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The Ability to Critically Evaluate Research Literature in Speech-Language Pathology

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THE ABILITY TO CRITICALLY EVALUATE RESEARCH LITERATURE IN SPEECH-
LANGUAGE PATHOLOGY

by

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B.S. University of Central Florida, 2017

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Arts
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ABSTRACT

Research in Speech-Language Pathology provides the basis for understanding how and to what degree therapeutic techniques and interventions affect the health and quality of life of individuals with communication disorders. Across numerous healthcare professions, research serves just as important a function and is used to guide the practices of professionals across the public health sector. Several disciplines, including chiropractic, nursing, and physical therapy, rely on the implementation of Evidence-Based Practice (EBP) to ensure that the process of rehabilitation and the techniques employed therein are carried out through the synthesis of best clinical judgment, empirical evidence, and patient values. The field of Speech-Language Pathology also uses EBP as the foundation of intervention and rehabilitation. Research has shown, however, that clinicians in a variety of settings encounter barriers to the implementation of EBP. Such reported barriers include lack of access to current research literature, lack of time with which to review the literature, and difficulty determining the quality of research available. General aims of the present study were: (1) to explore speech pathologists' self-reported patterns of access and use of techniques presented in the current research literature, (2) to investigate their self-rated knowledge of and ability to critically evaluate the research literature, and (3) to examine their knowledge and ability through use of a problem-based survey design. 325 certified Speech-Language Pathologists (SLPs) were administered a brief web-based survey to collect information that might provide insight related to these research questions. Results of the study indicated that, on average, participants access the research literature and utilize techniques found therein with moderate frequency. Findings also reveal that self-rated capacity and research knowledge were significantly greater for respondents who had acquired their PhD and for those who had previously conducted formal research. Significant results were also found when evaluating differences among respondent's place of work by median change in

self-rated research capacity. Furthermore, positive correlations were found between research knowledge and self-rated capacity and research knowledge and research evaluation. These findings call attention to the process through which research methodology is taught in higher education. The findings may also suggest that a more effective and functional model of instruction in this area is critical to the clinical implementation of EBP.

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TABLE OF CONTENTS

LIST OF FIGURES	ix
LIST OF TABLES.....	x
LIST OF ACRONYMS/ABBREVIATIONS	xi
CHAPTER ONE: INTRODUCTION	1
Evidence-Based Practice: Origins and Applications	1
Current Issues with EBP within the Healthcare Sector	3
EBP in Speech-Language pathology: What Do We Know?	5
Methods and Models for Teaching Research Methodology	6
Current Needs: How can we meet them to better implement EBP?	7
CHAPTER TWO: METHODS.....	9
Design.....	9
Item Development	9
Pilot Field Testing.....	10
Pilot Analysis.....	11
Final Survey	12
Participants	12
Item Analysis.....	14
Differential Item Analysis	14
Statistics	15

CHAPTER THREE: RESULTS	16
Sample Characteristics	16
Results of Item Analysis	19
Internal Consistency	19
Item Difficulty and Item Discrimination	20
Response Missingness	21
Results from Differential Item Analysis	21
Research Acquisition and Application	26
Self-Ratings of Research Capability	27
Research Knowledge	27
Evaluation of Research	28
CHAPTER FOUR: DISCUSSION.....	29
Conclusions	33
APPENDIX A: DIFFERENTIAL ANALYSIS GRAPHS	34
APPENDIX B: STATISTICAL ANALYSIS TABLES	41
APPENDIX C: FACE VALIDITY RATING SCALE	46
APPENDIX D: FINAL SURVEY TRANSCRIPT	48
APPENDIX E: RECRUITMENT DOCUMENT	59
APPENDIX F: INFORMED CONSENT DOCUMENT	61
APPENDIX G: IRB APPROVAL FORM.....	63

LIST OF REFERENCES	65
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LIST OF FIGURES

Figure 1: Flowsheet of respondent recruitment	13
Figure 2: Comparison of research capacity between perception groups.	35
Figure 3: Comparison of research capacity between Master's and PhD level participant groups.	36
Figure 4: Comparison of performance (Research Knowledge) between perception groups.....	37
Figure 5: Comparison of performance (Research Evaluation) between perception groups	38
Figure 6: Comparison of performance (Research Knowledge) between Master's and PhD level participants.	39
Figure 7: Comparison of performance (Research Evaluation) between Master's and PhD level participants.	40

LIST OF TABLES

Table 1 Average Item Rating by Judges.....	11
Table 2 Inter-rater Reliability for Face Validity (ICC (2, k))	12
Table 3 Respondent characteristics	18
Table 4 Internal Consistency of Self Rating Items	19
Table 5 Internal Consistency of Research Knowledge and Evaluation Items	20
Table 6 Item Analysis of Research Capacity	23
Table 7 Item Analysis of Research Knowledge	24
Table 8 Item analysis of Research Evaluation.....	25
Table 9 Interpretation of Item Difficulty Index	25
Table 10: Research Acquisition and Use.....	26
Table 11 Current practice area by research capacity, knowledge and evaluation ability.....	42
Table 12 Non-parametric comparisons between items.....	42
Table 13 Correlational results (Rho).....	43
Table 14 Knowledge items by research evaluation items	43
Table 15 Research capacity and evaluation ability by highest degree.....	44
Table 16 Research capacity and evaluation ability by prior research experience	45
Table 17: Survey Sample Table	57

LIST OF ACRONYMS/ABBREVIATIONS

ASHA	American Speech-language Hearing Association
ANA	American Nursing Association
APTA	American Physical Therapy Association
CCC	Certificate of Clinical Competence
CF(Y)	Clinical Fellowship (Year)
EBP	Evidence Based Practice
ICC	Intra-rater Correlation Coefficient
IMRAD	Introduction Methods Results and Discussion
IOM	Institute of Medicine
IRB	Institutional Review Board
NICU	Neonatal Intensive Care Unit
PBL	Problem Based Learning
SD	Standard Deviation
SIG	Special Interest Group
SLP	Speech-Language Pathologist

CHAPTER ONE: INTRODUCTION

Evidence-Based Practice: Origins and Applications

One of the most significant trends in healthcare education and practice today is the emergence and focus on Evidence-Based practice (EBP). EBP is defined by the American Speech-Language and Hearing Association (ASHA) as involving the dynamic integration of: (a) a Speech-language pathologist's (SLP) clinical expertise, (b) patient values, and (c) current best research evidence. EBP at its core is a process requiring 5 distinct steps;

1. Formulating an answerable question regarding practice needs
2. Tracking down the best available evidence to answer that question
3. Critically appraising the scientific rigor, validity and usefulness of the evidence
4. Integrating the critical appraisal of the data with one's clinical expertise and client values and circumstances to apply it to practice decisions
5. Critically evaluating outcomes.

Additionally, ASHA's 2005 position statement highlights an important sixth step in the process by requiring that its members can continually "monitor and incorporate new and high quality research evidence having implications for clinical practice (American Speech-language Hearing association, 2005). Theoretically, EBP promotes the utilization of knowledge gathered from many sources and, through critical evaluation of these data, making informed decisions (in collaboration with the client) regarding the most effective course of treatment/intervention. (Gambrill 2007; Gilgun 2005) This integrated, multistep approach is advocated at both the clinical level and at a broader agency/program level within the field of Speech-Language Pathology. Speech Language Pathology is not the only profession in which EBP is considered important. Several other fields, including nursing, chiropractic, and physical therapy all consider

EBP as one of the most important foundations for evaluating and supporting the provision of optimal care/treatment to patients.

In 2004, the American Chiropractic Association published a position statement regarding use of EBP in chiropractic medicine. In the position statement, the association specifically embraces Sackett and colleagues' definition of EBP as policy (American Chiropractic Association, 2004). To further clarify the necessity of *integration* of research, rather than dependence upon it as doctrine, the association stresses the importance of synthesizing research based techniques with clinical experience and consideration of individual patient needs to provide the most effective care to patients.

Likewise, the field of nursing defines its role as providing quality care to patients through the most beneficial and efficient means possible. Throughout the literature, EBP is cited as the means by which nurses acquire knowledge regarding the most recent and effective methods of caring for their charges. In an article published by the American Nursing Association (ANA), the author cites a previous report from the Institute of Medicine (IOM) which describes the significant gap between current levels of healthcare and the levels of healthcare that are attainable. The author continues, citing several other yearly IOM reports which "consistently identify evidence-based practice (EBP) as crucial in closing the quality chasm" (Stevens, 2013).

Moreover, Physical therapy, a profession like Speech-Language Pathology with regard to its rehabilitative principles, has also adopted EBP as a means through which optimal care may be provided. The American Physical Therapy Association (APTA) has a particular interest in research and the ways in which high quality evidence can improve care and decrease

potentially harmful variation in clinical practice. Though it is not a research-funding organization, APTA has provided resources to its members not only for EBP use in their facilities, but to guide them in conducting research that may better direct their field. Additionally, in 2013, APTA published a position paper endorsing the principles of EBP and its ability “to promote improved quality of care and patient/client outcomes” (American Physical Therapy Association, 2013). EBP is widely supported and adopted by countless health care associations nationwide as a means of maximizing care based efficiency within their fields. However, as is the case with many frameworks showing promise, EBP is not without flaws, and its consistent and effective implementation has met barriers in all corners of the healthcare sector.

Current Issues with EBP within the Healthcare Sector

While in theory, implementation of EBP is a potential key to improving the efficiency and safety of care practices being used across numerous healthcare professions, it is important to consider the reality of the field and both external and internal factors that may inhibit its seamless execution. The use of EBP has been well researched demonstrating strong support for its underlying aims, however its implementation has met with barriers in both out and inpatient settings.

A recent study conducted at the University of Pittsburg used a cross-sectional survey to gather information related to chiropractic professionals’ attitudes, skills, and use of research when using EBP. (Walker, B., Stomski, N., Hebert, J., & French, S, 2014) The researchers also inquired about information regarding difficulties the respondents experienced when implementing EBP. Survey responses were analyzed for frequency of response and significant relationships between key items. Results revealed that nearly a quarter of the 1,314

respondents reported lack of skill at interpreting, locating, and critically evaluating the research literature as the factor having the greatest negative impact on their use of EBP during practice. Other significant barriers included lack of time and lack of support from their facility/organization.

Similarly, a study was conducted with a cohort of 575 nursing professionals, examining attitudes and perceptions of EBP skill and use of literature. However, in addition to factors negatively affecting use, the study also aimed to discover facilitators of EBP use and access to the research literature. The investigators believed that comparisons between the two groups might reveal ways in which use of EBP could be improved. (Abrahamson, K., Fox, R., & Doebbeling, B., 2012) Factors from which the respondents could choose included lack of time with which to review the literature, lack of means through which to access the literature, and lack of supervisor support in both accessing and understanding the research literature. When asked to select the factors that facilitated or impeded their use of research literature, the option “Education/Orientation/Training” was selected the most often as both a facilitator and a barrier. This finding highlighted “training” as a critical mediator in the ability to effectively carry-out EBP.

Continuing to investigate barriers to EBP use in healthcare, a large survey of 1,064 physical therapists was undertaken. This survey also produced similar results to early enquiries. Respondents in this study were asked to rate their rationales for not consulting the literature when planning assessment and intervention. Results demonstrated that 56% of respondents reported lack of research skill, 55% reported lack of understanding of statistical analyses run, and 46.9% reported an inability to apply findings to patients with unique characteristics, as key obstacles (Ramírez-Vélez, R., Bagur-Calafat, M. C., Correa-Bautista, J. E., & Girabent-Farrés, M, 2015). Additionally, significant correlations were observed between the items “lack of

research skill”, and “lack of understanding of statistical analyses run,” indicating that those respondents rating the former as a barrier were more likely to also list the latter as a barrier. The preceding studies reveal a pattern in the perceived difficulties individuals in various healthcare professions experience when conducting a review of the literature to implement EBP. Based on the published findings from these studies, it would appear that difficulty with critically evaluating research literature due to insufficient, knowledge, skill, or training has a significant impact on the consistency with which healthcare professionals’ conduct EBP.

EBP in Speech-Language pathology: What Do We Know?

Evidence based practice is an important component in the fields of Speech Language Pathology, Chiropractic, Physical therapy, and Nursing. The results of several large-scale surveys have indicated that insufficient, knowledge, skill, and training related to research methodology can have a significant impact on evidence based practice. However, research related to EBP conduct within the field of Speech Language Pathology has been scarce. The limited research that has been published has focused upon self-perceived attitudes, and perceptions of EBP in Speech Pathology. To date two nationwide surveys have been conducted that provide some insight.

In 2005, Zipoli and Kennedy conducted a survey of 240 SLPs regarding EBP perceptions. Questions on the survey were related to attitudes, utilization, exposure, and perceived barriers in the implementation of EBP. Results of this investigation indicated predominantly positive attitudes toward the process and rationale behind EBP. The authors noted, however, that though the respondents reported positive attitudes toward EBP, few reported using research literature during clinical decision-making processes. Self-perceived clinical expertise and

consultation with colleagues and supervisors were the most commonly reported methods used to learn therapeutic techniques for treatment planning. The rationale provided most frequently for low use of research literature was lack of time. Incongruently, lack of skills and ability related to research methodology was the least reported rationale. Most concerning was the reported exposure to research and EBP during graduate training compared to that during clinical fellowship year (CFY) training, indicating a steady decline in research exposure once entering the field.

Methods and Models for Teaching Research Methodology

It is well established that knowledge and evidence base are associated with learning and teaching. Alternate models to instructing and reinforcing the process of research education and EBP have included theories of competence, acquisition, clinical decision making via problem based critical thinking, expert practice, peer modeling, mentorship and reflection. No matter which approach is advocated one key factor appears present throughout these models i.e. skill acquisition takes place within the context of actual application. In other words, for research skill to be developed and enhanced – the research process must be performed and practitioners exposed to its application. Problem-based learning (PBL) has received much attention throughout the literature as a potentially more effective method of teaching clinical skills and research methodology than traditional didactic teaching methods.

Though its implementation shows promise for improving information dissemination across the healthcare sector, a major fault of PBL cited in the medical literature is the reliance on prior knowledge. Students with a weaker knowledge base do not benefit as much from PBL methodologies than their more competent peers. Additionally, a meta-analysis of the current

literature related to PBL use in medical programs cited gaps in cognitive –processing between medical students as basis for caution when considering curriculum-wide application of PBL (Albansese & Mitchell, 1993). However, when used in undergraduate-level statistical methods, where prior knowledge was not required, it had much higher effect on improved performance (Karpiak, 2011). Research in nursing education advocates the use of PBL in both entry-level second-year courses (Yu, Lin, Ho, Wang, 2015; Kong, Qin, Zhou, Mou, & Gao, 2014; Marques & Correia, 2017). PBL has also proven to be effective when the information being taught is prior knowledge required for passing national certification exams (Shenouda, Swenson, & Fournier, 2003). While little research reporting effects of PBL on courses specific to Speech Pathology exists, Mok, Whitehall, and Dodd (2008) demonstrated the effects of PBL and concept mapping on the critical thinking skills of speech-language pathologists. Similarly, O'Mullhane and O'Sullivan (2012) have demonstrated that a combination of gaming technology and PBL may significantly improve learning outcomes in students taking graduate level research statistics courses. Clearly, a thorough understanding of research methodology and an ability to critically evaluate research is crucial to the implementation of EBP in Speech-Language Pathology. Given current knowledge of deficits on this topic, PBL may be an effective method to meet the profession's educational needs.

Current Needs: How can we meet them to better implement EBP?

EBP is an important component of evaluation and treatment planning in several healthcare professions, including speech-language pathology. Current research indicates that healthcare practitioners face barriers in the implementation of EBP, including lack of knowledge and skills related to critical evaluation of the current literature. Similar research in speech-language pathology reports lack of training and few means through which clinicians can access the

literature as barriers to effective EBP use. Problem based learning may be a solution to insufficient and ineffective training in research methodology. While university-level courses in research methodology are mandated by ASHA, it is not known how well this information is retained, consumed, and applied by clinicians already working in the profession.

To attempt to address this research gap, the following three research questions and hypotheses were posed:

1. **Aim:** Is there a significant difference between speech-language pathologist's self-ratings of research capability and their research knowledge?
 - a. *Hypothesis:* SLP self-rated research capacity will be higher than SLP research knowledge level demonstrated by the research knowledge survey questions.
2. **Aim:** Is there a significant difference between speech-language pathologist's self-ratings of research capability and their ability to critically evaluate research excerpts?
 - a. *Hypothesis:* The SLP self-rated research capacity will be lower than the critical research evaluation ability level.
3. **Aim:** Is there a significant difference between speech-language pathologist's knowledge of research methodology and their ability to evaluate research literature?
 - a. *Hypothesis:* The SLP knowledge of research methodology will be equal to the ability to critically evaluate the research literature.

CHAPTER TWO: METHODS

Design

The study implemented an online survey-web based design to collect information from professional Speech Language Pathology clinicians related to access, use, knowledge and critical evaluation of research literature. Participants were asked to rate their ability to critically evaluate certain aspects of the research literature when provided with a research exemplar. In the final, section a problem-based approach was used in order to gauge participants' knowledge related to research literature structure and their ability to evaluate specific aspects of the research content.

Item Development

The survey used in the study was created via Qualtrics online software (Qualtrics Labs, Inc., Provo, UT). It contained 29 questions, theoretically divided into five theoretical sections: demographics (9 questions), research access and use (5 questions), Self-perception of ability to analyze research (13 skills rated), research knowledge- identification of research components (9 questions), and critical research evaluation (5 questions). Items included in the self-rating section were designed to elicit self-perceptions of practicing clinicians regarding their research skill levels across the IMRAD (Introduction, Methods, Results and Discussion) structure of scientific enquiry (Day, 1989). Items in the research knowledge section asked clinicians to identify where specific components of research within the IMRAD structure could be located e.g. "In which section would you find the study hypothesis or purpose statement?" This included the nine major components; hypothesis, statistical plan, design type used, outcome measures, controls for bias, validity and reliability information, author acknowledged limitations of the study, the authors motivation for the study, and directions for future research. Items in this section and the order of options within each question were randomized to prevent order effect. Items in the

research evaluation section included problem based vignettes drawn from published Speech Language Pathology research literature. In this section participants were asked to critically evaluate research statements and answer questions such as “which of the following statements contains a research hypothesis” (Appendix C). All the items were created following an extensive review of the epidemiologic literature identifying critical components of research and research knowledge required to be able to evaluate methodologies in scientific enquiry (Sackett 1997; Hayes 1997; Biesta, 2007) To determine face validity, the survey was sent to a panel of three experts in the field who were asked to evaluate and rate the survey for wording, cohesiveness, clarity, comprehensiveness, and if the survey met the aims of the study. These experts were doctoral level research faculty with clinical certification in Speech Language Pathology (CCC-SLP). An intra-class correlation (ICC: 2, k) was performed to evaluate the level of independent concordance between judges on the validity of the survey items. The ICC by judges over the five rating categories was found to equal 0.913 (95% confidence interval 0.471-0.998) (Table 3). This level of agreement is considered excellent (Cicchetti, 1994). The panel was also given the opportunity to provide recommendations and suggestions for improvement. In response to suggestions from the panel, four items were modified to improve the overall quality of the survey. No items were removed or added following this rating process.

Pilot Field Testing

Following evaluation by the expert SLP panel for content validity, the initial version of the survey was utilized in a preliminary pilot field test. Respondents for this pilot were recruited via blast email sent to the clinical faculty at a university clinic. Respondents were given two weeks in which to respond.

Pilot Analysis

Initial results from the pilot sample were cleaned and coded via Qualtrics and reviewed using Microsoft Excel and SPSS Version 23.0. The pilot sample consisted of seven females and three males, with mean age of 52.2 (SD: 10.7) years. The sample included an experienced group of clinicians of which six were Master's level and four held a doctorate. On average the group had held the SLP certification for over 29 years (SD: 13.1). Similarly the majority of the pilot sample (70%) had reported prior research experience and were familiar with accessing (80%) and using research (70%) In addition they reported considerable satisfaction with the availability of research in their facility (90%). Results of the self-rated research capacity section revealed an average self-perception of research skill score of 8.4 (SD 2.3). Average research knowledge score was 5.8 (SD: 0.78) or 60%, while the average pilot group research evaluation score was 1.4(SD: 1.2) or 28%. Internal consistency for the 13-item self-rated research capacity section was Cronbach's Alpha 0.991, and 0.861 for research knowledge and evaluation. Given the strong internal consistency of the items from the pilot evaluation no further modifications were deemed necessary prior to dissemination.

Table 1 Average Item Rating by Judges

Rating	Mean Grade (SD)
<i>Wording</i>	8.33 (1.5)
<i>Cohesiveness</i>	9.33 (0.57)
<i>Clarity</i>	8.67 (1.5)
<i>Comprehensiveness</i>	9.33 (0.5)
<i>Meets the study aims</i>	9.33 (0.57)

Table 2 Inter-rater Reliability for Face Validity (ICC (2, k))

Category	ICC	95% confidence interval	Significance
<i>Overall ICC between raters</i>	0.913	0.471-0.998	0.004

Final Survey

The final survey used in the study was identical to the survey used during the piloting process. No items were deleted, changed, or presented in an alternate order than they were during pilot testing. A transcript for the survey is contained in [Appendix C](#).

Participants

Prior to recruiting participants for the study, approval from the Institutional Review Board (IRB) at the University of Central Florida was obtained. To be included in the study, participants were required to be either Speech-Language Pathologists or Audiologists who had obtained their CCC, recognizing them as certified members of ASHA. Participants were recruited via the online Special Interest Group (SIG) Communities on the ASHA website. ASHA's SIG communities' function as forums through which members can exchange information related to the area of practice/research represented by each group. There are a total of 19 SIGs, each containing discussion boards on which members can post questions, ideas, new research, and information regarding active research studies. To obtain participants via these groups, a recruitment message containing a link to the survey was posted on the discussion boards of all 19 SIGs (see [Appendix D](#)). The survey link remained active for 2 months. Upon clicking the link, potential participants were taken to the survey, which began with the study's informed consent document (See [Appendix E](#)). Those participants who agreed to the terms outlined in the consent document began the survey. Those who did not agree were redirected to the end of the survey. An initial 371 responses were obtained and exported from Qualtrics for analysis.

Responses were then analyzed to remove incomplete responses and to determine level of participant engagement. Random or careless responses can act together to increase error variance which will attenuate correlations, reduce internal consistency reliability estimates, and may potentially result in erroneous conclusions in surveys. For this reason a standard deviation (SD) of less than 0.4 on each participant's response pattern was utilized to indicate that study participants were not fully engaged in the survey (Huang, 2012). Disengaged responses were identified and reviewed for potential omission. In total, 46 (12.4%) responses were omitted from final analysis due to lack of variability in response, with standard deviations less than 0.4 on the Self-Rating, Knowledge, and Evaluation portions of the survey. The final number of responses analyzed during the study was 325 (88%); no other omissions were made prior to data analysis.

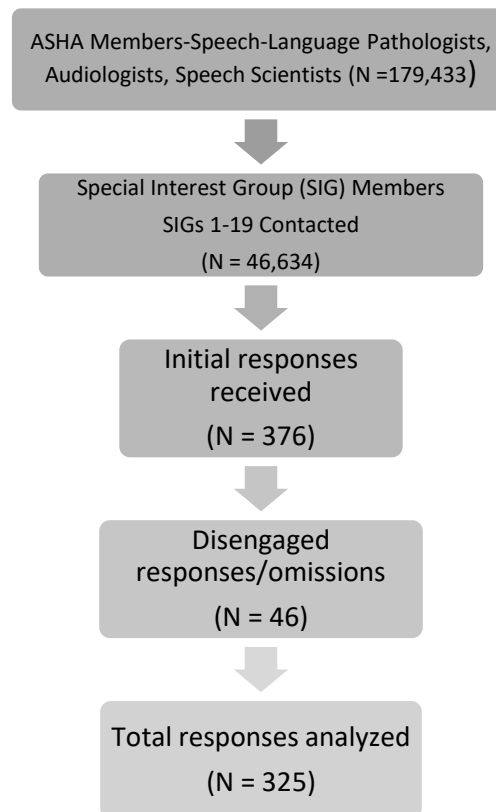


Figure 1: Flowsheet of respondent recruitment

Item Analysis

During the analysis process, item analyses were conducted on the 27 questions contained within the self-rating, knowledge, and evaluation sections of the survey. Item analysis is conducted in order to determine the overall quality of the tool being used. In the case of this survey, item analyses were conducted to determine how well each section represented the respondents self-perception of their research capability, their level of knowledge related to research literature, and their level of ability evaluating the research literature. Item analyses conducted include measures of internal consistency (Cronbach's Alpha), item discrimination, and item difficulty. Internal consistency represents a form of survey reliability. It represents how well a group of items represent a single, underlying, unidimensional concept, contingent upon the level at which the individual items relate to one another. Item discrimination represents the ability of a question to differentiate between those who know the content and those who do not. Item difficulty represents the level of difficulty of a question by comparing the number of individuals who answered correctly with the total number of individuals answering. Distributions were also analyzed for missingness, skewness, and kurtosis. Missingness refers to the number of individuals who did not answer a particular item. Skewness and kurtosis describe the shape of the distribution. Skewness refers to the degree to which the majority of scores fall at the high or low end of a distribution, relative to a normal distribution in which the majority of scores are centered at the mean. Kurtosis describes how flat a distribution is, relative to a normal distribution, which peaks at the center. Results from item analysis can be found in the section titled "Results of Item Analysis."

Differential Item Analysis

Differential item analysis was also conducted on the self-rated capacity, research knowledge, and research evaluation sections. Differential item analysis is used to compare item-by-item

performance between groups. To conduct differential item analysis, respondents were divided into “high” and “low” perception groups based on their average self-rated capacity. Those respondents whose average self-rated capacity was above 7.5 were placed in the high perception group; those with averages below 7.5 were placed in the low perception group. Differential item analysis was also used to compare performance between Master’s and PhD level respondents. Results from this analysis can be found in the section titled “Results of Differential Analysis.”

Statistics

Statistical analyses of survey items and their relationship to each other were conducted using SPSS 23.0 (IBM Corporation, 2012). Descriptive statistics and graphic analyses were used to understand the distribution of the data, and search for outliers. Data was summarized using the means, standard deviation, and modes. Analysis were conducted to review relationships between continuous variables, using Spearman Rho correlation coefficients. In addition categorical comparisons between variables were conducted using Chi square analyses. Non-parametric equivalents for independent T tests (Mann Whitney U) and one way ANOVA (Kruskal Wallis) were also employed as assumptions from parametric testing were violated. Due to the number of exploratory tests ($n = 62$) conducted an apriori Bonferroni family test wise adjustment was performed resulting in a P value of $p=0.0001$ to accept significance.

CHAPTER THREE: RESULTS

Sample Characteristics

Demographic information for the sample was obtained at the beginning of the survey and was analyzed using descriptive analytics and frequency counts (Table 1). The sample comprised 325 respondents, (23 males and 203 females), with a mean age of 46 (SD±12.6 years) whose average amount of years since obtaining the CCC was 18(SD±12.5 years). In total 258 (79%) respondents reported having a Master's degree in speech-language pathology as their highest degree and 67 (21%) reported having a doctorate as their highest degree.

With regard to participation in research and clinical experience, 114 (35%) of respondents reported having conducted formal research requiring IRB approval. Of those who reported having conducted formal research (, 12 (11%) reported conducting research in Articulation disorders, 6 (6%) in Fluency, 27 (25%) in Voice and Resonance, 38 (35%) in Expressive and Receptive Language, 5 (4.4%) in Hearing, 27 (24%) in Feeding and Swallowing, 22 (19.3%) in Cognitive Communication, 18 (15.8%) in Social Aspects of Communication, and 9 (7.9%) in Communication Modalities. Overall six respondents did not report an area in which they had conducted research.

Lastly, regarding current area of clinical practice, 98 (30%) reported working in the public school system, 7 (2%) in private schools, 39 (12%) in private practices, 27 (8%) in skilled nursing facilities, 73 (22%) in Acute/Subacute care in a hospital, 6 (2%) in the Neonatal Intensive Care Unit (NICU) at a hospital, 3 (~1%) in home health, and 31 (10%) in a university clinic. Two (~1%) respondents reported working while in graduate school, and 22 (7%) reported working as a faculty member at a university. In total 290 participants completed > 80% of the survey

questions. An additional 35(11%) completed only 48% of the survey. Average time to complete the survey was 130.24 minutes (SD: 777.69) or 2hrs and 17 minutes on average. Overall response rate to the survey from all SIG members approached was 0.8%. The total useable response rate from the total participant response pool was 89%.

Table 3 Respondent characteristics

General Characteristics					
	<u>Mean (SD)</u> <u>(n=325)</u>	<u>Frequency</u> <u>(n=325)</u>	<u>% of Sample</u> <u>(n=325)</u>		
Age in Years	46 (±12.6) 18(±12.5)				
Gender					
Male				23	7%
Female				302	93%
Time Since Acquiring CCC's					
Highest Degree Earned					
Master's				258	79%
PhD.				67	21%
Research and Clinical Experience					
	<u>Frequency</u> <u>(n=325)</u>	<u>% of Responses</u> <u>(n= 108)</u>	<u>% of Sample</u> <u>(n=325)</u>		
Since acquiring your CCC, have you conducted formal research (research requiring IRB approval)?					
Yes	114		35%		
No	211		65%		
In which of the following research areas have you conducted research?*					
Articulation	12	11%			
Fluency	6	6%			
Voice and Resonance	27	25%			
Language	38	35%			
Hearing	5	5%			
Feeding and Swallowing	27	25%			
Cognitive Communication	22	20%			
Social Aspects of Communication	18	17%			
Communication Modalities	9	18%			
In which of the following settings do you currently practice?					
Public School	98		30%		
Private School	7		2%		
Private Practice	39		12%		
Skilled Nursing Facility	27		8%		
Hospital, Acute/Subacute	73		22%		
Hospital, NICU	6		2%		
Home Health	3		1%		
University Clinic	31		10%		
Research	14		4%		
Student	2		1%		
University	22		7%		

Results of Item Analysis

Internal Consistency

Internal consistency was calculated using Cronbach's Alpha (α) for the Self-Rating section individually; a combined internal consistency rating was calculated for the Knowledge, and Evaluation sections. The self-rating portion contained 1 question comprised of 13 items with a total alpha for the scale of 0.970 (Table 2). The Knowledge and Evaluation sections contained 14 questions with a total alpha of 0.306 (Table 3).

Table 4 Internal Consistency of Self Rating Items

(How would you rate your ability to...)	Item-Total Correlation (Cronbach's alpha = 0.970, 13 items)
<i>Identify study design</i>	0.820
<i>Identify subject recruitment methods</i>	0.817
<i>Identify inclusion criteria</i>	0.830
<i>Identify exclusion criteria</i>	0.832
<i>Identify primary outcome measures</i>	0.859
<i>Evaluate type of outcome measures</i>	0.857
<i>Evaluate validity of tools used</i>	0.860
<i>Evaluate reliability of tools used</i>	0.852
<i>Understand statistical analyses</i>	0.755
<i>Interpret reported outcomes</i>	0.799
<i>Identify potential confounders</i>	0.865
<i>Identify biases effecting results</i>	0.880
<i>Identify and appreciate limitations</i>	0.851

Table 5 Internal Consistency of Research Knowledge and Evaluation Items

Item	Corrected Item-Total Correlation	α if deleted
<i>In which section are controls for bias described?</i>	0.146	0.263
<i>In which section would you find details regarding validity of tools?</i>	0.178	0.247
<i>In which section is the plan for statistics found?</i>	0.142	0.266
<i>In which section is the design type found?</i>	0.179	0.242
<i>In which section is the author's motivation for conducting the study found?</i>	0.092	0.295
<i>Which statement contains details regarding true randomization?</i>	0.158	0.274
<i>Which statement describes the validity of outcome measures used?</i>	0.040	0.315

*Scale (mean = 12.62, SD: 3.35)

Item Difficulty and Item Discrimination

Individual item difficulties and discriminations can be found in Tables 4, 5, and 6. Guidelines for interpretation of item difficulty can also be found in Table 7. According to results from item analysis, the abilities found by the respondents to be most difficult to rate were understanding statistical measures used in the study (Q14-9, $p=0.52$), understanding the reliability of measures used in the study (Q14-8, $p=0.65$), identifying potential confounders to the study results (Q14-11, $p=0.66$), and understanding the validity of measures used in the study (Q14-7, $p=0.67$). The questions in the knowledge section identified as being the most difficult were those asking the respondents to indicate in which sections of a research study the author's motivation for conducting the study (Q23, $p=0.08$), details about specific outcomes measures used in the study (Q19, $p=0.25$), and details regarding the validity of outcome measures used in the study (Q21, $p=0.52$) could be found. The questions in the research evaluation section identified as being the most difficult were those that asked the respondents to identify an error in statistics

(Q27, $p=0.018$), a true research hypothesis (Q25, $p=0.36$), and details related to the validity of outcome measures used in a research study (Q28, $p=0.24$).

Response Missingness

The percent of missing responses for each question can be found in tables 4, 5, and 6. Of the three major survey sections, the section gauging the respondents' ability to evaluate research had the highest number of missing responses ($n=630$, 21.52%). Of the items in this section, those with the highest number of missing responses were those that asked the respondents to identify an error in statistics ($n=130$, 40.0%), a bias represented by an excerpt from a published research study ($n=129$, 39.6%), and details related to the validity of outcome measures used in a research study ($n=163$, 41.8%). An overall pattern of progressive missingness was noted across items by length of survey, with greater missingness identified in the later section of the survey (i.e. research evaluation). Item by item missingness in this section however was not uniformly and greater missingness was not associated with only later appearing items.

Results from Differential Item Analysis

Results from differential item analyses are available in Appendix A. Average self-rated research capacity per question was higher in the high perception group for all 13 self-rating questions (Figure 2). Average self-rating per question was higher for respondents who had a PhD on all questions (Figure 3). Differential analyses of the research knowledge section demonstrated low levels of correct responses by all participants. Number of correct responses on the research knowledge portion of the survey was greater in the high perception group with the exception of one item. More respondents in the low perception group correctly answered the item asking where the research hypothesis could be found in a study (Figure 4). Number of correct responses per item on the research evaluation portion was also low overall participants. The

number of correct responses however, was greater in the high perception group with the exception of two items. Scores between groups were the same for the item asking the respondents to identify randomization. More respondents in the low perception group correctly answered the item asking the respondents to identify bias (Figure 6). Number of correct responses per item on the research knowledge portion was also greater for respondents who had a PhD on all items with the exception of one. More respondents who had a Master's only correctly answered the item asking them to identify a research hypothesis (Figure 7). Number of correct responses per item on the research evaluation portion was greater on all items for respondents who had a PhD.

Table 6 Item Analysis of Research Capacity

Item	Mean	SD	Skewness	Kurtosis	Missing %	Item Difficulty	Item interpretation	Item discrimination
<i>Identify study design</i>	6.98	2.55	-.666	-.478	0%	0.70	Easy	1.00
<i>Identify subject recruitment methods</i>	7.44	2.54	-.783	-.444	0.31%	0.75	Easy	1.00
<i>Identify inclusion criteria</i>	7.74	2.30	-.874	-.141	0.31%	0.79	Easy	0.923
<i>Identify exclusion criteria</i>	7.59	2.42	-.833	-.281	1.5%	0.77	Easy	1.00
<i>Identify primary outcome measures</i>	7.91	2.11	-1.17	.869	1.86%	0.84	Very easy	1.00
<i>Evaluate type of outcome measures</i>	7.49	2.24	-.835	.060	1.2%	0.79	Easy	1.00
<i>Evaluate validity of tools used</i>	6.61	2.43	-.498	-.465	1.2%	0.67	Easy	1.00
<i>Evaluate reliability of tools used</i>	6.51	2.47	-.503	-.488	2.48%	0.65	Easy	0.923
<i>Understand statistical analyses</i>	5.64	2.72	-.152	-1.04	3%	0.52	Average	1.00
<i>Interpret reported outcomes</i>	7.52	2.18	-.875	.095	1.2%	0.80	Easy	1.00
<i>Identify potential confounders</i>	6.49	2.70	-.578	-.725	2.48%	0.66	Easy	1.00
<i>Identify biases effecting results</i>	6.83	2.49	-.696	-.410	2.17%	0.72	Easy	1.00
<i>Identify and appreciate limitations</i>	7.75	2.17	-.978	.206	0.31%	0.81	Very easy	1.00

Table 7 Item Analysis of Research Knowledge

Item	Mean	SD	Skewness	Kurtosis	Missing %	Item Difficulty	Item interpretation	Item discrimination
Where is the hypothesis	4.65	.92	-2.69	6.48	12%	0.76	Easy	0.09
Where is the statistics plan	1.73	1.4	1.70	1.54	12%	0.67	Easy	0.36
Where is the design type	1.37	1	3.38	11.3	12.6%	0.71	Easy	0.55
Where are the outcome measures	3.24	1.5	-.593	-1.07	12%	0.25	Difficult	0.73
Where is controls for bias	1.57	1.4	2.24	3.37	12.3%	0.74	Easy	0.64
Where is information about validity of tools used	2.37	1.7	.677	-1.21	12%	0.52	Average	0.64
Where are the limitations of the study	4.66	.95	-2.82	7.53	12%	0.71	Easy	0.36
Where is the authors motivation	2.21	.69	3.91	16.2	12%	0.08	Very Difficult	0.36
Where is direction for future research	4.85	.43	-2.96	8.34	12%	0.77	Easy	0.45

Table 8 Item analysis of Research Evaluation

Evaluation Item	Mean	SD	Skewness	Kurtosis	Missing %	Item Difficulty	Item Interpretation	Item Discrimination
Which statement contains a research hypothesis?	1.69	.60	.228	-.605	35%	0.36	Difficult	0.75
Which statement describes randomization procedures?	1.42	.57	.993	.000	37%	0.39	Difficult	0.83
What stat error can you identify?	1.87	.83	.244	-1.52	39.6%	0.18	Very Difficult	1
Which statement describes validity?	2.23	.73	-.390	-1.037	41.8%	0.24	Difficult	1
What bias can you identify?	3.14	.53	-.897	5.15	40%	0.46	Average	0.92

Table 9 Interpretation of Item Difficulty Index

Difficulty Index	Range
Very difficult	20 & below
Difficult	21-40
Average	41-60
Easy	61-80
Very easy	≥ 81

Research Acquisition and Application

The survey contained 6 items inquiring about respondents habits related to access and use of research literature (Appendix C). When asked to select the methods through which they learned about current research, 247 respondents (76%) reported using electronic journals, 212 (65.2%) reported attending conferences and Continuing Education Unit (CEU) courses, and 194 (59.7%) reported consulting the ASHA website. 83 respondents (25.5%) selected their colleagues as the means through which they learned about current research. Using a sliding scale from 1 to 5, respondents were asked to rate their familiarity with accessing the research literature, their satisfaction with its availability at their place of work and the frequency with which they access and apply it. Participants were also asked how often (when reading the research literature), they look for suggestions for future research. The results from these items can be found in Table 8.

Table 10: Research Acquisition and Use

Variable	Mean	Mode (N,%)	SD
Familiarity (n=316) (1 = Not at all familiar, 5= very familiar)	4.14	4 (89, 28%)	0.94
Satisfaction (n=306) (1 = Not at all satisfied, 5= Very satisfied)	3.32	3 (71, 23%)	1.5
Frequency of Access (n=322) (1 = Never, 5 = Always)	3.65	4 (111, 33%)	1.01
Frequency of Use (n=317) (1 = Never, 5 = Always)	3.57	4 (134, 42%)	0.89
Suggestions for Future Research (n=306) (1 = Never, 5 = Always)	3.55	4 (97, 31%)	1.13

Self-Ratings of Research Capability

The respondent's self-ratings of research knowledge and ability to evaluate research literature (termed research capacity for this paper) were analyzed and compared to other survey item responses using parametric and nonparametric statistics. When comparing self-rated research capacity to highest degree earned, A Mann-Whitney test indicated that self-rated capacity (as measured by mean rating on 13 items) was significantly greater for respondents who had acquired their PhD (Mean Rank = 240.6) than for respondents who had acquired their Master's degree (Mean Rank = 141.4), $U = 7.74$, $p = 0.0001$, $r = 0.43$. Self-rated research capacity was also greater for respondents who had reported previous experience in formal research (Mean rank 213.01) than for those who had not (Mean Rank=134.51), $U=7.206$, $p=0.0001$, $r=0.41$. A Kruskal-Wallis one way analysis of variance test was conducted to evaluate differences among respondent's place of work by median change in self-rated research capacity. The test, which was corrected for ties, produced significant results, $\chi^2 (10, N=321) = 58.7$, $p=0.0001$. Pairwise Results from statistical analyses run can be found in tables 9, 10, 11, and 12.

Research Knowledge

Various statistical analyses were used to compare the respondents' performance on the Research Knowledge portion of the survey to other their responses to other items in the survey. The results of a Mann Whitney U Test indicated that performance in this section was significantly higher for respondents who had acquired their PhD (Mean Rank = 203.51) than for respondents who had only acquired their Master's (Mean Rank = 152.51), $U = 4.03$, $p = 0.0001$, $r = 0.22$. Respondents who had previously conducted formal research (Mean Rank = 188.12) also performed better on this section than those who had not (Mean Rank = 149.43), $U = 3.606$, $p = 0.0001$, $r = 0.20$. Through a comparison of means using non-parametric statistics, a positive

correlation was found between research knowledge and self-rated capacity, Spearman's Rho (323) = 0.258, $p < 0.001$. Chi-Squared analysis revealed a significant association ($\chi^2 = 14.03$, $p = 0.001$) between degree level and knowledge of where to find details related to validity of measures used in a research study with PhD level participants demonstrating higher knowledge than Master's level participants. Significant associations were also found between experience conducting research and knowledge of where to find the hypothesis ($\chi^2 = 19.43$, $p = 0.001$) and details related to validity of measures ($\chi^2 = 14.22$, $p = 0.001$) within a research study with. On both tasks, respondents who had previously conducted formal research demonstrated higher knowledge than those who had not.

Evaluation of Research

Non-parametric statistics were used to compare performance on the 5 questions related to evaluation of research literature and performance on the 9 research knowledge questions. A Spearman's Rho of 0.041 revealed a significant positive correlation between knowledge and ability to evaluate research literature ($p = 0.0001$). In reviewing specific associations between knowledge items and research evaluation items no significant associations were identified, however descriptive trends (i.e. those falling slightly above the Bonferroni cut point of $P = .0001$) included a relationship between knowledge of where to find the statistical plan within a study and the ability to critically evaluate validity findings ($\chi^2 = 9.21$, $P = .002$). Similarly a relationship between knowledge of where to find future research and the ability to evaluate potential biases was descriptively found ($\chi^2 = 9$, $P = .003$). No other significant trends were noted.

CHAPTER FOUR: DISCUSSION

This study has identified that the level of research knowledge and evaluation capability in the SLP survey respondent sample was low. Research evaluation skill was significantly lower than research knowledge in a high percentage of respondents. Likewise, the true level of research evaluation skill could not be fully evaluated due to the avoidance of responding to those survey items. Moreover, SLP clinician self-rated research capacity did not adequately reflect either research knowledge or the ability to critically evaluate research literature excerpts.

These findings appear to be supported by prior literature, which has identified barriers to the use of EBP processes by healthcare professionals emanating from insufficient knowledge and skills needed to properly evaluate the literature. Previous survey-based studies examining barriers to EBP in the fields of chiropractic (Walker, B., Stomski, N., Hebert, J., & French, S, 2014), nursing (Abrahamson, K., Fox, R., & Doebbeling, B., 2012), and physical therapy ((Ramírez-Vélez, R., Bagur-Calafat, M. C., Correa-Bautista, J. E., & Girabent-Farrés, M, 2015) all produced results that mirror the findings from the present study. In those studies the barriers reported as impeding EBP most frequently included; lack skill at interpreting, locating, and critically evaluating the research literature, lack of ability to understand statistical analyses and lack of adequate training and support.

In contrast, Zipoli et. al. 2005, reported that lack of time was the most reported reason that Speech Language clinicians do not consistently use EBP in treatment planning. Moreover, the SLP clinician respondents in their study reported lack of research skill and knowledge as the least significant factor related to lack of EBP use. Their findings also contrast those resulting from this current study which found low performance on research skill and knowledge items.

Similar to other Speech language investigations, this study has demonstrated that SLP clinicians often self-reported that they utilized research and research literature in their practice. Moreover the respondents reported a very high level of self-perceived EBP skill. Divergently those same respondents demonstrated considerably low levels of performance accuracy on research knowledge questions and the ability to evaluate research components drawn from actual published SLP research papers. In fact, even the ability to correctly identify where to find a specific research item within a published paper, did not relate to the ability to critically evaluate the same concept. Even more striking was the finding that the level of higher education (PhD vs Master's) did not dramatically improve the self-perception to research performance gap. This mismatch underscores an issue found within the current SLP literature on EBP. Investigations asking clinicians to rate their own appreciation of EBP and their research skill may fail to fully identify gaps in knowledge and skill associated with this task. Similarly this literature may under appreciate the educational barriers which appear impede EBP implementation. It appears that research in this area needs to move beyond the sampling of attitudes, utilization and self-perceived barriers to actual measurement of skillful use of research concepts.

This study is novel in its formulation and approach. Unlike prior research, this study has moved beyond the measurement of self-rated perceptions of EBP knowledge and use to evaluate knowledge through critical questioning and problem based approaches to evaluation. In this study, items used required respondents identify where critical research items could be located, based on IMRAD structure. It then provided actual research excerpts from published SLP research papers to evaluate if the respondent could accurately identify a research concept. Using this problem-based approach may have resulted in more accurate estimations of

respondent ability, and resulted in a pattern of avoidance of critical thinking tasks common to this area of education.

The strengths of the study include use of a large survey with a moderate sample of practicing, certified SLP's from a variety of locations nationwide. In addition, the majority of the sample had been certified SLP's for over 18 years. Additionally this study utilized a problem-based approach to engage respondents in critical thinking using actual excerpts – not simply simulations of research. Novel EBP questions were generated to address critical research concepts that mirror functional skills needed to engage in evidence-based practice. Given this the study is unique in its design and may provide a framework for EBP future studies.

This study also suffers from some issues that could limit the interpretation of its findings. These include the influence of a potential volunteer bias inherent in all survey-based designs. By its design a survey includes only respondents that choose to participate and these may be persons who are interested and able to perform EBP. If a volunteer bias exists then the results from the current survey should be interpreted as conservative in its findings. Furthermore, the items selected for use in the study may not encompass all possible research concepts, possibly weakening the claims related to research knowledge within the profession. While the low internal consistency alpha may lend weight to this argument, this same finding also supports the inclusion of numerous research concepts in the scales. Likewise this survey did not provide any knowledge of quality of masters' training or site of a respondent's original university degree. As such the SLP qualifications of respondents may have been achieved via an online training programs or from international facilities with variable levels of research acumen. Such data may have created the potential for variation in training that skewed results. Another potential

confounder to the results of this survey may arise from the complexity of research excerpts utilized. However, all of the excerpts chosen were drawn from current SLP research literature (within 5 years) and pilot field testing did not demonstrate concerns related to the use of these items. Further, the evaluation section covered only five significant research areas (hypothesis, randomization, stats error, validity, bias) and was therefore limited in its scope. Equally, the comparison of knowledge and evaluation may have been strengthened had the areas of knowledge being address been paired directly with each research evaluation item. Unfortunately to complete this would have extended the length of the survey possibly reducing the response rate. Lastly, there was also a large amount of missingness on the last 14 items of the survey. This may represent an order effect, especially given the length of the survey. However, high levels of missingness were not exclusive to those items at the end of the survey as missing responses were scattered across items throughout the entire survey and appear to be related to skill breaks rather than to non-random loss.

Results from the current study are important as they add to the body of knowledge on research training in SLP. Alternate models of instructing and reinforcing the process of research education for EBP, suggest that critical skills are not being taught well enough to secure the underlying knowledge for EBP. This study corroborates those statements, demonstrating that across all three sections of the study (self-rating, knowledge and evaluation) several common key elements were poorly understood. These included statistical methods, reliability, validity and the identification and evaluation of outcome measures. The reasons underlying these common weaknesses is not clear, however it may be that the limited offering of cursory statistics and design courses within the SLP graduate training process may not provide nor model a strong enough base for the development of critical research evaluation skills. New pedagogical models

that involve actual research practice and problem based thinking need consideration. The use and incorporation of “flipped “or blended classroom approaches in training (Bonk et al, 2010) may enhance this form of learning. Similarly, the addition of coordinated courses that bridge both undergraduate and masters training levels to effectively “build” research skill in a layered fashion may offer an option to boost research and EBP training.

Conclusions

Overall findings suggest a significant weakness in SLP training of research methodology. cursory statistics and research design courses may not be not good enough. New models, such as the problem-based models presented in the study, may improve the observed disparity of knowledge and critical thinking ability. The “flipped “classroom approach developed by Bonk and colleagues (2010) may perhaps be one such model. The addition of coordinated, scaffold for undergrad and Master’s level courses that effectively “build” research skill may also improve learning and retention of research knowledge and skills appears warranted. Future research studies may wish to expand upon the design of the current study, including a more thorough problem-based approach through the combination of technology and critical thinking tasks to improve upon the present study design.

APPENDIX A: DIFFERENTIAL ANALYSIS GRAPHS

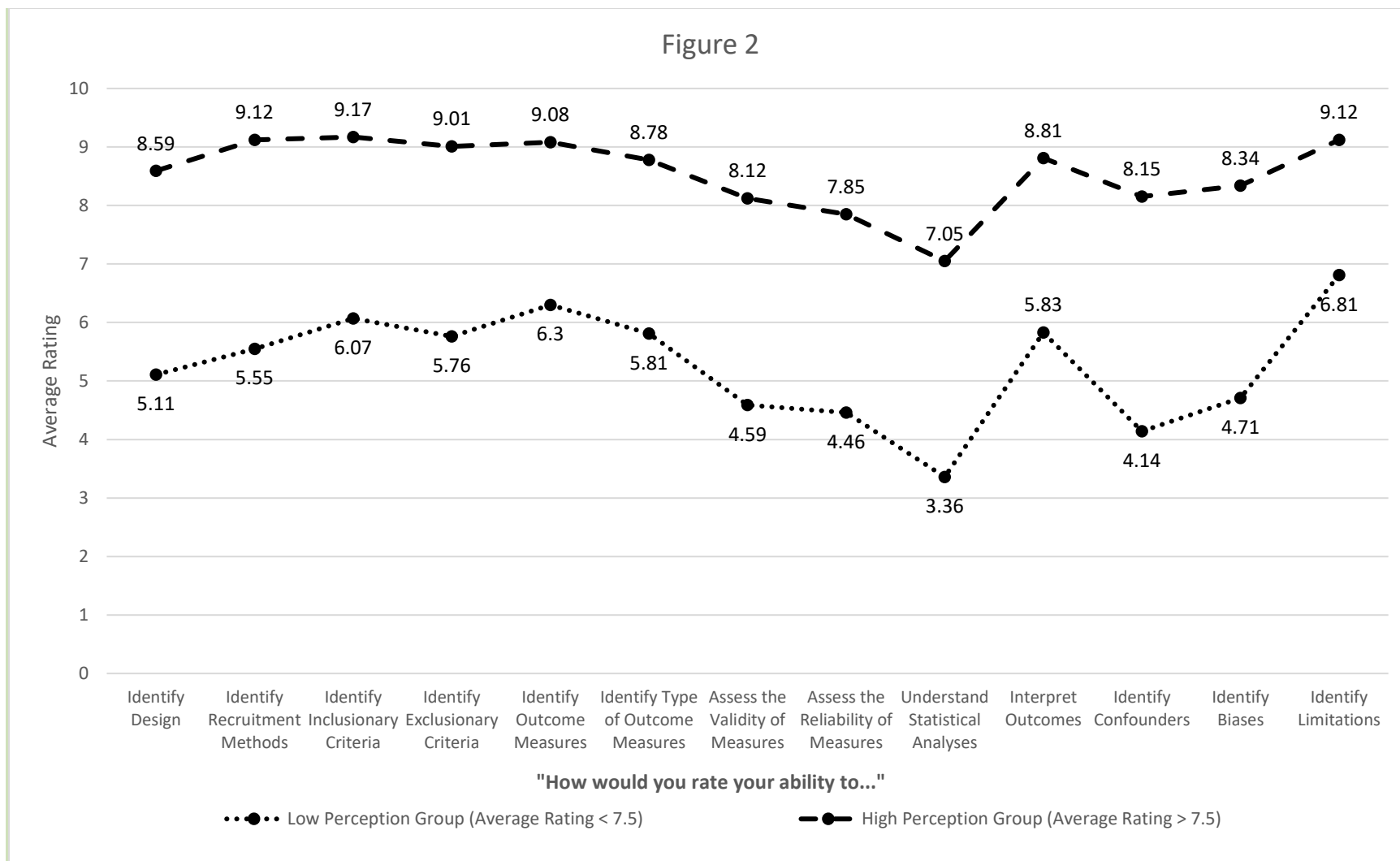


Figure 2: Comparison of research capacity between perception groups.

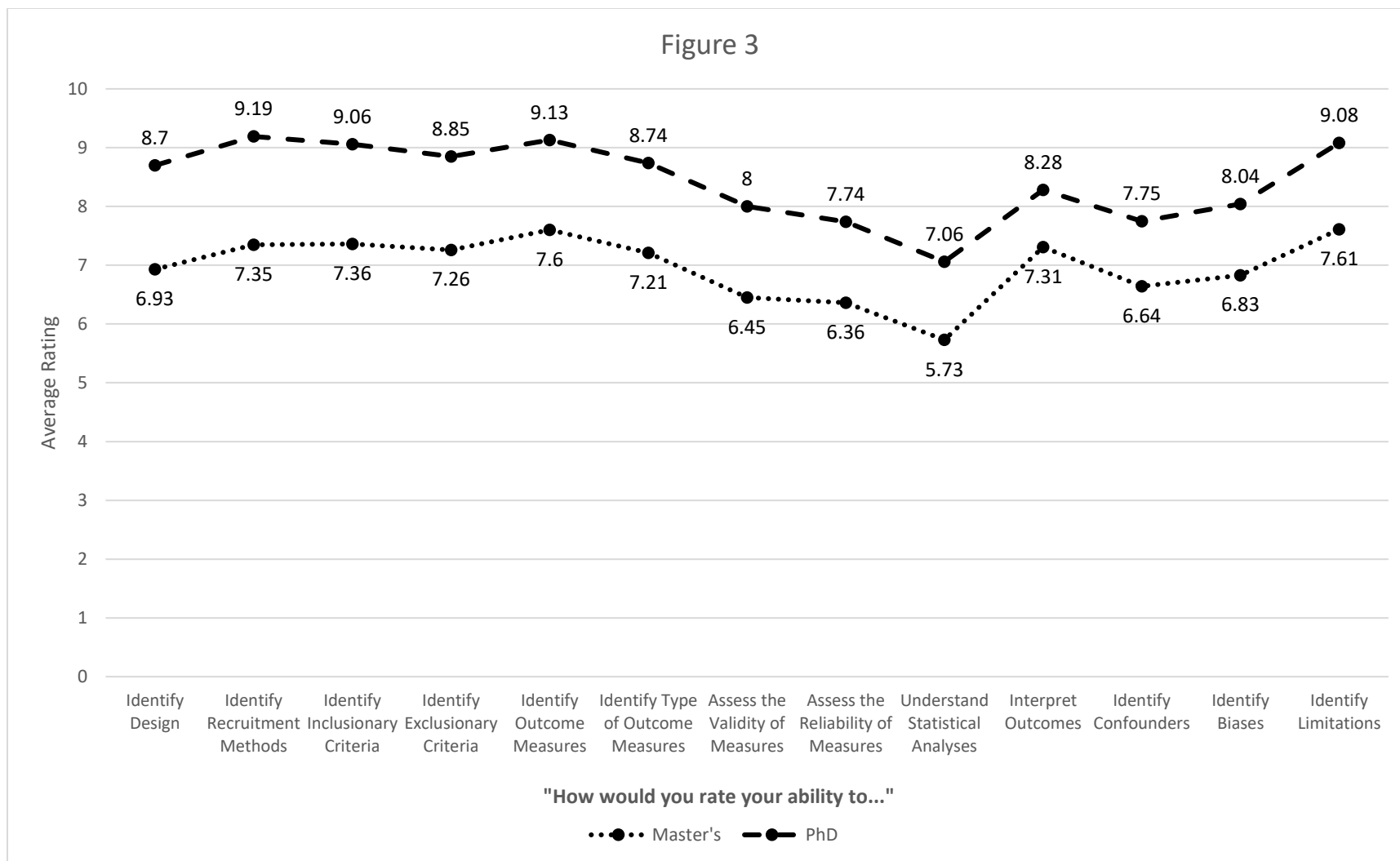


Figure 3: Comparison of research capacity between Master's and PhD level participant groups.

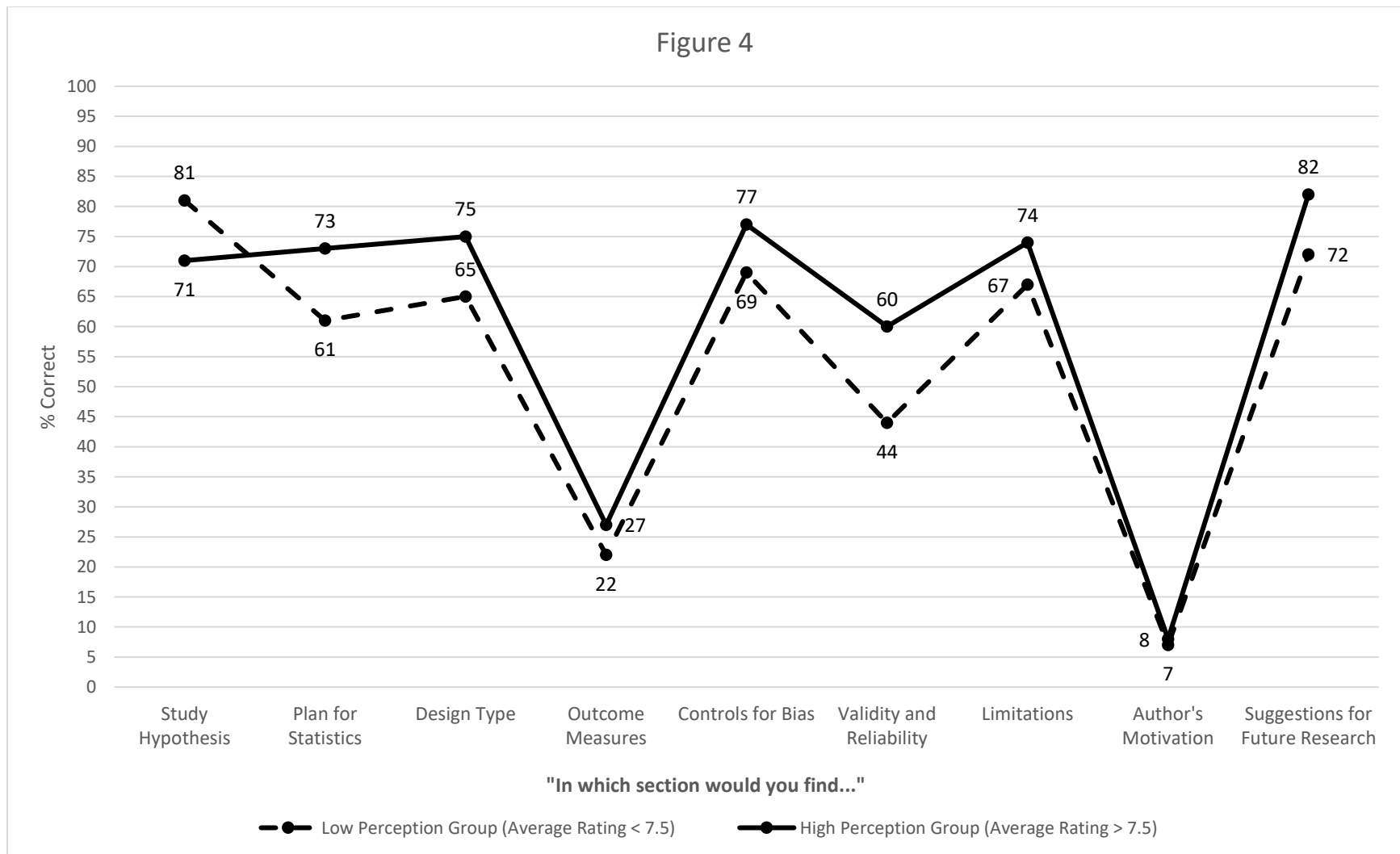


Figure 4: Comparison of performance (Research Knowledge) between perception groups.

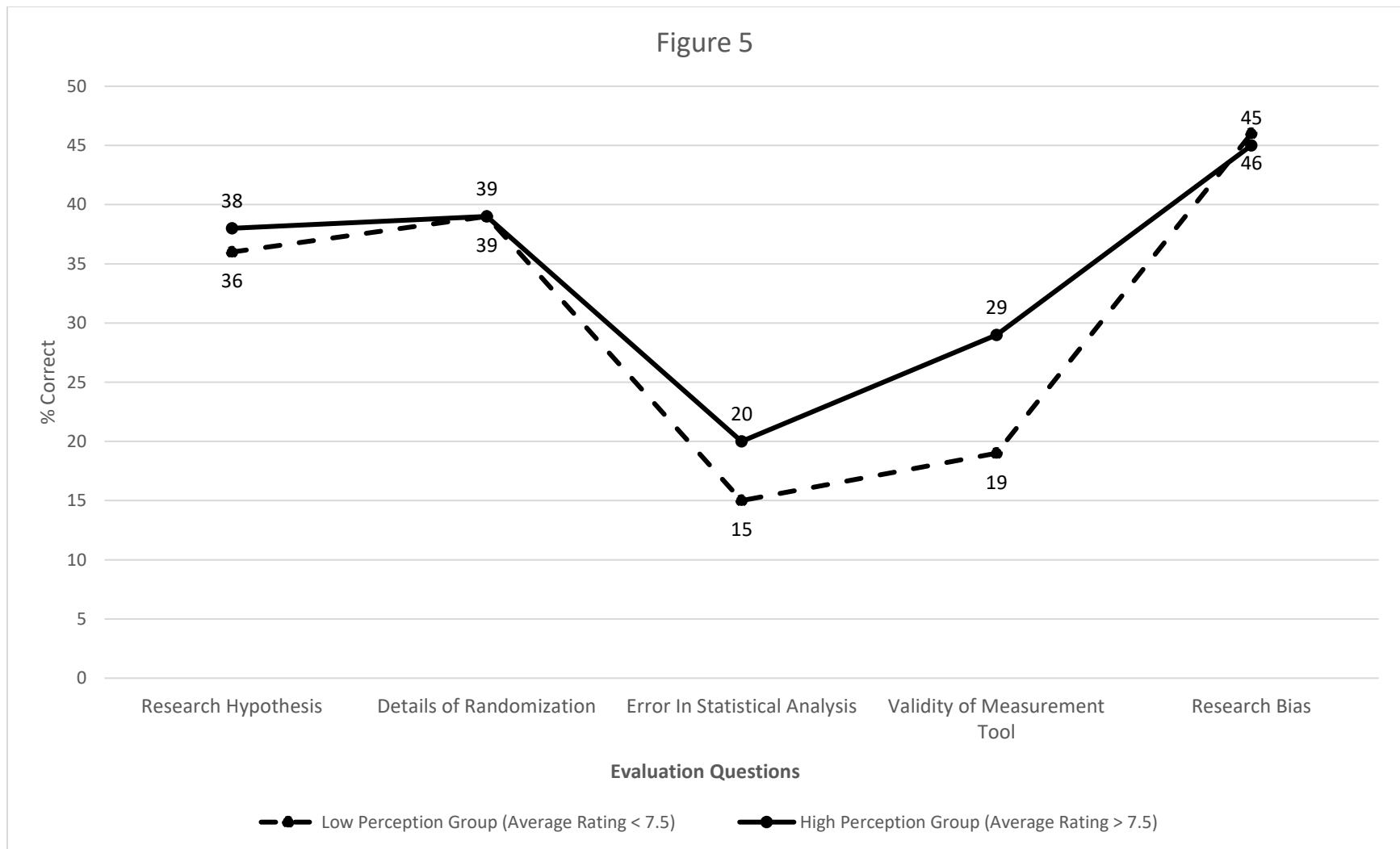


Figure 5: Comparison of performance (Research Evaluation) between perception groups

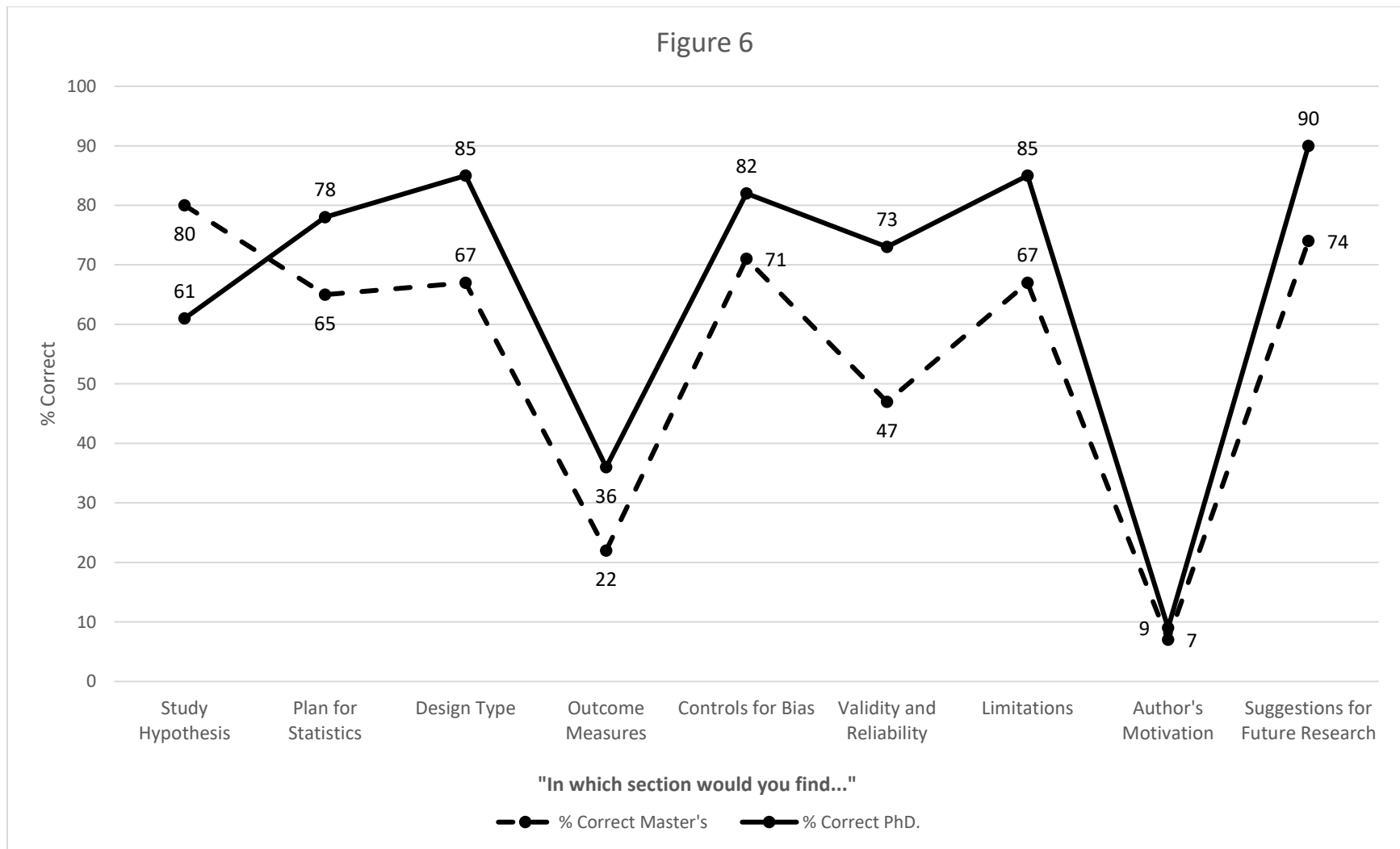


Figure 6: Comparison of performance (Research Knowledge) between Master's and PhD level participants.

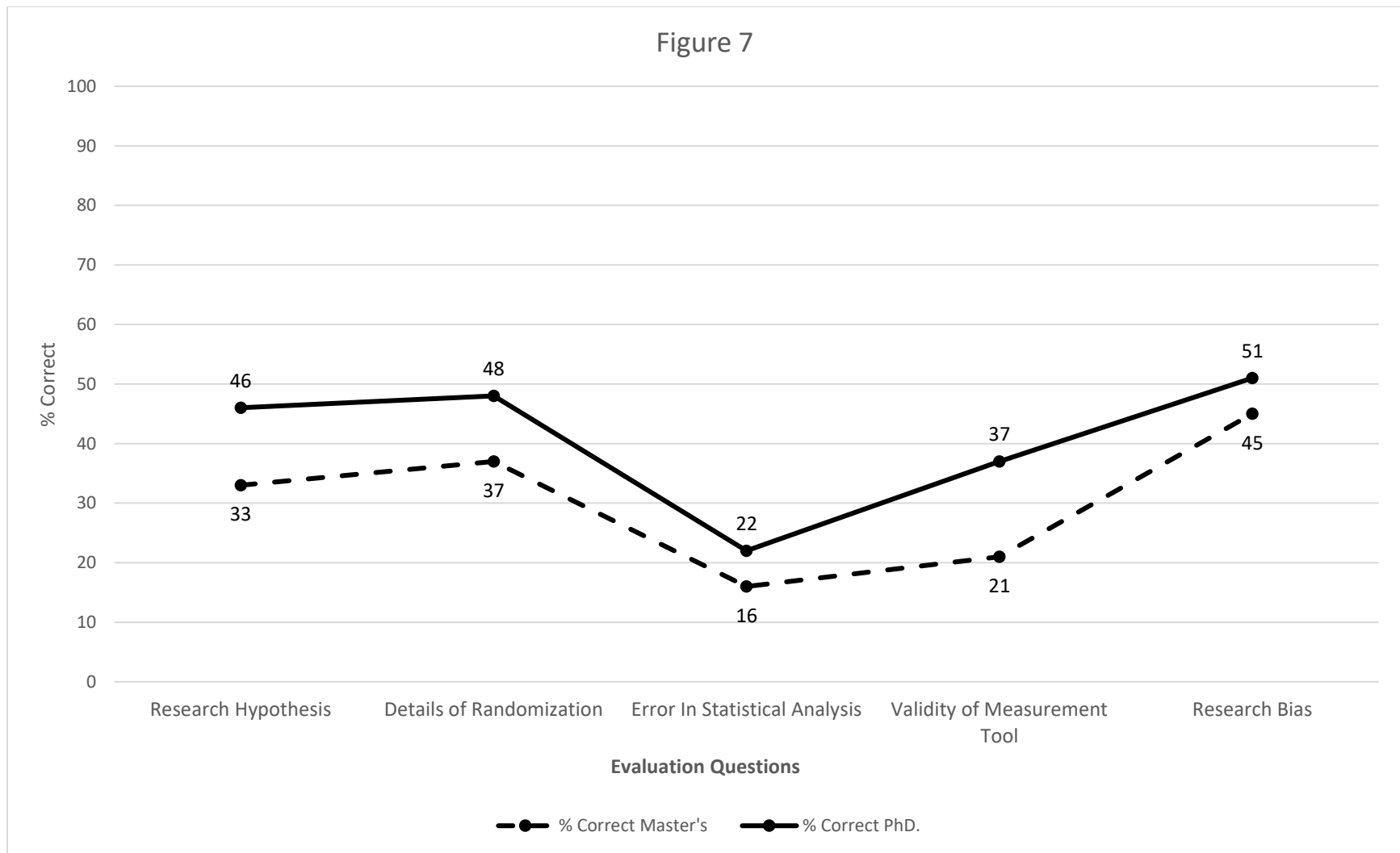


Figure 7: Comparison of performance (Research Evaluation) between Master's and PhD level participants.

APPENDIX B: STATISTICAL ANALYSIS TABLES

Table 11 Current practice area by research capacity, knowledge and evaluation ability

Variable	N	Df	N-Par ANOVA (Kruskal-wallis)	P value
<i>Self-rated capacity vs practice facility</i>	321	10	58.7	0.0001*
<i>Knowledge vs practice facility</i>	322	10	21.1	0.020
<i>Evaluation vs practice facility</i>	322	10	19.3	0.036

Table 12 Non-parametric comparisons between items

Relationship Tested	Group 1 (median rank)	Group 2 (median rank)	Mann-Whitney <i>U</i>	<i>P</i> value
<i>Gender vs Capacity</i>	M=197.8	F=159.2	1.908	0.056
<i>Gender vs Knowledge</i>	M=195	F=160.6	NS	NS
<i>Gender vs Evaluation</i>	M=147.3	F=164.2	NS	NS
<i>Level of education vs Capacity</i>	PhD=240.6	MA=141.4	7.738	0.0001*
<i>Level of education vs Knowledge</i>	PhD=203.5	MA=152.5	4.034	0.0001*
<i>Level of education vs Evaluation</i>	PhD=185.4	MA=157.2	2.275	0.023
<i>Past research exp. vs Capability</i>	Yes=213.0	No=134.5	7.206	0.0001*
<i>Past research exp. vs Knowledge</i>	Yes=188.12	No=149.43	3.606	0.0001*
<i>Past research exp. vs Evaluation</i>	Yes=169.88	No=159.28	NS	NS

*p=significant at p<0.0001

Table 13 Correlational results (Rho)

Variable	P value	Correlation (rho)
<i>Age vs Capacity</i>	0.045	0.112
<i>Age vs Knowledge</i>	0.016	-0.134
<i>Age vs Evaluation</i>	0.070	-0.101
<i>CCC vs Rating</i>	0.067	0.102
<i>CCC vs Knowledge</i>	0.013	-0.139
<i>CCC vs Evaluation</i>	0.035	-0.117
<i>Rating vs Knowledge</i>	0.0001*	0.258
<i>Rating vs Evaluation</i>	0.144	0.082
<i>Knowledge vs Evaluation</i>	0.0001*	0.399

*p=significant at $p < 0.0001$

Table 14 Knowledge items by research evaluation items

Knowledge Item vs Evaluation Item	Chi Value χ^2	P value	Correlation ϕ
<i>Hypothesis vs Hypothesis</i>	0.23	NS	NS
<i>Stats Plan vs Stats Error</i>	0.007	NS	NS
<i>Stats Plan vs Validity</i>	9.21	0.002	0.221
<i>Design vs Randomization</i>	0.25	NS	NS
<i>Outcomes vs Validity</i>	5.7	0.016	0.174
<i>Validity vs Validity</i>	0.69	NS	NS
<i>Validity vs Randomization</i>	5.0	0.025	0.156
<i>Bias vs Bias</i>	0.37	NS	NS
<i>Bias vs Hypothesis</i>	4.41	0.036	0.146
<i>Limitations vs Hypothesis</i>	6.97	0.008	0.183
<i>Future Research vs Hypothesis</i>	4.28	0.039	0.143
<i>Future Research vs Randomization</i>	4.87	0.027	0.154
<i>Future Research vs Bias</i>	9.0	0.003	0.215

Table 15 Research capacity and evaluation ability by highest degree

Where would you find...	MA**	PhD**	Chi value x	p value	Correlation ϕ
<i>Hypothesis</i>	206	41	24.146	0.0001*	-0.291
<i>Stats Plan</i>	167	52	NS	NS	0.107
<i>Design</i>	173	57	9.702	0.002	0.185
<i>Outcomes</i>	57	24	4.641	0.031	0.127
<i>Bias</i>	184	55	NS	NS	NS
<i>Validity</i>	121	49	14.031	0.0001*	0.221
<i>Limitations</i>	173	57	8.351	0.004	0.171
<i>Motivation</i>	19	6	NS	NS	NS
<i>Future Suggestions</i>	191	60	8.109	0.004	0.168
Can you identify...	MA**	PhD**	Chi value x	p value	Correlation ϕ
<i>A true hypothesis</i>	85	31	6.213	0.013	0.172
<i>True randomization</i>	95	32	4.544	0.033	0.149
<i>Error in statistics</i>	42	15	NS	NS	NS
<i>Validity of measures</i>	54	25	6.974	0.008	0.192
<i>Example of bias</i>	116	34	NS	NS	NS

*P is significant at $p < 0.001$, **number of correct responses

Table 16 Research capacity and evaluation ability by prior research experience

Where would you find...	Research No**	Research Yes**	Chi value x	p-value	Correlation ϕ
<i>Hypothesis</i>	206	41	24.146	0.0001*	-0.291
<i>Stats Plan</i>	167	52	NS	NS	0.107
<i>Design</i>	173	57	9.702	0.002	0.185
<i>Outcomes</i>	57	24	4.641	0.031	0.127
<i>Bias</i>	184	55	NS	NS	NS
<i>Validity</i>	121	49	14.031	0.0001*	0.221
<i>Limitations</i>	173	57	8.351	0.004	0.171
<i>Motivation</i>	19	6	NS	NS	NS
<i>Future Suggestions</i>	191	60	8.109	0.004	0.168
Can you identify...	Research No**	Research Yes**	Chi value x	p value	Correlation ϕ
<i>A true hypothesis</i>	85	31	6.213	0.013	0.172
<i>True randomization</i>	95	32	4.544	0.033	0.149
<i>Error in statistics</i>	42	15	NS	NS	NS
<i>Validity of measures</i>	54	25	6.974	0.008	0.192
<i>Example of bias</i>	116	34	NS	NS	NS

*P is significant at $p < 0.001$, **number of correct responses

APPENDIX C: FACE VALIDITY RATING SCALE

Consensus Panel Rating Scale

Q1 Please rate the study survey based on the following criteria by dragging the slider:

_____ Wording

_____ Cohesiveness

_____ Clarity

_____ Comprehensiveness

_____ Meets aims of the study

Q2 Please list your suggestions for modification:

APPENDIX D: FINAL SURVEY TRANSCRIPT

Research Analysis Survey

Q1 Please select yes if you agree to the terms provided above.

- Yes, I wish to continue.
- No, I do not wish to continue. (Skip to end of survey if this option is selected)

Q2 Please select your age by dragging the slider to the right.

_____ Age

Q3 Please select your gender.

- Female
- Male

Q4 Please select the year in which you acquired your Certificate of Clinical Competence (CCC) by dragging the slider to the right.

_____ I received my CCC in...

Q5 What is the highest degree you currently hold?

- Bachelor's
- Master's
- Doctorate

Q6 Since acquiring your CCC, have you conducted formal research (research requiring IRB approval)? (If yes, proceed to question 7. If no, skip to question 8)

- Yes
- No

Q7 In which of the following research areas have you conducted research?

- Articulation
- Fluency
- Voice and Resonance (
- Receptive and Expressive Language
- Hearing
- Feeding and Swallowing
- Cognitive Communication (TBI, MCI, Dementia, etc.)
- Social Aspects of Communication
- Communication Modalities (AAC, Assistive Technologies, etc.)

Q8 In which of the following areas have you primarily practiced?

- Articulation
- Fluency
- Voice and Resonance
- Receptive and Expressive Language
- Hearing
- Feeding and Swallowing
- Cognitive Communication (TBI, MCI, Dementia, etc.)
- Social Aspects of Communication
- Communication Modalities (AAC, Assistive Technologies, etc.)
-

Q9 In which of the following settings do you currently practice? If you are conducting research at a university or other institution and are not currently practicing, please select "Research." If you are a student and are not currently practicing or conducting research, please select "Student."

- Public School System
- Private School
- Private Practice
- Skilled Nursing Facility
- Hospital, Acute/Subacute Care
- Hospital, NICU
- Home health
- University clinic
- Research
- Student
- University

Q10 On a scale of 1 to 5, how familiar are you with:

_____ Accessing the research literature?

Q11 Which methods do you primarily use to get up to date research literature/evidence?

- Paper journals
- Electronic Journals
- ASHA website
- Information from colleagues
- Online databases (Google Scholar, PubMed, MedLine, Web of Science, etc.)
- General search engines (Google, Bing, Yahoo, etc.)
- Books

- Conferences or CEU courses

Q12 On a scale of 1 to 5, how would you rate:

_____ Your satisfaction with the availability of research literature in your facility?

Q13 On a scale of 1 to 5, how often do you in your current practice:

_____ Access the research literature?

_____ Use techniques described in the research literature?

Q14 When reading the research literature, how would you rate your ability to:

_____ Identify the study design type

_____ Identify subject recruitment methods

_____ Identify inclusionary criteria

_____ Identify exclusionary criteria

_____ Identify primary outcome measures

_____ Evaluate type of outcome measures

_____ Evaluate validity of tools used in the study

_____ Evaluate reliability of tools used in the study

_____ Understand statistical analyses performed

_____ Interpret reported outcomes

_____ Identify potential confounders to study integrity

_____ Identify biases affecting results

_____ Identify and appreciate study limitations admitted by authors

Q15 On a scale of 1 to 5, how often do you:

_____ Look for suggestions for future research when reading the research literature?

Q16 In which section would you find the study hypothesis or purpose statement?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q17 In which section would you find a plan for statistics used to obtain study results?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q18 In which section would you find a description of the design type used in the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion

- Unsure

Q19 In which section would you find details of specific outcome measures of used in the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q20 In which section would you find information about the controls for bias used in the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q21 In which section would you find details about the validity and reliability of measurement tools used in the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q22 In which section would you find limitations of the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q23 In which section would you find the author's motivation for carrying out the study?

- Methods
- Introduction
- Literature Review
- Results
- Discussion
- Unsure

Q24 In which section would you find suggestions for future research?

- Methods
- Introduction
- Literature Review
- Results)
- Discussion
- Unsure

Q25 Which of the following statements contains a research hypothesis?

- The purpose of this study was: (a) to determine the prevalence of phonological deficits in middle school students struggling with reading; and (b) to determine if instruction in phonological awareness (PA) would benefit these skills, as well as word recognition skills.
- The aim of this study is to determine if the use of a structured plan of assessment improves the stability and sensitivity of overall evaluation results.
- The purpose of the study was to explore the effect of oral stimulants on the perceived quality of life of individuals who stutter, via focus group.

Q26 Which of the following statements provides details of randomization in a research study?

- Using a random numbers table, the pharmacy department randomly assigned the subjects to receive methylphenidate or a placebo in identical tablets.
- Two third-grade classes from School A, one third-grade class from School B, and two second-grade classes at School B were randomly divided into two groups. There were 67 students in both groups after randomization.
- Ten patients were assigned to the ESSM group, ten to the ESTM group, and forty-nine to the CDM group.

Q27 What error in statistical analysis can you identify based on the table below?

- p-Values that are not significant are not reported.
- Sample size was not sufficient for statistical analysis.
- Statistics have been run on nominal data.

Table 17: Survey Sample Table

Variable	Masako maneuver (n=10)	Effortful swallow (n=8)	Supraglottic swallow (n=10)	p-Value
Age				
Mean	49.10	46.00	53.50	NS*
Standard Deviation	13.25	9.59	17.60	
Sex (male=0, female=1)				
Mean	1.50	1.62	4.32	NS
Standard deviation	0.53	0.82	0.75	
Pre-injury rating				
Mean	2.30	2.87	2.99	NS
Standard deviation	1.32	0.88	1.46	
Pre-injury retraction** (mm)				
Mean	3.95	4.80	5.78	0.31
Standard deviation	1.04	0.84	1.17	
Pre-injury protrusion** (mm)				
Mean	17.80	17.03	19.06	NS
Standard deviation	2.07	2.69	3.01	
Pre-injury elevation** (mm)				
Mean	27.50	26.98	22.08	NS
Standard deviation	2.00	2.33	3.44	
Pre-injury depression** (mm)				
Mean	24.75	27.64	22.97	NS
Standard deviation	3.82	8.08	6.58	

Q28 Which of the following statements describes the validity of a measurement tool used in a research study?

- The ICC (intra-class coefficient) values of the resting and shortest distances between the thyroid cartilage and hyoid bone during swallowing both exceeded 0.95 (ICC = 0.982 and 0.972, respectively), indicating excellent reproducibility of results.
- Based on this comparison, swallow frequency rate (<.40 swallows per minute) was 96% (95% CI, 80.3-99.4) sensitive and 67% (95% CI, 49.0-1.4) specific in the identification of clinically significant dysphagia.

- Intra- and inter-rater protocol agreements for the two speech-language pathologists were 100%. Inter-rater protocol agreement between teachers' aides and speech-language pathologists was 98.01%. Results confirm the reliability and 98% accuracy of a protocol administered by a teacher's aide.

Q29 What bias can you identify based on the following excerpt from a research study?

"In a randomized trial of education versus exercise and diet therapy for nutrition and obesity in children All children in years 1 and 2 (aged 5–7 years) from three primary schools in Jacksonville were targeted in January 2000. The primary schools were selected on the basis of previous links to the Nutrition and Food Science Department at Jacksonville University and their close proximity to the University."

- Too many groups are included in the study.
- Ages 5-7 is too wide a selection across age.
- Primary schools were selected near to the study site.
- No bias exists.

APPENDIX E: RECRUITMENT DOCUMENT

Hello,

UCF is currently completing a research project on the utility of research information for Speech Language Pathologists. The purpose of this message is to request your participation in completing a one time, brief online survey related to access, use, and ability to evaluate research literature in practice. Below you will find two links. The first is a consent document providing a brief explanation of the study and what you will be required to do should you choose to participate. The second link will take you to the study survey.

If you are happy to participate, please read though the consent document and click the survey link to begin.

Thank you for your time and consideration.

-Consent Link-

-Survey Link-

David Gregorio, B.S., B.A.
Graduate Research Assistant
University of Central Florida

[REDACTED]
([REDACTED])

APPENDIX F: INFORMED CONSENT DOCUMENT



EXPLANATION OF RESEARCH

Title of Project: *The Ability to Critically Evaluate Research Literature in Speech-Language Pathology.*

Principal Investigator: David Gregorio, B.S., B.A.

Faculty Supervisor: Giselle Carnaby, PhD, MPH, CCC-SLP

You are being invited to take part in a research study. You must be 18 years or older to participate in this study. Whether you take part is up to you.

- The purpose of the research study is to explore Speech-Language Pathologists' use of research literature and professional ability in critically evaluating research literature when planning the assessment and intervention of communication disorders.
- You will be asked to complete an online survey via the Qualtrics software.
- Expected duration of your participation in the research study is approximately 30 minutes. Once beginning the survey, you are free to discontinue participation at any time by closing your web browser.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please contact: David Gregorio, Graduate Student, Communication Sciences and Disorders Program, College of Health and Public Affairs, (727) 282-2764 or by e-mail at d_greg@knights.ucf.edu, or Dr. Giselle Carnaby, Faculty Supervisor, Department of Communication Sciences and Disorders, (407) 823-4798 or by email at Giselle.Carnaby@ucf.edu.

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

APPENDIX G: IRB APPROVAL FORM



University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: UCF Institutional Review Board #1
FWA00000351, IRB00001138

To: David Christopher Gregorio

Date: September 23, 2016

Dear Researcher:

On 09/23/2016, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review: Exempt Determination
Project Title: The Ability to Critically Evaluate Research Literature in Speech-Language Pathology
Investigator: David Christopher Gregorio
IRB Number: SBE-16-12441
Funding Agency:
Grant Title:
Research ID: N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the [Investigator Manual](#).

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

A handwritten signature in black ink that reads "Kanille Chay" followed by a horizontal line.

IRB Coordinator

LIST OF REFERENCES

- Abrahamson, K., Fox, R., & Doebbeling, B. (n.d). Facilitators and Barriers to Clinical Practice Guideline Use Among Nurses. *American Journal Of Nursing*, 112(7), 26-35.
- Albanese, M. A., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. *Academic Medicine*, 68(1), 52-81.
doi:10.1097/00001888-199301000-00012
- American Chiropractic Association. (2004). Evidence Based Medicine and Best Practices.
- Bussi res, A. E., Terhorst, L., & Leach, M. (2015). Self-reported attitudes, skills and use of evidence-based practice among Canadian doctors of chiropractic: a national survey. *Journal of the Canadian Chiropractic Association*, 59(4), 332-348.
- Biesta, G. (2007). Why "what works" won't work: Evidence-based practice and the democratic deficit in educational research. *Educational theory*, 57(1), 1-22.
- Cheung, G., Trembath, D., Arciuli, J., & Togher, L. (2013). The impact of workplace factors on evidence-based speech-language pathology practice for children with autism spectrum disorders. *International Journal of Speech-Language Pathology*, 15(4), 396-406.
doi:10.3109/17549507.2012.714797
- Cicchetti, Domenic V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment*. 6 (4): 284–290
- Cobus-Kuo, L., & Waller, J. (2016). Teaching Information Literacy and Evidence-Based Practice in an Undergraduate Speech-Language Pathology Program: A Student Reflection. *Contemporary Issues in Communication Science & Disorders*, 43, 35-49.
- Combes, B. H., Chang, M., Austin, J. E., & Hayes, D. (2016). The Use of Evidenced-Based Practices in the Provision of Social Skills Training for Students with Autism Spectrum Disorder among School Psychologists. *Psychology in the Schools*, 53(5), 548-563.
- Day, RA (1989). The Origins of the Scientific Paper: The IMRAD Format. *American Medical Writers Association Journal*. 4 (2): 16–18.
- Dotson, B. J., Lewis, L. S., Aucoin, J. W., Murray, S., Chapin, D., & Walters, P. (2015). Teaching evidence-based practice (EBP) across a four-semester nursing curriculum. *Teaching and Learning in Nursing*, 10, 176-180. doi:10.1016/j.teln.2015.05.004
- Eldredge, J. D. (2016). Integrating research into practice (Vol. 104, pp. 333-337). Carol Stream, Illinois: Medical Library Association.

- Farha, R. A., Alefishat, E., Suyagh, M., Elayeh, E., & Mayyas, A. (2014). Evidence-based medicine use in pharmacy practice: A cross-sectional survey. *Journal of Evaluation in Clinical Practice*, 20(6), 786-792. doi:10.1111/jep.12212
- Guo, R., Bain, B. A., & Willer, J. (2008). Results of an assessment of information needs among speech-language pathologists and audiologists in Idaho. *Journal of the Medical Library Association*, 96(2), 138-144.
- Haynes, R. B., Sackett, D. L., Gray, J. M., Cook, D. L., & Guyatt, G. H. (1997). Transferring evidence from research into practice: 2. Getting the evidence straight. *ACP journal club*, 126(1), A14-A14
- Hoffman, L. M., Ireland, M., Hall-Mills, S., & Flynn, P. (2013). Evidence-Based Speech-Language Pathology Practices in Schools: Findings from a National Survey. *Language, Speech, and Hearing Services in Schools*, 44(3), 266-280.
- Huang, J. L., Curran, P. G., Keeney, J. Poposki, E. M., & DeShon, R. P. (2012). Detecting and deterring insufficient effort responding to surveys. *Journal of Business and Psychology*, 27, 99 –114.
- Jin, J., & Bridges, S. M. (2014). Educational Technologies in Problem-Based Learning in Health Sciences Education: A Systematic Review. *Journal of Medical Internet Research*, 16(12), e251. <http://doi.org/10.2196/jmir.3240>
- Imafuku, R. r. g.-u. a. j., Takuya, S., & Yasuyuki, S. (2016). Developing Undergraduate Research in Japanese Medical Education. *Council on Undergraduate Research Quarterly*, 37(1), 34-40. doi:10.18833/curq/37/1/10
- Kaderavek, J. N., & Justice, L. M. (2010). Fidelity: An Essential Component of Evidence-Based Practice in Speech-Language Pathology. *American Journal of Speech-Language Pathology*, 19(4), 369-379.
- Kaplan, S. L., Tilson, J. K., Levine, D., George, S. Z., Fay, D., Hack, L., . . . Wainner, R. (2016). Strategies for Using the APTA Section on Research Evidence-Based Practice Curriculum Guidelines. *Journal of Physical Therapy Education*, 30(2), 23-31.
- Karpiak, C. P. (2011). Assessment of Problem-Based Learning in the Undergraduate Statistics Course. *Teaching Of Psychology*, 38(4), 251-254
- Kong, L., Qin, B., Zhou, Y., Mou, S., & Gao, H. (2014). The effectiveness of problem-based learning on development of nursing students' critical thinking: A systematic review and meta-analysis. *International Journal Of Nursing Studies*, (3), 458. doi:10.1016/j.ijnurstu.2013.06.009
- Marques, P. A. O., & Correia, N. C. M. (2017). Nursing education based on "hybrid" problem-based learning: The impact of PBL-based clinical cases on a pathophysiology course. *Journal of Nursing Education*, 56(1), 60. doi:<http://dx.doi.org/10.3928/01484834-20161219-12>

- Mok, C., Whitehill, T., & Dodd, B. (2008). Problem-based learning, critical thinking and concept mapping in speech-language pathology education: a review. *International Journal Of Speech-Language Pathology*, 10(6), 438-448.
- Olswang, L. B., & Prelock, P. A. (2015). Bridging the Gap Between Research and Practice: Implementation Science. *Journal of Speech, Language & Hearing Research*, 58(6), S1818-S1826. doi:10.1044/2015_JSLHR-L-14-0305
- O'Mullane, J. J., & O'Sullivan, K. K. (2012). Integrating PBL Games Into a Graduate-Level Statistics Module. *Proceedings Of The European Conference On Games Based Learning*, 1372-377.
- Palinkas, L. A., Garcia, A. R., Aarons, G. A., Finno-Velasquez, M., Holloway, I. W., Mackie, T. I., . . . Chamberlain, P. (2016). Measuring Use of Research Evidence: The Structured Interview for Evidence Use. *Research on Social Work Practice*, 26(5), 550-564.
- Ramírez-Vélez, R., Bagur-Calafat, M. C., Correa-Bautista, J. E., & Girabent-Farrés, M. (2015). Barriers against incorporating evidence-based practice in physical therapy in Colombia: current state and factors associated. *BMC Medical Education*, 15220. doi:10.1186/s12909-015-0502-3
- Rosenstock, L., Helsing, K., & Rimer, B. K. (2011). Public Health Education in the United States: Then and Now. *Public Health Reviews* (2107-6952), 33(1), 39-65.
- Sackett, D. L. (1997). *Evidence-based medicine: how to practice and teach EBM*. WB Saunders Company.
- Schneider, M. J., Evans, R., Haas, M., Leach, M., Hawk, C., Long, C., . . . Terhorst, L. (2015). US chiropractors' attitudes, skills and use of evidence-based practice: A cross-sectional national survey. *Chiropractic & Manual Therapies*, 23(1), 1-12. doi:10.1186/s12998-015-0060-0
- Schulman, C. S. (2008). Strategies for starting a successful evidence-based practice program. *AACN Advanced Critical Care*, 19(3), 301-313.
- Shenouda, N. S., Swenson, R. r., & Fournier, J. T. (2003). The Impact of a Newly Implemented PBL Curriculum on the National Board of Chiropractic Examiners Part I Examinations at the National University of Health Sciences. *Teaching & Learning In Medicine*, 15(4), 233-237.
- Sobell, L. C. (2016). Bridging the Gap Between Scientists and Practitioners: The Challenge Before Us – Republished Article. *Behavior Therapy*, 47, 906-919. doi:10.1016/j.beth.2016.11.007
- Spek, B., Wieringa-de Waard, M., Lucas, C., & Dijk, N. (2013). Competent in evidence-based practice (EBP): validation of a measurement tool that measures EBP self-efficacy and task value in speech-language therapy students. *International Journal of Language & Communication Disorders*, 48(4), 453-457. doi:10.1111/1460-6984.12015

- Spek, B., Wieringa-de Waard, M., Lucas, C., & Dijk, N. (2013). Teaching evidence-based practice (EBP) to speech-language therapy students: are students competent and confident EBP users? *International Journal of Language & Communication Disorders*, 48(4), 444-452. doi:10.1111/1460-6984.12020
- Stevens, K., (May 31, 2013) "The Impact of Evidence-Based Practice in Nursing and the Next Big Ideas" *OJIN: The Online Journal of Issues in Nursing* Vol. 18, No. 2, Manuscript 4.
- Taylor, M. V., Priefer, B. A., & Alt-White, A. C. (2016). Article: Evidence-based practice: Embracing integration. *Nursing Outlook*, 64, 575-582. doi:10.1016/j.outlook.2016.04.004
- Togher, L., Yiannoukas, C., Lincoln, M., Power, E., Munro, N., McCabe, P., . . . Douglas, J. (2011). Evidence-based practice in speech-language pathology curricula: A scoping study. *International Journal of Speech-Language Pathology*, 13(6), 459-468. doi:10.3109/17549507.2011.595825
- Walker, B., Stomski, N., Hebert, J., & French, S. (2014). Evidence-based practice in chiropractic practice: A survey of chiropractors' knowledge, skills, use of research literature and barriers to the use of research evidence. *Complementary Therapies In Medicine*, 22286-295. doi:10.1016/j.ctim.2014.02.007
- Yamalik, N., Nemli, S. K., Carrilho, E., Dianiskova, S., Melo, P., Lella, A., ... Margvelashvili, V. (2015). Implementation of evidence-based dentistry into practice: analysis of awareness, perceptions and attitudes of dentists in the World Dental Federation-European Regional Organization zone. *International Dental Journal*, 65(3), 127-145. doi:10.1111/idj.12160
- Yu, W. W., Lin, C. C., Ho, M., & Wang, J. (2015). Technology Facilitated PBL Pedagogy and Its Impact on Nursing Students' Academic Achievement and Critical Thinking Dispositions. *Turkish Online Journal Of Educational Technology - TOJET*, 14(1), 97-107
- Zipoli, R. P., Jr., & Kennedy, M. (2005). Evidence-based practice among speech-language pathologists: attitudes, utilization, and barriers. *American Journal of Speech-Language Pathology*, 14(3), 208-220.