUATE PROGRAMS IN SPEECH-LANGUAGE PATHOLOGY

Mary Lloyd Moore

December 2013

103 pages

Directed by: Barbara Burch, Reagan Brown, and Joseph Etienne

Educational Leadership Doctoral Program

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Speech-language pathology is a profession for which there is increasing demand as well as being one of the most desirable career paths in the United States. Graduation of qualified persons who can pass the Praxis exam is an essential outcome of all graduate programs in speech-language pathology. If predictors of competence could be identified before admission, graduate programs would be better able to select students who would maximize the expenditure of materials, energy, and expertise, thereby decreasing the potential failure for both students and universities. Therefore, this research addresses the extent to which selected variables may serve to predict success on the national competency exam (Praxis) in speech-language pathology.

The research conducted in this study was a quantitative analysis of postsecondary data made available from three state-supported comprehensive institutions in Kentucky. Astin's (1991) I-E-O model was used as the theoretical framework for this investigation. Data were analyzed to examine the extent to which prediction of success on the Praxis could be determined. The sample for this study consisted of 280 graduate student records during the years 2008-2012. Descriptive statistics, correlation coefficients, and stepwise multiple regression were used to analyze data in an attempt to identify the impact of the independent variables of ACT; two-year GPA; four-year GPA; GRE (GRE-T, GRE-V, GRE-Q and GRE-W); and GGPA on the dependent variable (Praxis exam). Correlation suggested statistically significant, but varying between weak and moderate, positive

relationships for most variables. The results of stepwise multiple regression indicated that 34% of the variance in predicting success on the Praxis exam could be explained by four variables: GRE-T, GRE-Q, four-year GPA, and GRE-W.

CHAPTER I: STATEMENT OF THE PROBLEM

If all my possessions were taken from me, with but one exception, I would choose to keep the power of communication, for by it, I would soon regain all the rest.

~Daniel Webster

Introduction

The ability to use language to communicate is a hallmark of being human.

Typically, infants arrive into this world “pre-wired” to learn language. They are able to acquire language skills according to developmental milestones and effectively use them to communicate, as well as to use the power and wonder of language effortlessly. These abilities are a gift bestowed upon them from birth (Hulit, Howard, & Fahey, 2011). For some, however, the ability to learn or use language is not so automatic. They experience difficulty with learning and using language to communicate, which may be due to a genetic or birth defect or some unknown cause. Additionally, individuals may lose the ability to communicate as a result of a brain injury, diseases, or challenges brought about by the aging process. In these instances, the expertise of a speech-language pathologist is required. Prepared to work with the totality of human communication, these professionals assess and treat speech, language, cognitive-communication, and swallowing disorders throughout an individual’s lifespan (American Speech, Language and Hearing Association [ASHA], 2007).

Speech-language pathology is a profession for which there is increasing demand. The national growth rate for speech-language pathologists is anticipated to be faster than average between 2010 and 2020, according to the U.S. Bureau of Labor Statistics (U.S. BLS, 2012) in the *Occupational Outlook Handbook*, 2012-2013 Edition. They reported an increase of 23% in job openings, or 28,880 additional speech-language pathologist positions. According to the 2011 Higher Education Data System (HES) Communication

Sciences and Disorders (CSD) Education Survey, 6,241 speech-language pathology master's degrees were granted in 2011, with 250 of 301 academic institutions responding to the survey (ASHA, 2011a). Thus, the demand is growing at a greater rate than the production of speech-language pathologists. One reason cited for this increase is the aging of the baby-boomer population. As these individuals live longer and grow older, more health conditions arise that cause communication challenges, including brain injury, stroke, and hearing loss (U.S. BLS, 2012).

In addition to the increasing demand for the profession of speech-language pathology, it is one of the most desirable career paths in the United States. *U.S. News and World Report* listed “speech-language pathologist” as one of the top 100 jobs in 2013, ranked at #28. Thus, the increased need for speech-language pathologists and the increase in desirability for the profession lead to an increasing number of students making application for a limited number of seats in graduate school. Because the demand exceeds the supply of speech-language pathologists, and the capacity of graduate schools offering the credential is limited, it makes sense to determine ways to predict success on the Praxis exam from a point very early in the process. In so doing, universities will be better able to effectively utilize limited resources by maximizing the degree to which students are successful on the Praxis exam. The reality of limited resources for both students and institutions leads to the desire of institutions to be efficient and effective in the expenditure of those resources in order to increase the capacity to populate the field of speech-language pathology. The Praxis exam is the hurdle students must jump to be successfully credentialed in the field. If variables could be identified that best predict success on the Praxis examination prior to admission, programs would be better able to

select students who would maximize the investment of materials, energy, and expertise, thereby decreasing the potential loss for both students and universities.

The Problem Defined

Few empirical studies are available that investigate predictors of success on the Praxis exam in speech-language pathology. Of those that exist, some have indicated that preadmission criteria predict graduate student performance (Forrest & Naremore, 1998; Garrity, Clark, & Brooks, 2008; Halberstam & Redstone, 2005; Kjelgaard & Guarino, 2012; Reed, 2007). Others (Ryan, Morgan, & Wacker-Mundy, 1998) indicated little correlation between the Praxis exam and preadmission criteria. Additionally, controversy exists about the validity of the Graduate Record Exam (GRE), which is required for many graduate programs, as a legitimate predictor of graduate student success (Kuncel, Hezlett, & Ones, 2001; Kuncel, Wee, Lauren, & Hezlett, 2010). No consistent data can be found to support whether predictors of success exist. The ability to identify predictors of success for students in speech-language pathology is valuable during the admission process. Graduation of qualified persons who can pass the Praxis exam is an essential outcome of all graduate programs in speech-language pathology. The paucity of empirical studies makes it difficult to ascertain whether reliable predictors of success on the Praxis exam could be determined prior to admission to a graduate program. If predictors of competence could be identified before admission, programs would be better able to select students who would maximize the expenditure of materials, energy, and expertise, thereby decreasing the potential failure for both students and universities.

Purpose of the Study

This research addresses the extent to which selected variables may serve to predict success on the national competency exam (Praxis) in speech-language pathology.

The study addresses the effects of the student characteristics of age, gender, ACT scores, two-year undergraduate GPA (input), and the ability to understand instruction as reflected in Graduate GPA (environment) on the Praxis performance (output). The purpose of the investigation leads to the central research question: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology (see Figure 1)?

Theoretical Framework and Empirical Research Questions

The theoretical framework that will guide this study is Astin's Input-Environment-Outcome model. According to Astin (1991), the foundation of the Input-Environment and Outcome (I-E-O) model is that educational achievement, outcome (O), is a result of individual student characteristics, input (I), that affect individuals' engagement with their educational environment, environment (E) (Kjelgaard & Guarino, 2012). In this study, the demographic factors of age, gender, ACT scores, two-year undergraduate GPA, graduate GPA, and GRE scores were considered to be Input (I). These demographic factors included both personal descriptors and admission variables. The personal descriptors were the age and gender of the individual student, and the admissions variables were individual ACT scores and GPA after two years in college. The admission variables for the graduate program included four-year college GPA and GRE scores.

The factor considered to be Environment (E) was the student's ability to receive and master the information provided during the course of graduate study, as measured by graduate GPA. According to Astin (1991), environment may include characteristics of classes taken and students in the program, courses taken, characteristics of professors,

living arrangements, marital status, number of children, and amount of time devoted to activities (studying, reading, sleeping, recreation, etc.).

The factor considered as Outcome (O) was the student's score on the Praxis exam, which is the culminating activity for the student to gain entrance to the field of speech-language pathology. This study investigates the connections between demographic factors of age, gender, ACT scores, and two-year GPA with four-year GPA, GRE, Graduate GPA, and Praxis scores. Figure 1 represents the theoretical model of factors correlating with Praxis scores.

The central research question addresses the effects of student characteristics and environment on Praxis performance. The following research questions guide this investigation:

1. To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the four-year graduate GPA; and (d) the Praxis exam?
2. To what extent does the four-year GPA correlate with scores on (a) the GRE, (b) the GGPA, and (c) the Praxis exam?
3. To what extent do scores on the GRE correlate with the GGPA and scores on the Praxis exam?
4. To what extent does the GGPA correlate with scores on the Praxis exam?
5. To what extent may one determine which variables or combination of variables are the most probable indicators success on the Praxis exam?

Significance of the Study

The American Speech-Language and Hearing Association (ASHA) directed the Higher Education Data System (HES) survey in 2010, revealing that 11,789 applications were accepted from 37,067 applicants, submitted to 235 speech-language pathology master's level programs in the United States (ASHA, 2011a). This translates to roughly 50 of 150 (33%) applicants being offered admission to a graduate program in speech-language pathology nationwide. Five Kentucky institutions offering master's degrees in speech-language pathology received 743 applications, with 302 approved for admission, a 40% acceptance rate. However, of those admitted, only 86.4% in the nation passed the Praxis exam, which is the gateway to practice (ASHA, 2011a). Over the most recent three-year period, the pass rate of Kentucky institutions was 98.4%, compared to the national pass rate of 86.4% (UK, 2013; U of L, 2013; MSU, 2013; WKU, 2013; ECU, 2013).

The pathway to becoming a licensed and American Speech Language and Hearing Association (ASHA) certified speech-language pathologist is a rigorous process that requires dedication, talent, and persistence. In order to function independently as a speech-language pathologist, a Certificate of Clinical Competence (CCC) must be acquired. One must obtain a master's degree from an accredited program, successfully complete required clinical experiences, and pass a national examination in speech-language pathology in order to become a licensed and certified speech-language pathologist, according to the American Speech Language and Hearing Association (ASHA, *n.d.*- b).

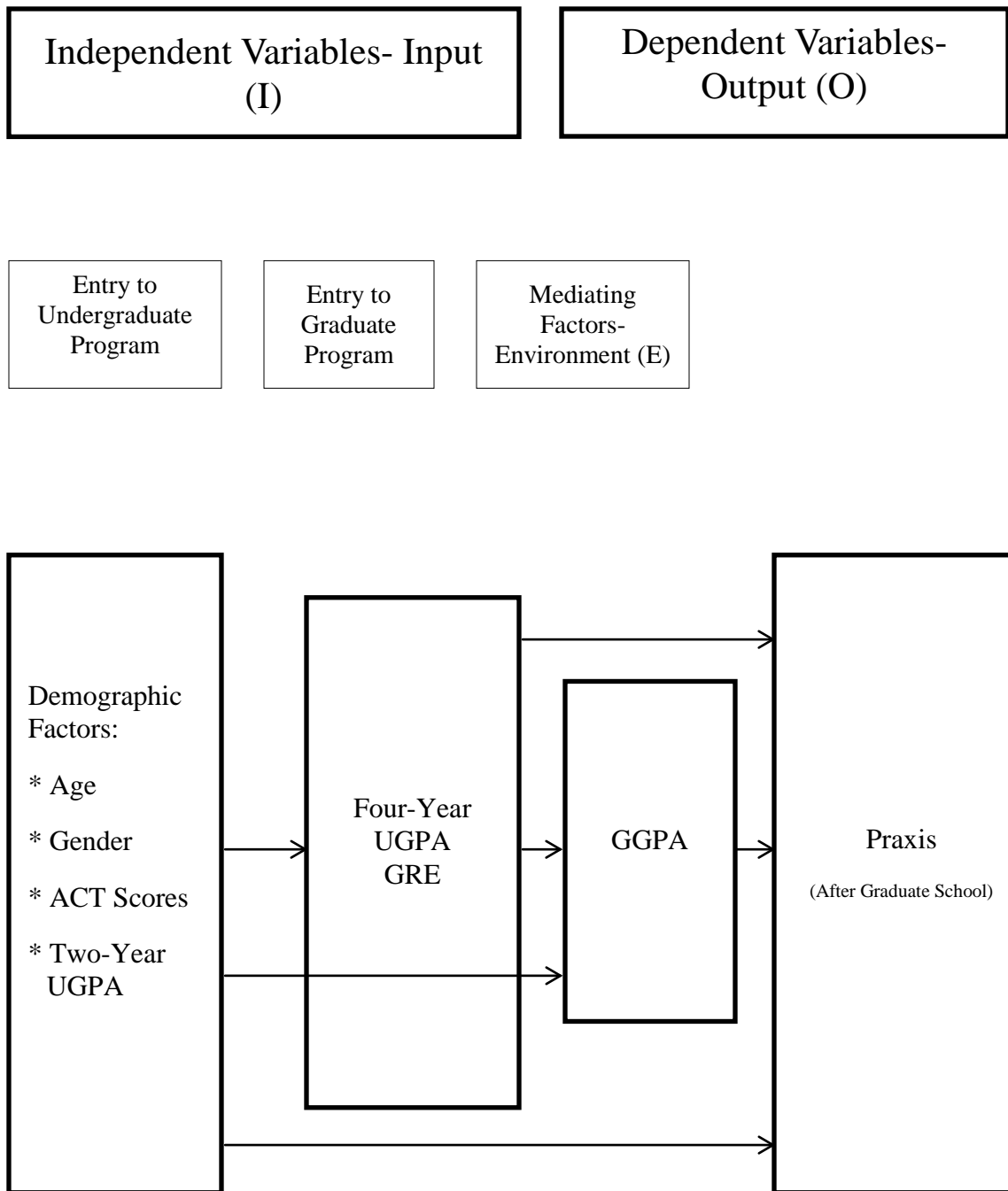


Figure 1. Theoretical model of factors correlating with Praxis scores.

The pathway to becoming a licensed and American Speech Language and Hearing Association (ASHA) certified speech-language pathologist is a rigorous process that requires dedication, talent, and persistence. In order to function independently as a speech-language pathologist, a Certificate of Clinical Competence (CCC) must be

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The Council of Academic Accreditation (CAA) must accredit the graduate program from which one graduates. The CAA, an autonomous body of ASHA, is recognized by the Commission on Higher Education and the United States Department of Education as the only agency that may accredit programs leading to the Master's Degree in Speech-Language Pathology. Students must demonstrate appropriate coursework in the foundational skills of human communication including normal speech, language, hearing, and swallowing processes as a condition of graduate school acceptance. This foundational knowledge may be obtained in undergraduate programs or post baccalaureate programs designed to offer the prerequisite skills necessary for graduate education (Kimbarow, 2008).

Once admitted to the graduate program, students engage in coursework designed to provide knowledge in the nine areas of articulation, fluency, voice and resonance, hearing, swallowing, cognitive aspects of communication, social aspects of communication, and communication modalities. Additionally, students gain clinical skills by acquiring a minimum of 400 hours during their clinical practica, which are part of the curriculum. At the end of the graduate program, students take the Praxis Examination as a condition for licensure in most states, with the exception of Colorado, Michigan, and South Dakota (Kimbarow, 2008). A final step in the certification process

is completion of a Clinical Fellowship Year (CFY), during which clinical fellows work with a mentor for the equivalent of 36 weeks of full-time clinical practice in order to continue clinical growth and synthesis of knowledge and skills gained during graduate education.

The requirements for licensure as a speech-language pathologist in Kentucky are as follows.

KRS 334A.050 Qualifications of Applicant for License.

To be eligible for licensure by the board as a speech-language pathologist or audiologist, the applicant must:

(1) Be a citizen of the United States or have declared his intention to become a citizen. A statement by the applicant under oath that he is a citizen or that he intends to apply for citizenship when he becomes eligible to make application shall be sufficient proof of compliance with this subsection;

(2) Show evidence of meeting the following professionally accepted academic and practicum standards:

(a) Master's degree in the area of speech-language pathology or audiology or substantive equivalent. The specific course work for this requirement is to be determined by the board and delineated in the administrative regulations;

(b) Completion of supervised direct clinical practicum with individuals presenting a variety of disorders of communication, the experience being obtained with the training institution or in one (1) of its cooperating programs; and

(c) Completion of postgraduate professional experience as deemed necessary by the board; and

(3) Pass the national examinations in speech-language pathology or audiology, which are approved by the American Speech and Hearing Association and in effect at the time of application for licensure. Written examinations may be supplemented by such oral examinations, as the board shall determine. An applicant who fails his examination may be reexamined at a subsequent examination upon payment of another licensing fee (The Kentucky Board of Speech-Language Pathology and Audiology, 2010).

Students must pass the Praxis Examination in Speech-Language Pathology as a condition of gaining the Certificate of Clinical Competence as well as entry into the field (ASHA, *n.d.* - b). The exam includes 120 questions intended to assess mastery of professional practice in the nine areas of study completed in the course of graduate study. Students must gain a minimum score of 600 in order to pass the exam (Kimbarow, 2008; ASHA, *n.d.* - a). Failure to pass the Praxis exam is a lose/lose situation for both the student and the university. For the student, the loss encompasses a career path and monetary and time investments. Also, potential psychological distress is possible for those who are unsuccessful. For the faculty member in the university, the loss is in time and expertise. Additionally, students who could have successfully completed the credential have lost out on instruction by not occupying a seat in the program.

Several contributions of this study add to the body of knowledge concerning factors that predict success on the Praxis exam in speech-language pathology. These factors relate to national programs as well as to programs specific to the Commonwealth

of Kentucky. First, although admissions are necessarily selective in all graduate and some undergraduate programs of speech-language pathology (Steffani & Slavin, 1997), no standard guidelines exist for program admission to either graduate or undergraduate programs in speech-language pathology. The necessity for programs to graduate well-prepared students is compounded by the added complexity of requiring a licensure exam, which must be passed in order to enter the field. Thus, an increased priority is placed on performance outcomes for students and accountability for institutions. Additionally, limited seats in programs, qualified faculty, and financial resources necessarily limit enrollment capacity. If program administrators were better able to predict those students who would be ultimately successful, as defined by passing the licensure exam, then performance outcomes and accountability measures would be better controlled. The results of this study could be used to inform individual programs about factors to consider when admitting students into both graduate and undergraduate programs in speech-language pathology. Thus, the ability to provide predictive variables for success will enable institutions to be more effective in student training.

Second, significantly limited literature is available focusing on reliable predictors of success on the Praxis exam in speech-language pathology. Adequate literature is desirable to support one's position on entrance requirements for graduate programs. The results of this investigation will add to the body of literature regarding predictors of success on the Praxis exam in speech-language pathology. Several empirical researchers have recommended future studies that predict success in graduate school, as defined by passing the Praxis exam in speech-language pathology (Forrest & Naremore, 1998; Halberstam & Redstone, 2005; Reed, 2007).

Third, students are unaware of which factors predict ultimate success for entrance into the field. The information gained from this research may be used to inform students from the very beginning of their application process those factors that are predictive of success on the Praxis exam in speech-language pathology, which is the gateway to the profession. Information from this study could provide specific facts about the utility of predictive admission criteria in forecasting ultimate achievement of the credential. The information could help guide admission requirements in undergraduate and graduate programs in speech-language pathology. Additionally, this information could be used to inform programs of when to provide student support from the standpoint of providing information to enhance and or change variables as they are made known.

Methodology

Information for this study will be obtained from the databases of three comprehensive state supported Kentucky universities and supplemented by information related to the Praxis exam scores obtained from program administrators at each university. The analysis will involve a retrospective record review of undergraduate and graduate students in speech-language pathology programs at Institution A, Institution B, and Institution C. Astin's (1991) Input-Environment-Outcome (I-E-O) model will guide this quantitative study. In this theoretical framework, Astin proposed that student outcomes are influenced by both student inputs and environmental factors. Three variables will be included in the framework: Input (student characteristics of age, gender, ACT scores, two-year GPA, and UGGPA); Environment (education as reflected in GGPA); and Outcome (Praxis scores). For this investigation, Input (I) will equate to the independent variables of Entry to Undergraduate Program and Entry to Graduate Program. Entry to

Undergraduate Program will consist of the demographic factors of age, gender, ACT scores and two-year GPA. Entry to Graduate Program will consist of the four-year undergraduate GPA and the Graduate Record Exam (GRE). Environment (E) will equate to the Mediating Factor of GGPA. Output (O) will equate to the Praxis exam in speech-language pathology.

Participants. Participants for this retrospective study will be all students who have graduated from the undergraduate and graduate programs in speech-language pathology at Institution A, Institution B, and Institution C between 2008-2012.

Procedure. Demographic, admission, test score, and grade point data will be extracted from student files by the registrars' offices. For the purpose of this investigation the term correlation means to serve as a predictor of success. Correlations will be examined between various demographic factors: Grade Point Average (GPA), Graduate Record Exam (GRE) scores, and scores on the national competency exam (Praxis) in speech-language pathology. The investigator will collect scores on the Praxis exam from the program administrators. Values for the independent and dependent variables will be entered into a spreadsheet and imported into the Statistical Analysis System (SAS). The independent variables are age; gender; ACT scores; UGGPA; GRE (GRE-T, GRE-V, GRE-Q, and GRE-W); and GGPA. The dependent variable is the Praxis exam score.

Data analysis plan. The primary tool for this investigation will be stepwise multiple regression in order to learn more about the relationship between the independent or predictor variables and the dependent variable. In stepwise multiple regression, a sophisticated analysis of the interrelationship of variables is possible, which enables investigation of how well a set of variables may predict an outcome, in this case,

performance on the Praxis exam (Pallant, 2010). Data will be analyzed, using SES, to provide descriptive, inferential, and stepwise multiple regression statistics.

Assumptions and Limitations of the Study

The following assumptions and limitations pertain to this research. The scope of this study consists of students who completed graduate programs at three state-supported comprehensive universities in Kentucky and who are eligible to sit for the Praxis exam in speech-language pathology. The sample did not include all undergraduate and graduate programs in the Commonwealth of Kentucky, nor did it include any institutions outside of Kentucky. Due to the national nature of criteria for this credential, the populations used in this research are representative of similar programs in the United States.

Second, the educational delivery methods and assessment may differ among faculty as well as among institutions. There is no control of variability in instructional delivery or assessment. Criteria for grading systems utilized in different institutions may vary based on instructor. Thus, grading may differ among instructors and institutions, making generalizability of undergraduate GPA and graduate GPA difficult to assure among programs.

Third, no control was employed for the amount of time that may have been taken to complete the program. Thus, some students may have taken more time than others to complete the degree and take the Praxis exam.

Fourth, subjective factors such as clinical ratings and personal attitudes, while important in gaining clinical knowledge and skill, were not included in this study. Thus, these subjective factors may contribute to successful demonstration of comprehensive

knowledge in areas specific to the profession of speech-language pathology, as determined by the Praxis exam.

Finally, because the programs involved in the research study are CAA accredited, the results are considered to be generalizable to other programs in different institutions in the United States. Thus, program standardization as a result of CAA accreditation makes institutional differences (size, location, etc.) irrelevant.

Definition of Terms

The following list of definitions refers to the terms used in this research study:

Speech-Language Pathologist

A speech-language pathologist is responsible for the diagnosis, prognosis, prescription, and remediation of speech, language, and swallowing disorders. A speech-language pathologist evaluates and treats children and adults who have difficulty speaking, listening, reading, writing, or swallowing. The overall objective of speech-language pathology services is to optimize individuals' ability to communicate and swallow, thereby improving quality of life (ASHA, *n.d.* - b).

American Speech Language and Hearing Association (ASHA)

ASHA is the national professional, credentialing, and scientific organization for audiologists; speech-language pathologists; speech, language, and hearing scientists; audiology and speech-language pathology support personnel; and students (ASHA, *n.d.* - c).

The Council on Academic Accreditation (CAA)

The CAA is the organization responsible for accrediting eligible clinical master's

degree programs in speech-language pathology and doctoral programs in audiology (ASHA, *n.d.* - d).

ACT

The ACT Test (*n.d.*), a curriculum- and standards-based educational assessment, evaluates students' academic readiness for college. It is used as an entrance requirement for many postsecondary institutions of higher learning (act.org/products/k-12-act-test)

Graduate Record Exam (GRE)

The GRE is a standardized, widely accepted entrance exam required by many graduate schools. It is divided into four areas: GRE-Total (GRE-T), Verbal Reasoning (GRE-V), Quantitative Reasoning GRE-Q), and Analytical Writing (GRE-W) (ETS, *n.d.*).

Praxis Exam in Speech-Language Pathology

The Praxis exam in Speech-Language Pathology assesses beginning clinicians' comprehension of the critical content and existing practices in speech-language pathology. A minimum score of 600 is necessary as a portion of the certification process by ASHA (ASHA, *n.d.*- a).

Summary

Speech language pathology is a profession for which there is increasing demand due, in part, to the aging of the baby-boomer population. In addition to the rising demand for the profession, it is one of the most desirable career paths in the United States. Thus, the increased need for speech-language pathologists and expansion in desirability for the profession lead to an intensifying number of students making application for a limited number of seats in graduate school. Additionally, documented shortage exists of speech-language pathologists, making it important that those who are admitted are ultimately

successful and able to enter the workforce. Although academic programs use a selective admission process, limited and at times conflicting data are available to support which characteristics correlate with program success, as measured by the Praxis exam in speech-language pathology. While some studies support the premise that there are correlations between pre-admission criteria and success on the Praxis exam, others do not.

Additionally, the national pass rate for the Praxis exam was only 86.4% in 2011-2012 (ASHA, 2012a), indicating that some students occupied seats in graduate programs without a return on the investment. These failures not only increase the shortage of speech-language pathologists in the field, but also they are a hardship for the students and faculty who have invested time and resources for those who may not attain licensure.

The impact of these combined factors demands a current study to determine pre-admission criteria that may predict program success, as measured by the Praxis exam in speech-language pathology. The present study provides an opportunity to examine whether admissions or demographic factors correlate with program success. The purpose of the investigation leads to the central research question: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology? In order to function independently as a speech-language pathologist, a Certificate of Clinical Competence (CCC) must be acquired. One must obtain a master's degree from an accredited program, successfully complete required clinical experiences, and pass a national examination in speech-language pathology in order to become a licensed and certified speech-language pathologist, according to the American Speech Language and Hearing Association (ASHA, 2007).

The Council of Academic Accreditation (CAA) must accredit the graduate program from which one graduates. The CAA, an autonomous body of ASHA, is recognized by the Commission on Higher Education and the United States Department of Education as the only agency that may accredit programs leading to the Master's Degree in Speech-Language Pathology. Students must demonstrate appropriate coursework in the foundational skills of human communication including normal speech, language, hearing, and swallowing processes as a condition of graduate school acceptance. This foundational knowledge may be obtained in undergraduate programs or post baccalaureate programs designed to offer the prerequisite skills necessary for graduate education (Kimbarow, 2008).

Once admitted to the graduate program, students engage in coursework designed to provide knowledge in the nine areas of articulation, fluency, voice and resonance, hearing, swallowing, cognitive aspects of communication, social aspects of communication, and communication modalities. Additionally, students gain clinical skills by acquiring a minimum of 400 hours during their clinical practica, which are part of the curriculum. At the end of the graduate program, students take the Praxis Examination as a condition for licensure in most states, with the exception of Colorado, Michigan, and South Dakota (Kimbarow, 2008). A final step in the certification process is completion of a Clinical Fellowship Year (CFY), during which clinical fellows work with a mentor for the equivalent of 36 weeks of full-time clinical practice in order to continue clinical growth and synthesis of knowledge and skills gained during graduate education.

Conclusion

This chapter presented the purpose of this research study. The following chapter will present the Review of the Literature.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

The Bureau of Labor Statistics reported that the job outlook for speech-language pathologists is likely to increase at a rate of approximately 23% between 2010-2020 (U. S. BLS, 2013). Additionally, the profession of speech-language pathology is one of the most attractive, according to *U. S. News and World Report*, noting that it is in the top 100 most desirable jobs of 2013, ranking 28th (*U.S. News and World Report*, 2013). The increase in demand, coupled with the high desirability, means there will likely be an increase in applications to both undergraduate and graduate programs in the field. Additionally, there is a documented shortage of speech-language pathologists, making it important that those who are admitted to academic programs are ultimately successful and able to enter the workforce (Edgar & Rosa-Lugo, 2007; Tracy, 2006).

Academic programs in speech-language pathology receive more applications than there are seats in classes. Thus, they are charged with the task of admitting students who ultimately will be able to pass the Praxis exam. Literature is quite limited on admissions criteria that predict success in undergraduate and graduate programs in speech-language pathology. The purpose of this quantitative study is to add to the body of literature in identifying admissions criteria that are predictive of success in the field, as defined by passing the Praxis exam. To gather background information, sections on the historical perspectives and standardized admission and exit examinations are examined. The review then addresses the SLP shortage, admissions criteria in undergraduate and graduate schools, and success rates for students. Empirical studies of characteristics

predicting success on the Praxis exam in speech-language pathology and a conceptual framework follow. The chapter concludes with a summary.

Historical Perspectives of Speech-Language Pathology

Although the profession of speech-language pathology may be traced back to 3500 BC, little is published about its history. Duchan (2002) stated that very little attention is given to the history of the profession of in training programs or in the literature. Kuster (2002) discovered that the only course dedicated to the history of speech-language pathology was offered as an elective at the Universidad Complutense de Madrid. Communication Disorders is an area as old as mankind, yet the field of speech-language pathology is a relatively new profession in the United States. This discussion will briefly describe the history of the field from its roots in Mesopotamia, Rome, Egypt, and Greece in 3500 BC to the present time. The most detailed description will focus on the period from 1900 to the present. The major source of this information is Duchan (2011), professor emerita from the State University of New York at Buffalo in her online work, *A History of Speech Language Pathology*.

Much emphasis was placed on communication, specifically oratory skills, as early as 3500 BC in ancient Mesopotamia, Rome, Egypt, and Greece. During this time young males were trained in rhetoric, and much value was placed on public speaking. When problems were encountered with appropriate articulation, educational remedial practices included memorization exercises, prayers and sacrifice, health maintenance, and speech exercises (Duchan, 2011).

According to Duchan (2011), three civilizations in the Middle Ages contribute to our understanding of the evolution of speech-language pathology: the Byzantine

civilization, Europe, and the Mideast Arabic world. All three viewed their worlds from a religious perspective. During this time, secular medical practice was synthesized with religious medicine. Rhetoric continued to be highly valued and was studied to improve skills in preaching in order to mediate disagreements between worldly science and sacred understanding. Treatment of communication disorders, such as stuttering, involved both religious and medical practices.

The Renaissance brought much change in all areas. Duchan (2011) reported that this period in history emphasized a universal language movement in which alphabets and languages were designed to be more accessible to everyone, as opposed to religious leaders and the highly educated. During this period, more interest was found in teaching the deaf to speak. Augmentative strategies, such as lip reading, sign language, and pictures, were developed to aid in teaching those who could not otherwise communicate. Additionally, this was the first time in history that a differentiation was made between being unable to speak and being unintelligent.

According to Duchan (2011), the 18th Century civilization encouraged a focus on understanding the natural world. Much time and effort were spent in categorizing diseases and disabilities, including speech disorders. During this time of investigation, researchers studied how speech and language were structured, including phonetics, prosody, morphology, lexicon, and grammar. A sense of morality toward fellow humans evolved, and education and speech therapies for the disabled emerged.

Duchan (2011) explained that three trends evolved in the 19th Century as precursors to the development of the field of speech-language pathology: the Elocution Movement, the Scientific Revolution, and the rise of professionalism. During the

Elocution Movement (1800-1865), elocutionists both performed and taught others how to perform. They focused on articulation, inflection, accent, and modulation. By the end of the century, elocutionists had formally organized themselves and established a journal, *The Voice*. It was at this time that universities began to offer formal programs in elocution, thus becoming a precursor to the field of speech-language pathology.

Duchan (2011) reported that The Scientific Revolution (1865 to early 1900s) brought about several developments crucial in laying the foundation for speech-language pathology. These developments included the scientific study of phonetics, brain studies, technological advances, the psychological testing movement, and the child study and child welfare movements. The emphasis on scientific thinking marked the beginning of assessment and measurement as the basis for clinical practice in the field of psychology. The use of assessments in psychology laid the foundation for the use of assessments in clinical practice in speech-language pathology.

The Progressive Era (1870-1914) ushered in a time when people felt a responsibility for others (Duchan, 2011). The emergence of professionalism occurred at that point, during which many professions were established such as social work, medicine, special education, and speech correction. These professional groups determined the nature and scope of their practice(s). Many concerns surfaced for these groups including: (1) determination of qualifications, (2) identification of professional jurisdiction, (3) establishment of monopoly of jurisdictional activities, and (4) establishment of scientific knowledge base for assessing professional expertise. The American Academy of Speech Correction was established in 1926 for the purpose of raising professional standards; the group established the *Journal of Speech Disorders* in 1936.

During the 20th Century, Duchan (2011) noted four periods in the development of the field of speech-language pathology: (1) The Formative Years (1900-1945); (2) The Processing Period (1945-1965); (3) The Linguistic Era (1965-1975); and (4) The Pragmatic Revolution (1975-2000). The Formative Years included three distinct avenues of development in treatment approaches to speech and language therapy: (1) Biomedical, with an emphasis on physical treatments; (2) atomistic (separating parts from the whole) and sensorimotor, with an emphasis on auditory training and/or motor placement; and (3) linguistic, with the emphasis on semantic meaning. During this period, the importance of language development in the emerging knowledge base of “speech” disorders was acknowledged. Also identified were disconnects between theory and practice. For example, Duchan noted that Van Riper did not include social training in his practice, although he was the first to acknowledge the importance of social context on the handicapped speaker. Another example Duchan offered was Berry and Eisenson’s theoretical focus on linguistics, but their recommended treatment approach focused on treating speech sounds. Duchan pointed out that a definite gap was found in research results and therapeutic strategies and cited that research in developmental psychology was available to speech pathologists, but it was not used until standardized tests were developed.

Duchan (2011) posited that the Processing Period heralded a time in the field of speech-language pathology emphasizing a more holistic, as opposed to atomistic, approach to speech and language disorders. This change in approach was attributed to two factors, both a result of the second world war: (1) American aphasiologists adopted their European counterparts’ position that aphasia was a language disorder rather than a

speech disorder as a result of soldiers returning from the war with head injuries, and (2) the immigration of Jewish European clinicians resulted in a more holistic approach to speech and language disorders. According to Duchan, during this time Goldstein, a neuropsychiatrist and researcher of aphasic patients, espoused his concepts of symbol formation: ideas of concrete and abstract attitudes to account for literalness in aphasia, and that inner speech is a level of language. Similarly, Duchan noted that the European immigrant Werner combined the European theories of Gestalt processing and holistic attendance to the organism, relating them to a theory of cognitive development and language acquisition. Duchan reported that Myklebust, as with Goldstein, described three types of language problems: receptive, expressive, and inner. He was the first American speech-language pathologist to focus on language disorders being distinct from speech disorders. Backus and Beasley promoted a move away from therapy that was based on devices to therapy based on relationships where children were seen in terms of interpersonal dynamics rather than on their clinical pathology. Similar to the Formative Era, an emphasis was placed on research that highlighted the language content of child language development. In 1957, Mildred Templin studied four aspects of child language norms that are still referenced today: (1) articulation of sounds, (2) speech sound discrimination, (3) sentence structure, and (4) vocabulary (Duchan, 2011).

During the Linguistic Era, language was viewed as a structured system with its specific rules of syntax, semantics, and phonology (Duchan, 2011). The following theorists, among others, added to the growing body of knowledge: Noam Chomsky offered his transformational generative language theory, hypothesizing that individuals used an abstract construct in understanding and generating language; Roger Brown

completed his landmark work, establishing the norms for acquiring 14 English morphemes; Laura Lee developed the Northwestern Syntax Screening Test; Elizabeth Carrow in 1971 developed the Test for Auditory Comprehension of Language; and David Ingram offered the phonological process analysis that differed from the previous focus of articulation analyses. The familiar theory-therapy gap was evident during this period as well as in others. Therapists developed goals using feature theory but administered therapy using a behavioral model. A seminal approach rooted in holism was established that focused on what the child heard from caregivers. This was called language expansion and is still recommended today to aid in language development.

Duchan (2011) reported that the Pragmatics Revolution ushered in a period of defining language in terms of its use rather than its form (syntax and phonology) and content (semantics). For the first time, an emphasis on social interaction was discovered, as opposed to a focus on the communicative partner. Early researchers in the area of pragmatics, including Halliday, Dore, and Chapman, identified the first communicative attempts of children as requests, comments, greetings, etc., or communicative acts. When these acts were identified, assessment protocols were developed. As clinicians determined the child's pragmatic skill level, they developed treatment strategies to include elicitation and modeling. Finally, pragmatics was established as a separate area for clinical focus.

Heretofore, conversation had been used as a generalization strategy rather than an important communicative area of focus. In addition to conversation, narrative was deemed important enough for its own clinical focus. The focus on social interaction complemented the strategy of event participation focusing on co-constructed activity in

which participants were jointly engaged. During this time, treatment evolved to a focus on a child's natural environment, rather than in isolated, artificially construed activities, as had been the previous practice. Clinicians were found practicing in homes, classrooms, and community settings. The theory emerged that "scripts" or "routines," such as peek-a-boo and pat-a-cake, were essential to language learning (Bruner, 1975, & Cazden, 1979, as cited in Duchan, 2011). Additionally, a focus evolved on the importance of a client's communication skills in relation to everyday life events, or the life-participation approach, in which the clinician worked to help families determine and achieve life goals. The field of speech-language pathology is still in the Pragmatics Revolution phase of its development.

The general history of the field of speech-language pathology has been briefly discussed. The roots dating back to 3500 BC in ancient Greece, Rome, Mesopotamia, and Egypt were presented. The evolution of the field was traced through the Middle Ages, Renaissance, and 18th Century. The 19th Century brought about three trends that set the stage for the field: the Elocution Movement, the Scientific Revolution, and the rise of professionalism. The 20th Century marked the birth of the speech-language pathology field and included four phases: (1) The Formative Years, (2) The Processing Period, (3) The Linguistic Era, and (4) the Pragmatic Revolution. In observing the beginning and the development of the field, we may begin to understand it; and, in so doing, we may better understand the rationale and reason for the present day approach in the field.

Scope of Practice for Speech-Language Pathologists

As has been noted, the services that speech-language pathologists provide have evolved through the years (Duchan, 2011). Presently, speech-language pathologists

provide a complete array of services in a large variety of settings including health care settings (hospitals, nursing homes, outpatient clinics, home health care, rehabilitation facilities, health care practitioners); educational settings (preschools, elementary schools, secondary and postsecondary schools, colleges and universities); early intervention programs; private practice; and research programs as well as industry (Lubinski, 2010; ASHA, *n.d.* - b).

The American Speech Language and Hearing Association (ASHA), along with state licensure agencies, delineate the roles and responsibilities of speech language pathologists practicing in the United States (Lubinski, 2010). The scope of practice, adopted in 2007 by the ASHA Ad Hoc Committee on the Scope of Practice in Speech-Language Pathology, is the official policy that delineates the specific areas that speech-language pathologists may provide services for which they were trained. The Scope of Practice outlines areas of professional practice, notifies others of those services, and supports speech-language pathologists in the delivery of evidence-based practice in communications disorders and swallowing, as well as in performing research (ASHA, 2007). Additionally, the Code of Ethics, which serves to outline the expected code of conduct for speech-language pathologists and frames appropriate professional behavior, sets forth the essential values and rules that function to preserve the highest standards of honorable and moral principles (ASHA, 2010; Lubinski, 2010).

The speech-language pathologist works with individuals of all ages, from infancy through advanced years, with a full range of human communication disorders including the prevention, assessment, and treatment of speech, language, cognitive-communication, and swallowing difficulties (ASHA, 2007; U.S. BLS, 2013). These difficulties in

communication may result from a wide range of reasons including trauma at birth, brain injury, stroke, hearing loss, developmental delay, cleft palate, or cerebral palsy (U. S. BLS, 2013). Additionally, speech-language pathologists may train students in college and university programs; direct private practices, clinics, agencies, and/or organizations; conduct research to increase understanding about communication processes; and supervise clinical programs in schools and universities (ASHA, *n.d.* - b; U. S. BLS, 2013).

Credentialing of Speech-Language Pathologists

In order to become a certified, licensed, practicing speech-language pathologist, an individual must obtain the appropriate credentials. The educational and clinical qualifications are rigorous and demanding. In order to function independently as a speech-language pathologist, one must acquire a Certificate of Clinical Competence (CCC). One must achieve a master's degree from an accredited program, successfully complete required clinical experiences, and pass a national examination in speech-language pathology in order to become a licensed and ASHA certified speech-language pathologist with the CCC credential, according to the American Speech Language and Hearing Association (ASHA, *n.d.* - b).

The Council of Academic Accreditation (CAA) must accredit the graduate program from which a student graduates in order to be eligible for certification. Kimbarrow (2008) reported that the CAA, an autonomous body of ASHA, is recognized by the Commission on Higher Education and the United States Department of Education as the only agency that may accredit programs leading to the Master's Degree in Speech-Language Pathology. Students must demonstrate appropriate coursework in the

foundational skills of human communication including normal speech, language, hearing, and swallowing processes as a condition of graduate school acceptance. This foundational knowledge may be obtained in undergraduate programs or post baccalaureate programs designed to offer the prerequisite skills necessary for graduate education.

Once admitted to the graduate program, students enroll in courses designed to provide knowledge in the nine areas of articulation, fluency, voice and resonance, hearing, swallowing, cognitive aspects of communication, social aspects of communication, and communication modalities. Additionally, clinical skills are acquired by obtaining a minimum of 400 hours during their clinical practica, which are part of the curriculum. At the end of the graduate program, students must pass the Praxis Examination as a condition for licensure in most states, with the exception of Colorado, Michigan, and South Dakota (Kimbarow, 2008). A final step in the certification process is completion of a Clinical Fellowship Year (CFY) during which clinical fellows work under the supervision of a mentor for the equivalent of 36 weeks of full-time clinical practice in order to continue clinical growth and synthesis of knowledge and skills gained during graduate education (ASHA, *n.d.* - e).

Standardized Tests Used As Predictors of Success

Throughout the journey to certification in speech-language pathology, standardized tests play an important role in a student's ability to move from one level to the next. Kuncel and Hezlett (2007) posited that student performance on standardized admissions assessments predict many facets of success across academic disciplines. The first step in attaining certification is acceptance into a baccalaureate program.

Historically, data derived from standardized testing has been used to predict success in both undergraduate and graduate academic programs. At the college undergraduate level, the ACT has been used since 1959 as both an entrance and placement test (A [mostly] brief history of SAT and ACT tests, *n.d.*). At the graduate level, the Graduate Record Exam (GRE), the Graduate Record Exam Subject tests (GRE-S), the Law School Admissions Test (LSAT), the Pharmacy College Admissions Test (PCAT), the Miller Analogies Test (MAT), the Graduate Management Admissions Test (GMAT), and the Medical College Admissions Test (MCAT) have been used as entrance exams and to predict success at the graduate level (Kuncel & Hezlett, 2007). As one matriculates from the graduate program in speech-language pathology, the Praxis exam is taken as a requirement both to be certified by ASHA and to practice in certain states (ASHA, *n.d.* - a).

Even with the wide use of standardized tests at the undergraduate, graduate, and business levels (Berrett, 2013), controversy surrounds their efficacy as predictors of success as well as debate about how to use them effectively in the admissions process (Hoover, 2008b). According to Eric Hoover (2008a), Mr. William Fitzsimmons, dean of admissions and financial aid at Harvard University led a panel that examined testing practices and made recommendations about the better use of college entrance exams. The panel found that colleges might deliberate whether suitable entrance decisions could be made effectively without the use of the ACT or SAT. However, Dr. Davie Deike, vice president for enrollment at Case Western Reserve, continued to believe that the ACT and SAT are helpful in determining which students should be offered admission, particularly at large universities with hundreds of applications (Hoover, 2008a; Hoover,

2008b). Peter Sacks reported in 2001 that the GRE had weak predictive validity for graduate school accomplishment, while parental education and income were strong predictors of test performance. In a meta-analysis of the predictive validity of the GRE, Kuncel et al. (2010) found that, despite earlier criticisms, the GRE is a valid tool across disciplines to predict a variety of outcomes.

Despite the controversy that exists, standardized tests are required in many institutions of higher learning. In the profession of speech-language pathology, the Praxis exam is required as the gateway to enter the field. This requirement is not always mandated in other areas of study. For instance, an English major, history major, or mathematics major may graduate from college with a degree that does not require either graduate study or the passing of a national exam to secure a job. In order to practice in the field of speech-language pathology, however, one must hold a master's degree and pass the Praxis exam. This requirement places additional pressure on students and academic programs alike to ensure that those who are admitted are able to ultimately enter the field. To admit students who are poorly qualified to be successful on the Praxis exam is a waste of the resources of students, academic programs, and individual faculty members (Kuncel et al., 2010).

The Praxis exam in speech-language pathology is a vital component of ASHA certification standards. It is administered to assess the beginning speech-language pathologist's understanding of critical content and up-to date practices in the field. The development of the Praxis examination is commissioned by the Educational Testing Service (ETS) by ASHA every five to seven years. The Praxis exam is a requirement for state licensure and the certificate of clinical competence issued by ASHA.

Individuals take the Praxis examination after all coursework has been completed as a condition of certification. A passing score of 600 is required, and individuals may take the Praxis exam more than once. (ASHA, *n.d.* - a).

The National Shortage of Speech-Language Pathologists

As has been previously stated, a shortage of speech-language pathologists exists. According to ASHA (*n. d* –b)), the Bureau of Labor Statistics reported that the national employment rate of speech-language pathologists is predicted to grow faster than average for all occupations through 2020. They anticipate that an additional 28,000 speech-language pathologists will be needed to meet the demand. This translates to a 23% increase in available jobs in the field, while the total for all occupations is predicted to be 14% (U.S. BLS, 2013). National ASHA Job Market Data noted that 47% of school-based speech-language pathologists who responded to a 2012 survey indicated that job openings exceeded the amount of individuals looking for positions, with more openings reported in the Mountain (65%) and Pacific (67%) states. Additionally, more job openings were found in rural communities (54%), as compared to urban/metropolitan and suburban areas (ASHA, 2012b).

National ASHA Job Market Data indicated that 37% of speech-language pathologists in health care settings who responded to a 2011 survey noted the same scenario. More job openings were reported in the New England States (48%) than in others. Additionally, more job openings were found in rural communities (42%), as compared to urban/metropolitan and suburban areas (ASHA, 2011b). Interestingly, both school-based and medically based speech-language pathologists indicated that more openings occurred in rural areas.

According to the occupational profile available at workforcekentucky.ky.gov (Kentucky Trends, 2013), demographic trends in the Commonwealth of Kentucky are consistent with the national trends, indicating that job opportunities continue to be favorable for speech-language pathologists. On June 2, 2013, 109 job openings were listed online for speech-language pathologists. This does not take into consideration those not listed in an online database.

Within the current climate of the shortage of speech-language pathologists, many strategies address this issue. Edgar and Rosa-Lugo (2007) posited that continuing research is necessary on the factors that may help in the recruitment and retention of school-based SLPs. They suggested strong needs for continuing staff development, adequate salary differentials, further development of alternative models for service provision, incentive programs, and partnerships between school districts and community agencies and universities.

Dr. John Tracy (2006), with the Oregon School System, suggested a system of effective recruitment and retention of school-based speech-language pathologists. Flahive and Wright (2006) at the ASHA Convention suggested three solutions for the shortage of speech-language pathologists in Texas: (1) more graduates; (2) more nontraditional ways to obtain a master's degree; and (3) allowing SLP-As to operate in ARD meetings. Gill, White, Green, and Bird (2011) described a statewide distance-learning program in Texas that blends traditional and innovative delivery systems. This non-traditional program has produced 500 speech-language pathologists over 13 years, with the opportunity for many more individuals to earn a master's degree in the future. Jakubowitz (2012) suggested speech-language pathology licensure portability that would

allow speech-language pathologists to practice wherever they were needed using telepractice (videoconferencing) as a mechanism to provide clinical services.

Admission Criteria for Academic Programs in Speech-Language Pathology

In a climate of diminished supply of speech-language pathologists to meet the demands of the population, it is crucial that program administrators admit only those students to undergraduate and graduate programs in Communication Sciences and Disorders who ultimately will be successful in gaining the credential that will help to prevent the waste of resources for the student or for the faculty member/university. Those individuals accountable for admissions decisions have a weighty responsibility to determine exactly who should gain admittance to the program.

Each undergraduate college or university program may have different requirements, but a common core can be found at most institutions. In addition to the application form/fee, an ACT or SAT score, letter of recommendation, and a personal statement are common requirements for an undergraduate program. Most state institutions require the ACT score, while private institutions require the SAT or ACT (Kung, *n.d.*).

Tara Kuther (*n.d.*) noted that essentially all graduate school applications involve the same basic requirements including a GRE score, transcript, letter of recommendation, and personal statement. Additionally, some programs require an interview. The GRE and Grade Point Average (GPA) cut-off scores will likely vary from institution to institution.

All roads, however, lead to the Praxis Exam score. A passing score of 600 on the Praxis exam is required for ASHA certification, in addition to a master's degree in

speech-language pathology and completion of the Speech-Language Pathology Clinical Fellowship year (ASHA, *n.d.*- a). However, a passing score on the Praxis exam is crucial for certification. A student may successfully complete the graduate degree in speech-language pathology and clinical fellowship year, but if unable to pass the Praxis exam, the time spent in class and clinical practica is for naught. The national pass rate in 2011-2012 was 86.4%, or 6,734 students (ASHA, 2012a). However, 13.6%, or 1056, students did not pass the Praxis Exam in 2011-2012. This failure rate represents many student and faculty hours lost in the training of these students, not to mention the loss in dollars for the student. Therefore, it is critical to do all that is possible to predict as early as possible those who will be successful on the Praxis exam, for the student's sake as well as that of individuals in the general population who need the services of a speech-language pathologist during a time when the demand is greater than the supply.

Characteristics Predicting Success in Graduate Programs in Speech-Language Pathology

It is desirable to predict prior to admission those students who are likely to be successful in completing the credential in speech-language pathology. However, the literature on predictive admission criteria in the field is limited, therefore making it plausible to look to other fields, such as counseling, that have conducted this type of research to glean applicable findings to the field of speech-language pathology. The methods of determining predictors for the successful completion of the credential in speech-language pathology, as reported in the limited available literature, rely on retrospectively analyzing student records.

Forrest and Naremore (1998) studied the predictive utility of application materials for graduate admissions in speech-language pathology, but they considered only the Graduate Record Exam (GRE) and undergraduate GPA in students enrolled in the Master's Program of Speech-Language Pathology at Indiana University. An empirical analysis was conducted to determine whether any information in application materials would predict student success in the master's program, as well as performance on the professional examination in speech-language pathology, in order to add to the body of literature in the field.

Forrest and Naremore (1998) selected records of students entering Indiana University's MA program in the Department of Speech and Hearing Sciences between 1992 and 1995. The records were divided into two groups. Group 1 consisted of 30 students (20% of the entire group) who entered the MA program in speech-language pathology between 1992 and 1994. Group 2 consisted of 15 randomly selected students who entered the program in 1995, which served as a test of the validity of the classification function obtained in Group 1. The selection for the two groups involved a three-tiered process: (1) students enrolled in the program between 1992 and 1994 and assigned as being at the top or bottom of the class based on faculty memory were placed into Group 1; (2) student records were reviewed for graduate grades and scores on the national competency exam (Praxis), with those having GPAs of 3.7 and above and Praxis exam scores of 700 and above assigned to the top of the group and those with GPAs between 3.0 and 3.2 and scores between 600 and 700 on the Praxis exam placed at the bottom of the group; and (3) random assignment to Group 2 by the departmental secretary based on letters of the alphabet of 15 students who entered the program in 1995.

The following information was selected from the files of both groups: (1) undergraduate GPA; (2) GRE subtest scores for verbal, quantitative, and analytical; (3) quality of undergraduate institution score based on 1 = reputation equivalent to Indiana University, 2 = reputation somewhat lower than Indiana University, and 3 = weak reputation; (4) binary categorization of undergraduate degree, with 1 = speech and hearing sciences undergraduate degree and 2 = undergraduate major in another discipline; and (5) standing in top or bottom of class.

Data from Group 1 ($n = 30$) was added to a stepwise discriminant analysis using Minitab version 10.1 to calculate the discriminant function of the data. Data from Group 2 was used to validate the function obtained from Group 1. The results showed that students from the top and bottom half of the group who entered Indiana University in the MA program in speech-language pathology could be identified with 93% accuracy based on undergraduate GPA alone. Undergraduate major was negatively associated with success in the master's program, indicating that those students not majoring in speech-language pathology were more likely to be successful in the graduate program than those majoring in speech-language pathology. GRE was least effective in predicting success in the master's program. Additionally, the function calculated for Group 1 was adequate to predict the success of Group 2 students with 80% accuracy. Limitations to this study included a limited sample size from one university that may not be representative of all students of speech-language pathology. Additionally, the researchers indicated that other more elusive and subjective measures of student success were not included in the study. The researchers recommended that other programs conduct studies to analyze predictive factors of success in completing the credential in speech-language pathology.

Ryan et al. (1998) focused their research specifically on the extent to which various admission criteria for graduate programs in speech-language pathology were able to predict pass rates on the National Examination in Speech Language Pathology (NESPA) to determine whether the GRE was an effective predictor of performance. The purpose of the study was to quantify the relationships between each pre-admission predictor and student performance on the NESPA, as well as to identify variables that may be successful in predicting outcome performance.

Ryan et al. (1998) reviewed records of 96 students from two comparable graduate programs, one in New York ($n = 61$) and one in Texas ($n = 35$). No statistical differences in data were found in the two groups, and the data was pooled. The records for each student included GRE scores, GPA, undergraduate major status, and presence of personal interview. Not all students were required to report NESPA scores, and GGPA was not available for all. Thus, a NESPA subgroup of 84 students and a GGPA subgroup of 94 students were available. The researchers ultimately created four subgroups: (1) undergraduate major ($n = 51$) versus preparatory students ($n = 33$); (2) personal interview ($n = 19$) versus no interview ($n = 65$); (3) students with GRE 1+2 scores > 1000 ($n = 23$) versus those with scores < 1000 ($n=61$); and (4) students with GRE total scores > 1400 ($n = 48$) versus those with scores < 1400 ($n = 36$). Descriptive statistics and Pearson r correlation coefficients were calculated for variables under consideration. Multiple regression analyses and t-tests using SPSS were conducted on all four subgroups to test between mean NESPA scores. The results indicated that GRE scores were a poor predictor of NESPA performance. Likewise, a minimal relation was found between UGGPA or GGPA and NESPA. According to the findings of this study, two of the

methods of graduate program admission that most heavily relied upon criteria were not predictive of ultimate success on the NESPA. Interestingly, the results of the study indicated that students with a pre-admission interview had a higher NESPA score. Another interesting finding was that “preparatory” students, or those without an undergraduate major in speech-language pathology, had somewhat higher scores on the NESPA. Although the authors did not directly name any limitations of this study, some include a somewhat small sample size from only two academic institutions in the United States. The researchers posited that future studies could include other factors such as student traits, graduate program, and clinical performance ratings. Ryan (2000) added 34 students to the database and reanalyzed the data. The results from that study indicated very little change.

Halberstam and Redstone (2005) conducted a correlational study to determine whether applicant variables exist that would predict performance of graduate students in Speech-Language Pathology at Lehman College of the City University of New York. The researchers investigated whether significant relationships could be found between the graduate grade point average (GGPA) and objective measures of admission criteria - undergraduate grade point average (UGGPA), speech prerequisite grade point average, undergraduate major, age (at admission), and native English speaker status - as well as subjective measures of admission criteria - letters of recommendation, personal essay, and previous work experience. The results of the study were intended to add to the body of literature concerning the relation between predictive admission criteria and graduate student success in the field of speech-language pathology.

Halberstam and Redstone (2005) selected and classified a sample of 23 students' admission files from a master list of those who graduated between fall 2001 and summer 2002 or had completed more than 30 hours of graduate credit by summer 2002. Group 1 consisted of the weakest students, as rated by nine members of the academic staff; and Group 2 consisted of the strongest students, as rated by the same academic staff. Students in both groups maintained a GPA of 3.0 or more and were in the process of meeting all standards set forth by ASHA. The categorization of groups into two levels was considered a subjective criterion variable, and the students' graduate GPA was considered an objective criterion variable. The objective predictor variables included undergraduate grade point average, undergraduate grade point average for speech prerequisite courses, age at admission, undergraduate major, and whether the student's native language was English. The subjective predictor variables included ratings of letters of recommendation, personal essay, and previous work experience. A 4-point scale ranging from 1 = fair to 4 = excellent was utilized to judge the letter of recommendation and the personal essay. A 4-point scale ranging from 1 = no work experience to 4 = work in the field as a speech teacher or in a similar role was utilized to judge previous work experience. The inter-rater reliability coefficients were .09 or higher for all three subjective predictor variables. Correlation coefficients were calculated for the criterion variables and the objective and subjective predictor variables. The results indicated that the letters of recommendation variable was significant at the .05 level; undergraduate GPA, speech prerequisite GPA, and personal essay were significant at the .01 level. This study was limited by the small sample size and the inclusion of only Lehman College, resulting in difficulty generalizing the findings beyond the sample. The

researchers recommended that further predictive studies be completed at other academic institutions both in the United States and abroad.

Reed (2007) investigated admissions criteria that predict success in a master's level communication sciences and disorders program at a traditionally black university. Success was defined as passing the Praxis exam in speech-language pathology. In this study, a quantitative research design was implemented using a retrospective records review with data analysis conducted through Pearson Product-Moment correlational analysis and multiple regression. Of the 44 records, 43 were successfully extracted from academic files of students enrolled in the master's degree program in Communication Sciences and Disorders at Alabama A & M University during a time frame of three and a half years. The ethnic diversity comprised 26 (59%) Caucasians, 16 (36%) African Americans, 1 (2%) American Indian, and 1 (2%) other. The predictor variables included Undergraduate Grade Point Average (UGPA), GRE General Test verbal subtest score, GRE General Test verbal and quantitative scores, and clinical practica GPA. Results of multiple regression analysis and Pearson Product-Moment indicated that GRE verbal subtest score, the sum of GRE verbal and quantitative subtest scores, and UGPA, in concurrence with the total of verbal and quantitative GRE scores, were predictors of first-time passing of the Praxis exam.

Reed (2007) indicated a limitation to the study, in that only one ASHA accredited historically black university that offered a master's degree in Communication Sciences and Disorders was included. The recommendations for future research that were included in the study were (1) further examination of the significance of GPA and GRE subtest scores at other universities to confirm the propriety of these variables being used as

requirements for admission, and (2) the quantification of the value of letters of recommendation in the admission process. Additionally, the recommendation was made that future research include how to best predict the success of minority students in master's programs in Communication Sciences and Disorders programs in order to increase their representation in the field (Reed, 2007).

Garrity et al. (2008) engaged in a research study entitled "Relationships Among GPA, GRE, and Praxis II Scores in CSD Students" in order to examine the relationships among the UGPA, GRE-verbal, GRE-quantitative, GRE- analytical, Praxis II scores, and maternal education level. The sample of 28 was enlisted from Communication Sciences and Disorders (CSDS) majors at Armstrong State University during the fall and spring semesters of 2008. Due to the small sample size, correlational analyses were used to determine the strength of associations among the variables. The results revealed a significant correlation between GGPA and Praxis II scores ($r = .87$). A moderate correlation was found between GRE-verbal and maternal educational attainment ($r = .41$).

Kjelgaard and Guarino (2012) investigated the predictive validity of undergraduate GPA, GRE-Q, and GRE-V scores on the graduate GPA using Astin's I-E-O model as a theoretical framework. They also investigated the predictive validity of the graduate GPA on the Praxis exam score. The researchers conducted a retrospective record review of 122 students who completed the graduate program in speech-language pathology at a school in the northeastern United States using SPSS regression analyses. The results supported the predictive validity of undergraduate GPA and GRE-Q/GRE-V scores in the graduate GPA. Likewise, the predictive validity of the graduate GPA on the Praxis exam was supported. They suggested using Astin's I-E-O Model as a theoretical

framework for future research to investigate the predictive validity of admissions criteria on student success in the field of speech-language pathology.

As in speech-language pathology, the counseling field has similar issues in identifying predictive admission criteria for their programs. Rather than examining predictors of success in master's programs in speech-language pathology, Schmidt, Homeyer, and Walker (2009) studied the Counselor Preparation Comprehensive Exam (CPCE). They investigated the correlation between counseling students' pre-admission variables of UGPA, GRE verbal and quantitative scores, and scores on the (CPCE) at one counselor education program in central Texas. The researchers intended to provide useful information for counseling program administrators regarding effective admission criteria.

Schmidt et al. (2009) reviewed pre-admission records of 403 students enrolled between 1998 and 2005 in a counseling program at a large university in central Texas. All students were admitted based on their application materials consisting of letters of recommendation, writing sample, UGPA, and GRE (combined minimum score of 900 for GRE-V and GRE-Q). The sample included 84% women ($n = 340$) and 16% men ($n = 63$). Most (88%) were Caucasian, with some Hispanic (8%), few African American (2%), and fewer Asian (1%). Three data sets were collected on each student: (1) demographic data (gender, ethnicity, and program emphasis); (2) admissions data (UGPA, last 60 hours, GRE-V, and GRE-Q scores); and (3) CPCE total score and eight subscale scores. Multiple regression analyses were conducted for the dependent variables of CPCE total score and eight subtests. Descriptive statistics, Pearson moment correlations, partial correlations, and logistic regression also were calculated for the variables being

considered. Evidence was found that UGPAs, GRE-V scores, and GRE-Q scores were valid in predicting CPCE total scores for students in this sample, but the variation of 21% was somewhat small (the variability ranged from 3% to 16% for the subtests of the CPCE). They also found evidence that GRE-V was the strongest predictor of, not only the total CPCE, but also of the eight subtests.

The researchers indicated limitations to the study because the data gathered was from students enrolled in only one master's program in counseling in central Texas. Additional limitations were due to the lack of factors being considered such as testing environment, personal issues, and situational stressors that could diminish a student's ability to pass the CPCE. Recommended future research included investigating other evaluative measures such as observation skills and clinical performance, as well as sampling a more diverse population.

Conceptual Framework

Astin (1991) has been involved in educational assessment for more than 25 years. As a result of his experience and practice, he developed the three-pronged Input-Environment-Outcome (I-E-O) model. The foundation of the (I-E-O) model is that educational achievement, otherwise known as outcome (O), is a result of individual student characteristics, otherwise known as input (I), that affect individuals' engagement with their educational environment, otherwise known as environment (E) (Kjelgaard & Guarino, 2012).

According to Astin (1991), Input (I) is what the individual student brings to the table at the outset of the educational experience. He described different types of student input including fixed student attributes (demographic data); cognitive functioning (GPA

and standardized admissions tests); aspirations and expectations (self-predictions, degree aspirations, major field of study); self-ratings; values and attitudes; behavioral patterns; educational background characteristics; and other input measures. Input measures correlate with both environmental and outcome measures (Astin, 1991).

Environment (E) is the student's ability to receive and master the information provided during the course of the educational experience. There are two types of environmental data: between-institution measures and within-institution measures. Astin (1991) noted that between-institution measures include structural characteristics such as size selectivity, types of control, highest level of degree offered, budget, size of library, etc.; while within institution measures include classes taken, characteristics of students in the program, characteristics of campus services and facilities, courses taken, characteristics of professors, living arrangements, marital status, number of children, and amount of time devoted to activities (studying, reading, sleeping, recreation, etc.).

Astin (1991) stated that Outcome (O) is the student's development that the institution influences by providing the program of study support. Outcomes also are known criterion variables, output variables, aims, goals, and/or objectives. Outcome is the ultimate product of the interaction of student input with student environment.

Summary

An increasing demand exists for speech-language pathologists in the United States. The Bureau of Labor Statistics predicts that by 2020 job openings in speech-language pathology will increase by 23% (U.S. BLS, 2013). Thus, in order to meet the increasing need for speech pathologists, those who occupy those limited seats must successfully complete the credential. When they do not, it is a lose/lose situation. For the

student, the loss encompasses a career path, monetary investment, and time investment. For the faculty member, the loss is in time and expertise. Additionally, students who could have successfully completed the credential have lost out on instruction by not occupying a seat in the program.

The general history of the development of speech-language pathology, dating back to 2500 BC in ancient Greece, Rome, Mesopotamia, and Egypt and evolving through the Middle Ages, Renaissance, 18th, 19th, and 20th centuries, sets the stage for current practices (Duchan, 2002). In order to become a speech-language pathologist, one must engage in a rigorous process of credentialing that includes a graduate degree from an accredited institution of higher learning, passing a national Praxis exam, and engaging in a post-graduate clinical fellowship year (ASHA, *n.d.* - b). Standardized tests (ACT, GRE, and Praxis II) are mechanisms throughout the credentialing process that measure one's qualification for entrance to both the educational and clinical practice.

Limited research investigates predictors of success on the Praxis exam in speech-language pathology. The studies included in this literature review were primarily empirical research pieces on pre-admission predictive criteria for graduate student performance. The purposes of the seven studies all related to the ability to predict student success with pre-admission criteria, including information such as GRE scores, UGGPA, pre-admission interview, letters of recommendation, undergraduate major, and level of maturity. Six studies focused specifically on the field of speech-language pathology (Forrest & Naremore, 1998; Garrity et al., 2008; Halberstam & Redstone, 2005; Kjelgaard & Guarino, 2012; Reed, 2007); and one focused on the field of counseling (Schmidt et al., 2009). All studies relied on retrospective record review. The focus of the

research by Halberstam and Redstone (2005) was on predicting student success in speech-language pathology graduate programs with applicant variables. Forrest and Naremore (1998) also studied the predictive ability of application materials in speech-language pathology. Ryan et al. (1998) focused their study on the extent to which various admission criteria for graduate programs in speech-language pathology were able to predict pass rates on the NESPA exam. Reed (2007) focused on admissions criteria that predict success in a master's level Communication Sciences and Disorders program at a traditionally black university. Garrity et al. (2008) examined the relationships among the UGPA, GRE-verbal, GRE-quantitative, GRE analytical, Praxis II scores, and maternal education level. Kjelgaard and Guarino (2012) studied the predictive validity of undergraduate GPA, GRE-Q, and GRE-V scores on GGPA using Astin's I-E-O model as a theoretical framework. They also studied the predictive validity of the GGPA on the Praxis exam score. Schmidt et al. (2009) did not deal with the field of speech-language pathology. Rather, they focused on the field of counseling, investigating the correlation between pre-admission variables and scores on the CPCE.

All studies (Forrest & Naremore, 1998; Garrity et al., 2008; Halberstam & Redstone, 2005; Kjelgaard & Guarino, 2012; Reed, 2007; Ryan et. al., 1998; Schmidt et al., 2009) were quantitative research based on retrospective record review. All found that pre-admission variables do indeed predict graduate student performance, but consistency among studies was varied. Forrest and Naremore (1998) discovered that students from the top and bottom half of the group who entered Indiana University in the MA program in speech-language pathology could be identified with 93% accuracy based on UGPA alone. They also found that undergraduate major was negatively associated with success

in the master's program. Ryan et al. (1998) revealed that GRE scores were a poor predictor of NESPA performance, and little correlation was found between UGGPA or GGPA and NESPA. In addition, they discovered that students without a major in speech-language pathology had somewhat higher scores on the NESPA, similar to the findings of Forrest and Naremore (1998). Halberstam and Redstone (2005) found that undergraduate GPA, speech prerequisite GPA, and personal essay were correlated ($p < .01$) with graduate student performance. Reed (2007) noted that GRE verbal subtest scores, the sum of GRE verbal and quantitative scores, and UGGPA in concurrence with the sum of verbal and quantitative GRE scores were predictors of first-time passing of the Praxis exam. Garrity et al. (2008) discovered a significant correlation between GGPA and Praxis II scores and a moderate correlation between GRE-Verbal and maternal educational attainment. Kjelgaard and Guarino (2012) found that their results supported the predictive validity of undergraduate GPA and GRE-Q/GRE-V scores in the graduate GPA. Likewise, the predictive validity of the graduate GPA on the Praxis exam was supported. Relative to the field of counseling, Schmidt et al. (2009) discovered that UGPA, GRE-V, and GRE-Q were valid to a small degree for predicting CPCE scores, which was not found in the other studies. They also learned that GRE-V was the strongest predictor of total CPCE performance as well as performance on the eight subtests.

Astin's (1991) three-pronged Input-Environment-Outcome (I-E-O) model proposed that student outcomes are influenced by both student inputs and environmental factors. The foundation of the (I-E-O) model is that educational achievement, otherwise known as outcome (O), is a result of individual student characteristics, otherwise known

as input (I), that affect individuals' engagement with their educational environment, otherwise known as environment (E) (Kjelgaard & Guarino, 2012).

Conclusion

This chapter presented the Review of the Literature for this research study. The following chapter will present the research design and methodology for the study.

CHAPTER III: RESEARCH DESIGN AND METHODOLOGY

Introduction

The research conducted in this study was a quantitative analysis of postsecondary data made available from three state-supported comprehensive institutions in Kentucky. Data were analyzed to examine the extent to which prediction of success on the Praxis Exam in speech-language pathology could be determined. The sample consisted of graduates from the graduate program in speech-language pathology at three state-supported comprehensive universities in the Commonwealth of Kentucky during the years of 2008-2012. Descriptive statistics, inferential statistics and logistic regression were used to analyze data in an attempt to identify the impact of the independent variables on the dependent variable. This chapter reviews the design and data sources, population and sample, variables, and statistical analysis procedures that were utilized in this research study.

Sources of Data

Data were collected from the program files using a Student Records Analysis Summary form developed by the investigator (see Appendix A). The population for this retrospective study was comprised of students who had completed the graduate program in speech-language pathology at three state-supported comprehensive universities in the Commonwealth of Kentucky during the years of 2008 - 2012. The investigator collected the demographic, admission, grade point data, and Praxis exam scores from the program administrators at the respective universities.

Population and Sample

The population for this study consisted of students who graduated from the graduate programs in speech-language pathology at three state-supported comprehensive universities in the Commonwealth of Kentucky in the years of 2008-2012. The set of complete data records obtained from the three above-mentioned Kentucky universities constitutes the effective sample.

Variables in the Study

The dependent and independent variables are consistent with the designated blocks of factors in Figure I (see Chapter I). These variables are described below.

Dependent Variable

The dependent Outcome (O) variable for this study was the score on the Praxis exam in speech-language pathology obtained from the program administrator for each program. A minimum ratio score of 600 constituted a passing score.

Independent Variables

The study included two conceptually distinct types of independent variables consistent with Astin's (1991) I-E-O model: Input (I) variables and a mediating Environment (E) variable. Specific predictors included are described below.

Input (I) Variables

The research is designed to identify different personal demographic factors likely to impact school achievement. Specific demographic considerations were included as follows.

Age (AGE) is the ratio scale coded per age of each student at time of admission to graduate program.

Gender (GENDER). Two nominal categories coded 0 = Male and 1 = Female were recorded for each student.

ACT (ACT). ACT composite ratio score were recorded for each student.

Two-year Grade Point Average (2 GPA). The two-year cumulative GPA was recorded for each student on a 4-point ratio scale.

Grade Point Average (GPA). The four-year undergraduate cumulative GPA was recorded for each student on a 4-point ratio scale.

Graduate Record Exam (GRE). GRE-T, GRE-V, GRE-Q, and GRE-W ratio scores were recorded for each student.

Mediating Environment (E) Variable

According to Astin's (1991) I-E-O model, the environment (E) of the student was reflected in Graduate Grade Point Average (GGPA) and considered to be a mediating factor in the student's success on the Praxis exam. The environment (E), in this case GGPA, reflects institutional differences such as structural characteristics of size, selectivity, types of control, highest level of degree offered, budget, size of library, etc., and within institution measures such as courses taken, characteristics of students in the program, characteristics of campus services and facilities, characteristics of professors, living arrangements, marital status and number of children, and amount of time devoted to activities (studying, reading, sleeping, recreation, etc.).

Graduate Grade Point Average (GGPA). Graduate cumulative GPA was recorded for each student on a 4-point ratio scale.

Analysis of the Data

The purpose of this research was to investigate the extent to which selected variables may serve to predict success on the Praxis exam in speech-language pathology. This study addressed the effects of the student characteristics of age, gender, ACT scores, and two-year undergraduate GPA (input), and the ability to understand instruction as reflected in Graduate GPA (environment) on the Praxis performance (output). Data for this investigation were analyzed to examine the relationships among demographic and admission requirements for undergraduate and graduate programs in speech-language pathology (input) on the ability to understand curriculum, as reflected in the graduate GPA (environment) and the Praxis exam (outcome), as well as to determine the predictive value of input and mediating variables on the outcome variable.

Data Screening and Checking

The first step in the analysis was data screening and checking. Data were checked to ensure that they had been accurately recorded. Data for students who had started and withdrawn from the program were discarded.

Steps in the Analysis

After the data had been entered and checked for missing data, the analysis involved correlation and stepwise regression, the primary analytic tool for this investigation. The analyses utilized for each research question are listed in Table 1. For the reader's information, the research questions are listed following Table 1.

Table 1

Relationship of Type of Analysis to Independent and Dependent Variables by Research Questions

| Research question | <u>Independent variables</u> | | <u>Dependent variable</u> | |
|-------------------|------------------------------|---------------------------|---------------------------|---------------------|
| | Input (I) | Mediating Environment (E) | Output (O) | Analysis |
| 1. | Demo*/UGPA/GRE/ | GGPA | Praxis | Correlation |
| 2. | GPA/GRE | | Praxis | Correlation |
| 3. | GRE | GGPA | Praxis | Correlation |
| 4. | | GGPA | Praxis | Correlation |
| 5. | Demo/UGPA/GRE | GGPA | Praxis | Stepwise regression |

* Demographic data included ACT and 2- year UGPA

Research Questions

The central research question guided the research for this study: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology? The study was led by five research questions:

1. To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the four-year graduate GPA; and (d) the Praxis exam?
2. To what extent does the four-year GPA correlate with scores on (a) the GRE, (b) the GGPA; and (c) the Praxis exam?
3. To what extent do scores on the GRE correlate with the GGPA and scores on the Praxis exam?

4. To what extent does the GGPA correlate with scores on the Praxis exam?
5. To what extent may one determine which variables or combination of variables are the most probable indicators of success on the Praxis exam?

Analysis of the Data

The principle method of analysis for this investigation was stepwise regression, which is a statistical technique that explores the best combination of variables that predict the dependent variable. Stepwise regression is indicated when the goal is to create an accurate and tightly fitted predictive model by excluding variables that do not add to explaining the dependent variable (University of Texas, 2007). This exploratory technique is utilized when the goal of the researcher is to establish a parsimonious structure for data collection in future research. In addition to stepwise regression, standard statistical procedures including descriptive statistics and correlation coefficients were utilized (see Figure 2). The analyses indicated in Table 1 were followed to answer the research questions. For each question, the independent and dependent variables are indicated, as well as the statistical procedure used.

Descriptive Statistics

Descriptive statistics provide a quantitative impression of the data by classifying and summarizing. This study examines the minimum, maximum, range, mean, percentile, and standard deviation to determine variable characteristics.

Pearson Correlation

The most commonly used correlation coefficient in the behavioral sciences is the Pearson product-moment correlation coefficient, otherwise known as Pearson r or r . This statistical operation provides an index of the degree of relationship between two variables.

The nearer the r is to either -1 or +1, the stronger the relationship that exists between variables. It must be remembered that r indicates relation, not causation (Hinkle, Wiersma, & Jurs, 1998). This method was utilized to answer Research Questions 1-3 in this study.

Stepwise Multiple Regression

Stepwise multiple regression is a technique utilized when the researcher desires to explore the best combination of independent variables that predict the dependent variable with as few terms as possible. It occurs when independent variables are individually entered into the solution model based on pre-established statistical criteria, in this case, statistically significant Pearson correlation coefficients (Nie, Hull, Jenkins, Steinbrenner, & Bent 1970). After each variable is entered into the model, a significance test is completed to determine the contribution of that particular variable. If it does not contribute to the significance of the regression, the variable may be deleted (Hinkle et al., 1998). This model was determined to be the most suitable statistical operation for Question 5 in this study because the goal was to explore the best combination of variables that predict scores on the Praxis exam in speech-language pathology.

Reliability and Validity Considerations

Research tools consist of the methods or equipment used to gather information for a particular study and must possess certain characteristics to ensure their fidelity. According to Slavin (2007), two critical issues occur in test measurement: reliability and validity.

Reliability is the degree to which a test measure is consistent in obtaining the same results over time and between examiners. When assessment instruments are

generated, computation of reliability statistics is recommended. Several methods can be used to compute reliability coefficients (Wiersman & Jurs, 2009).

Validity refers to the degree to which a particular testing instrument measures what it purports to measure. No single numerical score of an assessment's validity exists. The researcher(s) must establish that the assessment is valid (Slavin, 2007).

The dependent variable in this study is the Praxis examination in speech-language pathology. The validity and reliability of this instrument are examined. A measurement of reliability allows researchers to generalize beyond the immediate items on a test form to all items that could be included. Reliability measures for the Praxis exam in speech-language pathology were computed using Kuder and Richardson's 1937 formula 20 (KR 20) (ETS, 2010). The reliability coefficient was reported as 0.88, indicating a high degree of reliability.

According to the 2010 ETS Praxis Technical Manual:

the main source of validity evidence for licensure tests comes from the alignment between what the profession defines as knowledge and/or skills important for safe and effective practice and the content included on the test (Standards for Educational and Psychological Testing, 1999). The knowledge and skills that the test requires the test taker to demonstrate must be justified as being important for safe and effective practice at the time of entry into the profession...the link forged between occupational content and test content is based on expert judgment by practitioners and other stakeholders in the profession who may have an informed perspective about requisite knowledge and skills. (p. 15)

Ethical Considerations

Permission for this research study was obtained from the Human Subjects Review Board at Western Kentucky University (Appendix B). The purpose of this approval is to guarantee that confidentiality is met and that the study poses no more than minimal risk of threat or harm to any participants. No student identification was utilized in the collection of data; thus, the study posed no risk or threat to individuals. The application received the status of Exempt from Full Board Review.

Limitations

A point worth noting is that some statisticians recommend caution when using stepwise multiple regression, as the computer makes the decisions as to which order to input the variables and, in some cases, the results may be inflated. However, in the case of exploration, as in this research study, the use of stepwise regression is the more powerful method of finding the data set that best predicts success on the dependent variable, thereby streamlining data collection and analysis in future research.

An additional limitation is in the completeness of the data. Some data points sought may not be possible to obtain from participating institutions, thereby making it impossible to fully incorporate all data points. This is likely due to different institutions collecting data in different ways, which complicates data collection.

Furthermore, the educational delivery methods and assessment may differ among faculty as well as among institutions. No control of variability exists in instructional delivery or assessment. Criteria for grading systems utilized in different institutions may vary based on instructor. Thus, grading may differ among instructors and institutions, making generalizability of undergraduate GPA and graduate GPA difficult to ensure among programs.

No control was employed for the amount of time to complete the program. Thus, some students may have taken more time than others to complete the degree and take the Praxis exam.

Finally, subjective factors such as clinical ratings and personal attitudes, while important in gaining clinical knowledge and skill, were not included in this study. Thus, these subjective factors may contribute to successful demonstration of comprehensive knowledge in areas specific to the profession of speech-language pathology, as determined by the Praxis exam.

Summary

This research analysis was discussed relative to retrospective record review of graduate students at three comprehensive state-supported institutions in Kentucky. Astin's (1991) Input-Environment-Outcome (I-E-O) model will guide this quantitative study. Data will be analyzed using SES to provide descriptive, inferential, and stepwise multiple regression statistics. Validity and reliability considerations were discussed. The study was approved by the IRB at WKU. Possible limitations to the study were presented.

Conclusion

This chapter presented the methodology for this research study. The following chapter will present findings.

CHAPTER IV: RESULTS

Introduction

The purpose of this research study was to investigate variables that could predict success on the Praxis examination in speech-language pathology. This chapter discusses findings from the theoretical perspectives presented in Chapter I and reports the impact of Independent (input) variables of two-year GPA, ACT, UGPA, and GRE and the mediating (Environment) variable of GGPA on the Dependent (Outcome) variable. The Dependent variable is the reported outcome on the Praxis exam in speech-language pathology. The data was made available from three state-supported regional universities in Kentucky.

Research Questions

The central research question guided the research for this study: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology? The study was led by five research questions:

1. To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the four-year graduate GPA; and (d) the Praxis exam?
2. To what extent does the four-year GPA correlate with scores on (a) the GRE, (b) the GGPA, and (c) the Praxis exam?
3. To what extent do scores on the GRE correlate with the GGPA and scores on the Praxis exam?
4. To what extent does the GGPA correlate with scores on the Praxis exam?

5. To what extent may one determine which variables or combination of variables are the most probable indicators of success on the Praxis exam?

The balance of this chapter is separated into sections that address the procedure/process, data screening, statistical analyses, the research questions, and a summary. For the sections on descriptive and correlational statistics, the information reported is consistent with the two types of independent variables in Figure 1 - control (Input) variables and mediating (Environment) variables.

Procedure/Process

The investigator scheduled a visit with each program administrator at three state-supported comprehensive universities in Kentucky to discuss the project and request permission and approval of IRB to use the data for research purposes. Verbal permission, followed by written permission, was granted; and records for graduates of the graduate program in speech-language pathology program during the years 2008-2012 were requested and obtained. Data collected were age; gender; ACT; two-year undergraduate GPA (2 yr. GPA); undergraduate GPA (four-year GPA); GRE (GRE-T, GRE-V, GRE-Q, and GRE-W); graduate GPA (GGPA); and Praxis exam scores.

Data Screening

A total of 281 student records were obtained: 85 from University A; 80 from University B; and 116 from University C. One record was removed from the sample, as one student did not complete the program at University A. As seen in Table 2, the final sample size was 280 student records ($N = 280$). Within this sample, each record did not report all variables requested. For a breakdown of how many students reported data for a specific variable refer to Table 3.

Table 2

School Demographic Data

| | <u>Student Records</u> | |
|----------|------------------------|-----|
| | <i>n</i> | % |
| School A | 84 | 30 |
| School B | 80 | 29 |
| School C | 116 | 41 |
| Total | 280 | 100 |

Statistical Analyses

A retrospective data analysis was implemented in this research study. Simple means and standard deviations were calculated at the descriptive level to describe and summarize the data, as seen in Table 3. Correlation analyses were conducted on the independent and dependent variables to determine significant relationships among the variables, as seen in Table 4. Stepwise regression analyses were performed on the independent and dependent variables to explore which independent variables might predict success on the Praxis exam in speech-language pathology, as seen in Table 5. The dependent (Outcome) variable employed in this study was the score on the Praxis exam in speech-language pathology. Independent (Input) variables included the ACT, two-year GPA, four-year GPA, GRE-V, GRE-Q, GREW, GRE-total, and the mediating factor (Environment) of GGPA.

Table 3

Descriptive Statistics: Summary of Independent Variables

| Variables | <i>n</i> | Missing data points | <i>M</i> | Standard Deviation | Minimum | Maximum |
|------------|----------|------------------------|----------|-----------------------|---------|---------|
| ACT | 231 | 49 | 22.5 | 2.5 | 15 | 29 |
| 2 Year GPA | 248 | 32 | 3.5 | 0.33 | 2.3 | 4.0 |
| 4 Year GPA | 254 | 26 | 3.6 | 0.29 | 2.5 | 4.0 |
| GGPA | 236 | 44 | 3.8 | 0.18 | 3.04 | 4.0 |
| GRE-T | 271 | 9 | 894 | 118 | 480 | 1200 |
| GRE-V | 272 | 8 | 405 | 65 | 270 | 630 |
| GRE-Q | 272 | 8 | 485 | 91 | 210 | 690 |
| GRE-W | 268 | 12 | 3.77 | 0.62 | 0.5 | 5.5 |
| Praxis | 268 | 12 | 656 | 46 | 520 | 800 |

Table 4

Means, Standard Deviations, and Intercorrelations for Selected Analysis Variables

| Variable | <i>n</i> | Mean | <i>SD</i> | Intercorrelations, Pearson Correlations, Coefficients | | | | | | | | |
|-------------|----------|--------|-----------|---|----------|------------------|------------------|-----------|------------|------------|------------|------------|
| | | | | 1 Praxis | 2 ACT | 3 2-Yr GPA | 4 4-Yr GPA | 5 GGPA | 6 GRE-T | 7 GRE-V | 8 GRE-Q | 9 GRE-W |
| 1. Praxis | 268 | 655.70 | 46.26 | | 0.39** | 0.31** | 0.34** | 0.22* | 0.42** | 0.49** | 0.19* | 0.26** |
| 2. ACT | 231 | 22.48 | 2.46 | 0.39** | | 0.34** | 0.32** | 0.24* | 0.59** | 0.54** | 0.40** | 0.18 |
| 3. 2 Yr GPA | 248 | 3.49 | 0.32 | 0.31** | | | 0.79** | 0.40** | 0.21* | 0.26** | 0.12 | 0.15 |
| 4. 4 Yr GPA | 254 | 3.58 | 0.29 | 0.34** | | | | 0.49** | 0.29** | 0.25** | 0.20 | 0.20* |
| 5. GGPA | 236 | 3.81 | 0.18 | 0.22* | | | | | 0.30** | 0.23* | 0.25** | 0.15 |
| 6. GRE-T | 271 | 894.22 | 117.89 | 0.42** | | | | | | 0.65** | 0.82** | 0.26** |
| 7. GRE-V | 272 | 405.25 | 65.16 | 0.49** | | | | | | | 0.16* | 0.30** |
| 8. GRE-Q | 272 | 484.88 | 91.19 | 0.19* | | | | | | | | 0.11 |
| 9. GRE-W | 268 | 3.76 | 0.61 | 0.26** | | | | | | | | |

** $p < 0.0001$ * $p < 0.001$

Table 5

*Stepwise Regression Values Associated With Individual Predictors of Praxis Scores*****p < 0.0001 *p < 0.001 N=181**

| Regression Step | Predictor | <i>R</i> ² Statistics | | <i>R</i> Statistics | | Beta | Beta T-Value |
|--------------------|------------|----------------------------------|-----------------------------|---------------------|------------------|--------|-----------------|
| | | ΔR^2 | Total <i>R</i> ² | <i>R</i> | <i>F</i> - Value | | |
| 1 | GRE Total | 0.215 | 0.215 | .46 | 63.31** | 0.725 | 7.22** |
| 2 | GRE Q | 0.081 | 0.296 | .54 | 26.71** | -0.422 | -4.42** |
| 3 | GPA 4 Year | 0.033 | 0.330 | .57 | 11.35* | 0.175 | 3.07* |
| 4 | GRE W | 0.011 | 0.341 | .58 | 4.12* | 0.116 | 2.03* |

Notes:

-Partial R-Square Values: The unique percentage of variance in the dependent variable explained by the predictor variable.

-Model R Square: The cumulative variance of dependent variables explained with each successive predictor variable added to the equation.

Descriptive Analysis

Descriptive statistics are reported for both the independent and dependent variables. The two types of independent variables - Input (I) and Mediating (M) - are presented in separate sections. The specific variables within each section follow the framework outlined in Figure 1, as described in Chapter III.

Independent Variables

The independent variables in this research are divided into two groups of Control (Input) and Mediating (Environment).

Control (Input) Variables

The control (Input) variables include demographic factors of age; gender; ACT scores; two-year UGPA; four-year GPA (GRE-T, GRE-V, GRE-Q, GRE-W); and the mediating (Environment) variable of GGPA. Age and gender were eliminated from the statistical analysis, as the sample was 99% female, and age was not a factor that could be controlled.

Demographic factors

The demographic factors are defined as specific characteristics of the student's age, gender, ACT scores, two - year UGPA, four-year GPA, and GRE scores. The population ranged from 21 to 41 years of age, with a mean of 23.14. Records for four males were included in the data. Thus, the sample may be described as 99% female.

Table 3 reflects the distribution of ACT scores for the population used in this study, with 49 missing data points. The population sample exhibited a fairly normal distribution of scores, ranging from 15 to 29 ($M = 22.5$; $SD = 2.5$). The two-year UGPA ranged from 2.29 to 4.0 ($M = 3.5$; $SD = .033$) on a 4-point scale, with 32 missing data points. The four-year GPA ranged from 2.5 to 4.0 ($M = 3.6$; $SD = 0.29$) on a 4-point scale, with 26 missing data points. The GRE-Total ranged from 480 to 1200 ($M = 894$; $SD = 118$), with 9 missing data points. The GRE-V ranged from 270 to 630 ($M = 405$; $SD = 65$), with 8 missing data points. The GRE-Q ranged from 210 to 680 ($M = 485$; $SD = 91$), with 8 missing data points. The GRE-W ranged from 0.5 to 5.5 ($M = 3.77$; $SD = 0.62$), with 12 missing data points.

Mediating Environment (E) Variable

The mediating environment (E) variable was the GGPA. The GGPA can mirror institutional differences such as structural characteristics of size, selectivity, types of control, highest level of degree offered, budget, size of library, etc., and within institution measures such as courses taken, characteristics of students in the program, characteristics of campus services and facilities, characteristics of professors, living arrangements, marital status and number of children, and amount of time devoted to activities (studying, reading, sleeping, recreation, etc.). The GGPA reflects the environment as interpreted by the student and reflected in the GGPA. According to Table 3, the GGPA ranged from 3.04 to 4.0 ($M = 3.8$; $SD = .18$) on a 4-point scale with 44 missing data points.

Dependent Variable Praxis Exam in Speech-Language Pathology

The dependent variable in this study was passing the Praxis exam in speech-language pathology with a score of 600 or higher. According to Table 3, the Praxis scores ranged from 520 to 800 ($M = 656$; $SD = 46$), with 12 missing data points.

Correlation and Stepwise Regression Analysis

In order to answer the first three research questions, correlational analyses were implemented to determine a relation between specific variables and the power of that relationship. Stepwise regression analysis was utilized to explore the best set of predictors for the Praxis exam in speech-language pathology. Stepwise regression analysis was selected because of its value in identifying the best set of predictors for a dependent variable. It is a semi-automated process of building a regression model by sequentially adding or discarding variables based on the contribution of the proportion of variance they add to the model (Nau, 2005).

Research Questions

The following five research questions address the relationships among demographic factors or Input variables, mediating or Environment variables, and the Outcome variable of performance on the Praxis exam in speech-language pathology.

Research Question 1

To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the four-year graduate GPA; and (d) the Praxis exam?

The data were analyzed using bivariate correlations. Due to the high proportion of female students, the demographic factor of gender was discarded. Additionally, the demographic factor of age was discarded, as the majority of students was in the age range of 21-25 years. Means, standard deviations, and Pearson correlations for the dependent variable and each of the independent variables are reported in Table 4. The correlations revealed that eight predictor variables were significantly related to the dependent variable. Table 4 summarizes the correlation matrix.

Both the ACT score and two-year GPA were significantly correlated with the four-year GPA. The ACT had a moderately positive relationship, while the two-year GPA had a strong positive relationship with the four-year GPA. Interestingly, the strongest correlation in the study was between the two-year GPA and the four-year GPA with the exception of within GRE subtests. The ACT was significantly correlated with the GRE-T and GRE-V with a strong positive relationship, a moderately positive relationship with the GRE-Q, but minimal correlation with the GRE-W. Although the two-year GPA was significantly correlated with the GRE-T and GRE-V, the correlation

was minimal. While both the ACT and two-year GPA were significantly correlated with the GGPA, the ACT had minimal relation with the GGPA, while the two-year GPA had a moderately positive relation. Both the ACT and two-year GPA were significantly correlated with the Praxis exam, each having a moderately positive relationship.

Research Question 2

To what extent does the four-year GPA correlate with scores on (a) the GRE, and (b) the Praxis exam?

The data were analyzed using bivariate correlations. Pearson correlations for the relationships between the four-year GPA and the GRE-T, GRE-V, GRE-Q, GRE-W, and Praxis are reported in Table 4.

The four-year GPA was significantly correlated with all above-mentioned variables, although no particularly strong relationships were evident. It was found to have minimally positive relationship with the GRE-T, GRE-V, GRE-W, and the GRE-Q. The most robust association was found between the four-year GPA and the Praxis exam, with a moderately positive relationship.

Research Question 3

To what extent do scores on the GRE correlate with the GGPA and scores on the Praxis exam?

The data were analyzed using bivariate correlations. Pearson correlation coefficients for the relationship between the GRE-T, GRE-V, GRE-Q, GRE-W, and the Praxis exam are reported in Table 4.

The GGPA was significantly correlated with the GRE-T, GRE-V, and GRE-Q but not with the GRE-W. The GRE-T revealed a moderately strong positive correlation,

while the GRE-V and GRE-Q indicated minimal relationships. The Praxis exam was significantly correlated with all the above-mentioned variables having a moderately strong relation with the GRE-T and the GRE-V. The relationships with both the GRE-Q and GRE-W were minimal.

Research Question 4

To what extent does the GGPA correlate with scores on the Praxis exam?

The data were analyzed using bivariate correlations. The Pearson correlation coefficient for the relationship between the GGPA and Praxis exam is reported in Table 4. The GGPA was significantly correlated with the Praxis exam but the relationship was minimal. In Astin's (1991) model, the expectation was that these variables would be more highly correlated, which is not evident in this research analysis.

Research Question 5

To what extent may one determine which variables or combination of variables are the most probable indicators of success on the Praxis exam?

Stepwise regression was utilized to predict Praxis scores based on eight individual variables. Four variables were found to be strongly associated with the Praxis scores ($F: 4, 232 = 29.61, p < 0.001, \text{adjusted } R^2 = 0.341; r = .58$). Final results from the stepwise procedure are summarized in Table 5.

The GRE-T revealed the largest amount of variance in the Praxis score that could be explained by its contribution, followed by the GRE-Q, the four-year GPA, and the GRE-W. Although the GRE-Q and GRE-W individually were not among the independent variables most highly correlated with the Praxis score, the combination of their contribution was most significant in predicting performance.

Summary

Descriptive statistics were utilized to describe the population of the study. The sample consisted of 280 graduates from the graduate program in speech-language pathology at three state-supported regional universities in Kentucky. The five empirical research questions were directly connected to the central research question: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology?

The Pearson's correlation coefficients, in response to Research Question 1 (To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the four-year graduate GPA; and (d) the Praxis exam?), indicated a significant, moderately strong correlation between the Act and two-year GPA; while the two-year GPA had a strong relationship with the four-year GPA. The ACT was moderately positively correlated with the GRE-T and GRE-V, moderately correlated with the GRE-Q, with minimal relationship with the GRE-W. The two-year GPA was moderately positively correlated with the GRE-T and GRE-V, and minimally related to the GRE-Q or GRE-W. The ACT had minimal relationship with the GGPA while the two-year GPA had a moderately strong relation. Both the ACT and two-year GPA were moderately positively correlated with the Praxis exam.

In response to Research Question 2 (To what extent does the four-year GPA correlate with scores on (a) the GRE; (b) the GGPA; and (c) the Praxis exam?), Pearson correlation coefficients indicated the four-year GPA was minimally correlated with the

GRE-T, GRE-V, GRE-Q, and GRE-W. A moderately strong correlation was found between the four-year GPA and the Praxis exam.

Using Pearson correlation coefficients in response to Research Question 3 (To what extent do scores on the GRE correlate with the GGPA and scores on the Praxis exam?), the Praxis exam was discovered to be slightly positively correlated with the GRE-T and GRE-V, while the relation was negligible with the GRE-Q and GRE-W.

In response to Research Question 4 (To what extent does the GGPA correlate with scores on the Praxis exam?), the GGPA was significantly correlated with the Praxis exam, but the relationship was weak.

Finally, stepwise regression was used for Research Question 5 (To what extent may one determine which variables or combination of variables are the most probable indicators of success on the Praxis exam?) to explore the best combination of demographic and admission requirements and GGPA to predict success on the Praxis exam performance. Four variables (GRE-T, GRE-Q, four-year GPA, and GRE-W) were found to be strongly associated with predicting performance on the Praxis exam in speech-language pathology.

Conclusion

This chapter presented the results of this research study. The following chapter will summarize and discuss findings.

CHAPTER V: DISCUSSION AND CONCLUSIONS

This retrospective data analysis explored the issue of whether variables could be identified that would serve to predict performance on the Praxis examination in speech-language pathology. This chapter presents the study in brief, a summary of the data, draws a conclusion from the current study, and makes recommendations for future research. The summary includes a restating of the purpose, research questions, a description of the methodology, and findings of the study. The conclusion and recommendations are reported based on the outcomes of each research question. The chapter concludes with a Personal Reflection.

The Study in Brief

The need for skilled speech-language pathologists continues to grow with a reported 23% increase in job openings, or the need for an additional 28,880 positions, according to the Bureau of Labor Statistics in the *Occupational Handbook*, 2012-2013 edition. The aging of the baby-boomer population is one of the reasons cited for this increase. As individuals live longer and grow older, more health issues emerge that produce communication problems including stroke, brain injury, and hearing loss (U.S. BLS, 2013). Additionally, the field of speech-language pathology is a profession ranked in 2013 as one of the top 100 jobs, coming in at #28, by *U.S. News and World Report*. Thus, the increased need of, and desirability for, the profession produce an ever-increasing number of students making application for a limited number of seats in graduate programs. The current climate of limited resources for both students and institutions of higher learning leads to the desire of institutions to be efficient and effective in the outflow of those resources in order to increase the profession of speech-

language pathology. The Praxis exam in speech-language pathology is the gateway through which one must pass to be successfully credentialed in the field. If factors could be identified that best predict success on the Praxis examination prior to admission, programs would be better able to select students that maximize the investment of materials, energy, and expertise, thereby decreasing the potential loss for both students and universities.

Of the few existing empirical research studies that investigate predictors of success on the Praxis exam in speech-language pathology, some have indicated that preadmission criteria predict graduate student performance (Forrest & Naremore, 1998; Garrity et al., 2008; Halberstam & Redstone, 2005; Kjelgaard & Guarino, 2012; Reed, 2007) and others (Ryan et al., 1998) have indicated little correlation between the Praxis exam and preadmission criteria. This limited, somewhat conflicting, research provided incentive for the central research question that guides this study: To what extent do selective variables of graduate admission predict success on the Praxis exam in speech-language pathology?

Research Questions

Five research questions were developed to explore the relationship between two sets of variables (Input and Environment) on the Praxis examination in speech-language pathology (Outcome). Input variables included age; gender; ACT scores; two-year GPA; four-year GPA; and GRE (GRE-T, GRE-V, GRE-Q, and GRE-W). Environment variable was the GGPA. The research questions that guided the investigation were:

1. To what extent do demographic factors of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year undergraduate GPA; (b) the GRE; (c) the graduate GPA; and (d) the Praxis exam?
2. To what extent does the four-year GPA correlate with scores on (a) the GRE; and (b) the Praxis exam?
3. To what extent do scores on the GRE (GRE-T, GRE-V, GRE-Q, and GRE-W) correlate with scores on the Praxis exam?
4. To what extent does the GGPA correlate with scores on the Praxis exam?
5. To what extent may one determine which variables or combination of variables are the most probable indicators for success on the Praxis exam in speech-language pathology?

Summary

Purpose

This research study addressed the issue of whether variables could be identified that would serve to predict success on the Praxis exam in speech-language pathology. This study explored the effects of the student characteristics of age, gender, ACT scores, two-year GPA, four-year GPA, and GRE scores (input) and the ability to understand instruction as reflected in the GGPA (environment) on the Praxis performance (output). The review of the literature guided the selection of variables to include in the research.

The literature review revealed conflicting results among studies. While all studies (Forrest & Naremore, 1998; Garrity et al., 2008; Halberstam & Redstone, 2005; Kjelgaard & Guarino, 2012; Reed, 2007; Schmidt et al., 2009) found that pre-admission variables predict graduate student performance, consistency among studies was varied.

Forrest and Naremore (1998) discovered that UGPA could be identified with those students in the top and bottom half of the class with 93% accuracy. They also found that undergraduate major was negatively associated with success in the master's program. Halberstam and Redstone (2005) found that undergraduate GPA, speech prerequisite GPA, and personal essay were correlated ($p < .01$) with graduate student performance.

Kjelgaard and Guarino (2012) found that their results supported the predictive validity of undergraduate GPA and GRE-Q/GRE-V scores in the graduate GPA. Likewise, the predictive validity of the graduate GPA on the Praxis exam was supported. The findings of the current study are consistent with Kjelgaard and Guarino (2012), in that they both discovered that the undergraduate GPA correlated with the GGPA. The results of the current study, however, found little to no correlation between the GGPA and Praxis exam.

Ryan et al. (1998) revealed that GRE scores were a poor predictor of NESPA performance, and little correlation was found between UGGPA or GGPA and NESPA. In addition, they discovered that students without a major in speech-language pathology had somewhat higher scores on the NESPA, similar to the findings of Forrest and Naremore (1998). Results of the current study are inconsistent with these results, in that the combination of GRE-T, GRE-Q, and GRE-W were found to be partial predictors of the Praxis exam.

Reed (2007) noted that GRE verbal subtest scores, the sum of GRE verbal and quantitative scores, and UGGPA were predictors of first-time passing of the Praxis exam. These results are somewhat consistent with the findings of the current study, as the GRE-T, GRE-Q, and GRE-W and UGGPA in combination were partial predictors of passing

the Praxis. Garrity et al. (2008) discovered a significant correlation between GGPA and Praxis II scores, unlike the findings of the current research, and a moderate correlation between GRE-Verbal and maternal educational attainment.

Relative to the field of counseling, Schmidt et al. (2009) discovered that UGPA, GRE-V, and GRE-Q were valid to a small degree for predicting CPCE scores, which was not found in the other studies. They also learned that GRE-V was the strongest predictor of total CPCE performance, as well as performance on the eight subtests. See Table 6 for a summary of the empirical studies discussed.

This research also framed the study around Astin's (1991) three-pronged I-E-O model that posited student outcomes are influenced by both student characteristics and environmental factors. According to this model, educational achievement, or outcome (O), results from individual student characteristics, input (I), that affect individuals' engagement with the educational environment (E) (Kjelgaard & Guarino, 2012).

Table 6 – *Summary of Empirical Studies in Literature Review*

| Researchers | V Variable | <u>Positive Correlation</u> | | <u>Negative Correlation</u> | | Agreement with current study | |
|---------------------------------------|-------------------------------|-----------------------------|------------------|-----------------------------|------------------|---------------------------------|-----|
| | | Grad School Performance | National Exam | Grad School Performance | National Exam | | |
| Forrest & Naremore (1998) | UGPA | Top half of class | | | | X | |
| | Undergrad Major | Bottom half of class | | Success in grad school | | N/A | N/A |
| Halbertstam & Redstone (2005) | UGPA | | | | | X | |
| | 2-Year GPA | Success in | | | | X | |
| | Personal Essay | grad school | | | | X | |
| Kjelgaard & Guarino (2012) | UGPA; GRE-V; GRE-Q | GGPA | | | | | X |
| | GGPA | | Praxis | | | | X |
| Ryan et al. (1998) | GRE Scores | | | | Praxis | | X |
| | UGPA | | | GGPA | Praxis | | X |
| Reed (2007) | UGPA; GRE-V; GRE-V & GRE-Q | | Praxis | | | X Some- what | |
| Garrity et al. (2008) | GGPA | | Praxis | | | | X |
| Schmidt et al. (2009) (Counseling) | UGPA; GRE-V; GRE-Q | | CPCE | | | X Some- what | |

Methodology

Following approval of the study by the Western Kentucky University Institutional Review Board (Appendix B), data were collected from individual student files from three state-supported comprehensive universities in the Commonwealth of Kentucky for the years of 2008-2012. The investigator collected the demographic, admission, grade point data, and Praxis exam scores from the individual program administrators. The study began with 281 student records: 85 from Institution A, 80 from Institution B, and 116 from Institution C. One student record was removed from the sample, as the program was not completed. The final sample size was 280 student records ($N = 280$). Within this sample, it should be noted that each student record did not report all variables requested; statistics were calculated with the data sets received rather than discarding incomplete files. Data points for specific variables ranged from 231-272 (see Table 2).

Analyses for this retrospective data analysis included descriptive statistics and correlation analyses of the predictor variables and the dependent variable of the Praxis examination in speech-language pathology. Stepwise multiple regression analyses were performed on the independent and dependent variables to explore the best set of predictors for success on the Praxis exam.

Findings of the Study

At the outset of this research study, no preconceived ideas were held about which variables would predict success on the Praxis examination in speech-language pathology; it was a mission of exploration. The limited available literature was inconsistent as to the significance of specific predictor variables for success on the Praxis exam. While some studies cited evidence that certain variables such as GRE scores were good predictors

(Garrity et al., 2008; Kjelgaard & Guarino, 2012; Reed, 2007), others (Ryan et al., 1998) found that GRE scores were poor predictors. The ultimate goal of this study was to explore the extent to which empirical evidence could be established for factors that would predict success on the Praxis exam in speech-language pathology, thereby contributing to the body of knowledge in the field of practice. The following provides a summary and analysis of the five research questions. Due to the high proportion of female students, the demographic factor of gender was discarded. Additionally, the demographic factor of age was discarded, due to the fact that the data regarding age was not received from all institutions.

Descriptive Statistics

Descriptive statistics describe basic characteristics of the data utilized in this research study. These figures were calculated for the student records obtained for the sample ($N=280$). The age of students entering the graduate program in speech-language pathology ranged from 21-41, with 22 as the most frequent age reported. In this study, a greater percentage of females (99%) graduated from graduate programs in speech-language pathology as compared to males (1%). In fact, only records from four males were included in this study. These statistics are higher than national norms, where 94.9% of those offered entrance to master's programs in speech-language pathology were female (ASHA 2011a).

Research Question 1

To what extent do demographic factors (Input variables) of age, gender, ACT scores, and the two-year undergraduate GPA correlate with (a) the four-year

undergraduate GPA; (b) the GRE (GRE-T, GRE-V, GRE-Q, and GRE-W); (c) the GGPA (Environment variable); and (d) the PRAXIS exam (Outcome variable)?

Significant Pearson correlations were found between eight predictor variables and the Praxis examination. The following guidelines were used to interpret the correlation coefficients: .10-.30 = minimally strong correlation; .30-.50 = moderately strong correlation; .50 and above = strong correlation (Cohen, 1992). As mentioned previously, the demographic factors of age and gender were discarded, due to the discovery that the data obtained would not be relevant for this study.

The ACT had a moderately positive correlation ($r = .32; p < .0001$) with the four-year GPA and minimal relation with the GGPA ($r = .24; p < .001$). A strong relationship was found with the GRE-T ($r = .59; p < .0001$) and GRE-V ($r = .54; p < .0001$); a moderately strong relation ($r = .40; p < .001$) with the GRE-Q; but minimal correlation with the GRE-W ($r = .18$). Finally, the ACT revealed a moderately strong relationship ($r = .39; p < .001$) with the Praxis exam. It is interesting to note that the ACT showed a strong relationship with the GRE-T and GRE-V. However, a moderately strong relationship was seen with the four-year GPA and Praxis, and little relation with the GGPA.

The two-year GPA revealed a strong correlation ($r = .79; p < .001$) with the four-year GPA; in fact, it had the highest correlation of the entire research analysis. A moderately strong relation was found with the GGPA ($r = .40; p < .0001$). The two-year GPA indicated little relationship with the GRE-T ($r = .21; p < .001$), GRE-V ($r = .26; p < .0001$), GRE-Q ($r = .12$), or GRE-W ($r = .15$). Conversely, a moderately strong relationship ($r = .31; p < .0001$) was found with the Praxis examination.

Discussion

The results of this analysis indicated that, while the ACT was strongly correlated with other standardized tests with the exception of the GRE-W, it was moderately correlated with the four-year GPA and minimally correlated with the graduate GPA. This information may be relevant to consider for making decisions about which students to admit to undergraduate programs.

Additionally, this information may be useful for undergraduate programs in speech-language pathology, in that it appears the two-year GPA is strongly related with the four-year GPA, more so than the ACT score. This information may be useful for graduate programs, in that it provides some evidence of a moderately strong relation between the two-year GPA and both the GGPA and the Praxis exam. Halberstam and Redstone (2005), likewise, found that the two-year GPA was positively correlated with the GGPA. No literature is available to support or conflict with these results, as the ACT and two-year undergraduate GPA were not included in studies discussed in the literature review, except in the case of Halberstam and Redstone (2005).

Research Question 2

To what extent does the four-year GPA correlate with scores on (a) the GRE (GRE-T, GRE-V, GRE-Q, and GRE-W), and (b) the PRAXIS exam?

The four-year GPA revealed a statistically significant, but minimally positive, relationship with the GRE T ($r = .29$ $p > .0001$); GRE-V ($r = .25$; $p > .0001$); GRE-Q ($r = .20$); and GRE-W ($r = .20$; $p > .001$). Conversely, a moderately strong relationship ($r = .34$; $p < .0001$) was found with the Praxis exam. Thus, little correlation was noted

between the four-year GPA and the GRE-T, GRE-V, GRE-W, and GRE-W, but a moderately strong relationship was found between four-year GPA and Praxis exam.

Discussion

These findings indicate a minimal relationship is documented between the four-year GPA and GRE scores and a moderately strong relationship between the four-year GPA and Praxis scores. No literature supports the minimally positive relationship between the four-year GPA and GRE scores, as these correlations were not included in studies in the literature review. The results of this study are not strong enough to support the relationship of the four-year GPA with scores on the GRE. However, the findings support the correlation between four-year GPA and Praxis exam, which may be of interest to admissions committees of graduate programs in speech-language pathology.

Research Question 3

To what extent do scores on the GRE (GRE-T, GRE-V, GRE-Q, and GRE-W) correlate with the GGPA and scores on the PRAXIS exam?

The GGPA was statistically significantly correlated with the GRE-T ($r = .30$; $p > .0001$); GRE-V ($r = .23$; $p < .001$); and GRE-Q ($r = .25$; $p < .0001$); but not the GRE-W. The GRE-T revealed a moderately positive correlation, while the GRE-V and GRE-Q indicated minimal relationship. The Praxis exam was significantly correlated with all the above-mentioned variables, having a moderately strong positive relationship with the GRE-T ($r = .42$; $p < .0001$) and the GRE-V ($r = .49$; $p < .0001$). The relation with both the GRE-Q ($r = .19$; $p < .001$) and GRE-W ($r = .26$; $p < .0001$) was minimal.

Discussion

The results of this study indicate a moderately strong relationship between the GGPA and scores on the GRE-T and GRE-V, but little relation with the GRE-Q and GRE-W. These findings are partially consistent with Kjelgaard and Guarino (2012), who found that the GRE-Q and GRE-V were positively related with the GGPA.

The Praxis exam revealed a moderately strong positive relationship with the GRE-T and GRE-V. These findings are consistent with Reed (2007), who found that the GRE-V and a combination of the GRE-V and GRE-Q were positively related with the Praxis exam. The results may be of interest to graduate program admission committees in speech-language pathology, in that they support the relation of GRE scores, particularly GRE-T and GRE-V, with GGPA and Praxis exam performance.

Research Question 4

To what extent does the GGPA correlate with scores on the Praxis exam?

The GGPA was significantly correlated with the Praxis exam

($r = .22$; $p < .001$), but the relationship was minimal.

Discussion

Findings from this research study indicate that the GGPA has little relationship with performance on the Praxis exam, despite the fact that it appears logical. One caveat that must be added, however, is that the range of GGPA is 3.8-4.0. This restricted range necessarily limits the correlation coefficient. According to Oller (2006), the correlation is reduced when one restricts the range of scores, as are restricted in graduate school admission, and, hence, GGPA. These results are inconsistent with the findings of Kjelgaard and Guarino (2012) and Garrity et al. (2008), who found that the GGPA and

Praxis are strongly correlated with each other. Astin (1991) posited that the foundation of the Input-Environment and Outcome (I-E-O) model is that educational achievement, outcome (O), is a result of individual student characteristics, input (I), affecting individuals' engagement with their educational environment, (E) (Kjelgaard & Guarino, 2012). According to Astin's I-E-O model, the GGPA, as influenced by Input variables, would have been correlated with the Praxis exam.

Research Question 5

To what extent may one determine which variables or combination of variables are the most probable indicators for success on the Praxis exam in speech-language pathology?

Stepwise multiple regression was utilized to predict Praxis scores, based on eight independent variables. Four variables were found to account for 34% of the variance in the Praxis scores $F(4,232) = 29.61, p < .0001$, adjusted $R^2 = 0.341$. The correlation coefficient for the solution was .58, indicating a strong correlation. The GRE-T revealed the largest amount of variance in the Praxis score that could be explained by its contribution, followed by the GRE-Q, the four-year GPA, and the GRE-W. Although the GRE-Q and GRE-W individually were not among the independent variables most highly correlated with the Praxis score, the combination of their contribution was most significant in predicting success. The GRE-V had a .49 Pearson correlation coefficient with the Praxis exam and was not included in the stepwise formula results. This is likely due to the GRE-T subsuming to a degree the score on the GRE-V.

Discussion

Four variables were found to be significant as a result of stepwise multiple regression analysis to explore which combination of factors are suggested as probable predictors of success on the Praxis exam. In order of significance, GRE-T, GRE-Q, four-year GPA and GRE-W exhibited the most significant influence on Praxis performance. The unsquared multiple correlation coefficient was .58, indicating a strong correlation (Cohen, 1992). Additional support for interpreting the unsquared correlation (as opposed to the squared correlation) as an indicator of the strength of association can be found in a study by Brogden (1946) who demonstrated that it is the unsquared correlation is linearly related to the predictive power of a test. This result is of interest to graduate programs in speech-language pathology, in that the four variables may be considered strong predictors of performance on the Praxis exam. While they are strong predictors, there are additional variables that contribute to the total prediction of Praxis scores. These could be innate student characteristics, the sequence of courses taken, clinical experiences obtained, clinical disposition for the profession, or an entirely different factor or combination of factors. Thus, while the question posed has been partially answered, more exploration is needed in order to fully explain the combination of variables that best predict success on the Praxis exam.

The literature presented conflicting results related to four-year GPA in predicting success on the Praxis exam in speech-language pathology. Ryan et al. (1998) found that UGPA was not effective at predicting GGPA or Praxis. The results are consistent with the findings of Reed (2007) and Schmidt et al. (2009) in the field of counseling, both of

whom found that the UGPA and some combination of the GRE were predictive of success on the Praxis exam in speech-language pathology.

Conclusion

The findings from this research study lead to one relevant conclusion. The combination of variables identified by Stepwise Regression analysis - GPA, GRE-T, GRE-Q, and GRE-W are predictors of performance on the Praxis exam. Despite the strong correlation as to what predicts performance on the Praxis exam in speech-language pathology, however, a need remains to continue to search for indicators that will maximize the resources used, both personally and institutionally, for the training of individuals in the field.

Recommendations for Future Research

Throughout this study an attempt has been made for accuracy in exploring those factors that may predict success on the Praxis exam in speech-language pathology. This section includes recommendations for future research that may provide additional information to the limited body of knowledge.

First, because only three universities from one state were included in this study, it is recommended that the study be repeated using a larger sample, including more states. The inclusion of representative universities from across the nation would benefit future studies.

Second, a clinical expertise component was absent in this investigation. It is recommended that clinical ratings of knowledge and skill be included in future research which would allow for expertise, as well as academic skill, to be included in the analysis.

Third, no description of the student's clinical disposition was included in the study. Future research should include some measure of student disposition for the field of speech-language pathology.

Concluding Researcher Reflections

This study has broadened a consciousness of, and appreciation for, those who strive to provide relevant empirical contributions to their field of study. This research began with a review of limited literature that offered inconsistent results regarding the predictive validity of admission variables in the field of speech-language pathology. While the findings were supportive of the results of some of the research in the literature review, they were not supportive of others. Further research is needed to continue to examine those variables that may predict success on the Praxis exam from the point of entry into the program and to contribute to the limited body of available research on the topic.

Failure on the Praxis exam in speech-language pathology contributes to the shortage of speech-language pathologists during a time of increasing need, not to mention the waste of materials, energy, and expertise for both students and universities who have dedicated significant time, energy, and resources for those who may not achieve the credential. Graduate programs in speech-language pathology must continue to explore and identify valid predictors of success on the Praxis exam in order to admit those students at the beginning of the educational process who will maximize the investment of time, energy, and resources of both institutions and students. Perhaps some of information presented in this research may offer opportunities for the continuance of identifying those variables that predict ultimate success, passing of the Praxis exam in

speech-language pathology. Some analysis of coursework in the first two years of the college experience would be valuable predictors of success. In addition, some measure of personal characteristics of student aptitude for the field may assist in predicting success. Utilizing individual and institutional resources wisely is critical to build the capacity of the field of speech-language pathology during a time when the knowledge and expertise it provides is crucial to the well-being of so many individuals and families.

No matter what predictors are discovered, one cannot to lose sight of the worth of the student's personal characteristics and the values they contribute, not only for success in the program but for success in professional development. We must continue to focus on the value of the individual in the quest for quantifiable predictors of success.

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Appendix A: Student Records Analysis Summary Form

| Student number | Age | Gender | Act | 2 Yr. GPA | 4 Yr. GPA | GRE-T | GRE-V | GRE-Q | GRE-W | GGPA | Praxis |
|----------------|-----|--------|-----|-----------|-----------|-------|-------|-------|-------|------|--------|
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Appendix B: Institutional Review Board Approval Letter



A LEADING AMERICAN UNIVERSITY WITH INTERNATIONAL REACH
OFFICE OF COMPLIANCE

DATE: April 19, 2013

TO: Mary Lloyd Moore, MAE, M.S.
FROM: Western Kentucky University (WKU) IRB

PROJECT TITLE: [451734-1] Predictive Admission Criteria in Undergraduate and Graduate Programs in Speech-Language Pathology.

REFERENCE #: IRB 13-344

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: April 19, 2013

REVIEW TYPE: Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

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

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Paul Mooney at (270) 745-2129 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

