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DEFINING DELIBERATE PRACTICE IN SUPERVISED DIETETICS EDUCATION

by

Kevin D. Haubrick

A Dissertation
Submitted to the Graduate School
and the Department of Nutrition and Food Systems
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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ABSTRACT

DEFINING DELIBERATE PRACTICE IN SUPERVISED

DIETETICS EDUCATION

by Kevin D. Haubrick

May 2017

Deliberate practice serves as a potential framework to understand what activities, attributes, and characteristics make an individual an expert in their chosen field or profession. Historically, deliberate practice activities included those that were highly structured with purposeful goals, frequent repetition, and active feedback with immediate remediation. Deliberate practice has never been defined within the context of supervised dietetics education; therefore, the purpose of this research was to develop a valid and reliable instrument to define deliberate practice in supervised dietetics practice, based on the opinions of practitioners and educators in dietetics and allied health professions. Segment one of the research consisted of semi-structured interviews with dietetic program directors, preceptors, practitioners, and non-dietetic allied health educators. A total of 100 themes emerged from an inductive content analysis coding method. Participants in the second segment sorted previously identified themes (100 items) into predetermined categories reflective of the constructs of deliberate practice. An instrument was created of the 55 items retained, from segment two, for use in segment three, which consisted of pilot testing the instrument. Face and content validity of the instrument were tested, and initial reliability estimates were >.70 for most categories. Instrument evaluation from the pilot testing resulted in a 55-item instrument to be tested in segment four. Lastly, all items were subject to factor analysis resulting in a seven-

factor solution with 32 items accounting for 59.72% of the shared variance. Deliberate practice within supervised dietetics education can be defined with the following characteristics: (1) opportunities to practice skills and hone knowledge; (2) experiential practice to develop innate talent; (3) skills focused on a high level of patient-centered nutrition care; (4) frequent and ongoing feedback; (5) reading and understanding evidence-based practice literature; (6) professional education and networking opportunities; and (7) environment where the student is free to make mistakes. The applied purpose of this research provides an initial definition of deliberate practice, which lays the foundation for further validation studies of the final constructed definition of deliberate practice in dietetics with the benefit of outlining which practice activities are appropriate in the education of a RD.

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DEDICATION

I could have never gotten to where I am today without the love and support of my family. To Mike, you enduringly supported and provided me the strength to get through many of a challenging day. Knowing you were there with me was all that I needed to get past the many obstacles of this journey. To my precious children. Elizabeth and Anthony. Thank you for also being there with me on this journey. I am proud to share this moment with you. You are the love and lights of my life. I love you all so much.

To my Mom and Dad, thank you for always encouraging and believing in me during my earlier education years.

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To Glenda Woscyna, thank you for demonstrating the characteristics of what it means to be an outstanding program director.

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LIST OF ABBREVIATIONS

ACEND	Accreditation Council for Education in Nutrition and Dietetics
ADA	American Dietetic Association
AND	The Academy of Nutrition and Dietetics
CADE	Commission on Accreditation for Dietetics Education
CBE	Competency-Based Education
CDR	Commission on Dietetic Registration
CP	Coordinated Program in Dietetics
DI	Dietetic Internship
DP	Deliberate Practice
DPD	Didactic Program in Dietetics
DPEN	Development of Expert Performance in Nursing
DTR	Dietetic Technician, Registered
EFA	Exploratory Factor Analysis
FIDE	Fédération Internationale des Èscheces
GPA	Grade Point Average
GRE	Graduate Record Examination
IOM	Institute of Medicine
ISPP	Individualized Supervised Practice Pathway
MAP	Minimum Average Partial
NDEP	Nutrition and Dietetics Educators and Preceptors
NP	Nurse Practitioner

OSCE	Objective Structured Clinical Examination
RD	Registered Dietitian
SAT	Scholastic Achievement Test
USDE	United States Department of Education

CHAPTER I - INTRODUCTION

Deliberate practice serves as a potential conceptual framework to assure that the practice is appropriate in the education of a Registered Dietitians (RD). First studied by Ericsson, Krampe, and Tesch-Römer (1993), deliberate practice encompasses attentive, concentrated carefully planned activities. The concept of deliberate practice has been studied across the domains of sports, gaming, music, and professions, for the purpose of developing expertise in that respective field. Past research in deliberate practice highlights professional readings, individual and group practice, and individual and group study as beneficial activities during deliberate practice time. Interviews, questionnaires, and diaries or logs were the research methods utilized to obtain the results in deliberate practice. However, research within the realm of deliberate practice and the dietetics profession is not evident in the literature. An understanding of the dietetic education model is beneficial, as deliberate practice will be applied to the dietetics education model during this study.

Deliberate practice is an ideology that attempts to explain how one achieves expert performance in a given domain (such as sports, gaming, music, and professions). Deliberate practice has two main assumptions. First, the amount of time individuals spend improving skills through deliberate practice activities is monotonically related to the achievement in performance levels, whereas the values of the X-axis increase, the values of the Y-axis also functionally increase (de Bruin, Smits, Rikers, & Schmidt, 2008; Ericsson, 2014; Ericsson, Krampe, & Tesch Römer, 1993; Ericsson & Ward 2007). For example, as age chronologically increases so should performance levels. Second, high levels of achievement will not be reached with less than 10-years or 10,000 hours of

practice (Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996). The deliberate practice literature has defined four main characteristics of practice activities to be considered deliberate practice in nature, which include: (a) highly structured with purposeful goals, (b) repetitive, (c) provide feedback with active remediation, and (d) lack of enjoyment with high concentration (Campitelli & Gobet, 2008; Charness, Tuffiash, Krampe, Reingold, & Vasyukova, 2005; de Bruin et al., 2008; de Bruin, Kok, Leppink, & Camp, 2014; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford, Ward, Hodges, & Williams, 2009; Haag-Heitman, 2008; Johnson, Tenenbaum, & Edmonds, 2006; Law, Côte, & Ericsson, 2007; McKinney & Davis, 2003; Moulaert, Verwijnew, Rikers, & Scherpbier, 2004; Sonnentag & Kleine, 2000).

To date, researchers have studied deliberate practice in the areas of sports (swimming, rhythmic gymnastics, soccer), gaming (chess), music, and professions (nursing, medical education, aviation, typing, and teaching). Generally, the aims of the research have been to determine if the number of accumulated hours of deliberate practice activities develop expertise in a given domain or to explore potential activities and attempt to define deliberate practice in that particular setting. Researchers explored potential deliberate practice activities, such as professional readings, individual and group practice, and individual and groups study, and found these activities beneficial in developing expertise. Tools utilized to explore potential deliberate practice activities include interviews, questionnaires, and/or diaries or logs as data gathering mechanisms.

The current dietetics education model is, for the majority of students, a two-step process. Students must first complete an accredited Didactic Program in Dietetics (DPD)

plus a separate, accredited 1,200-hour supervised practice experience in a Dietetic Internship (DI) to be eligible to sit for the credentialing examination. As reported by both the accreditation and credentialing entities the end goal is to assure competence to practice (Accreditation Council for Education in Nutrition and Dietetics [ACEND], 2015a, 2015b; Commission on Dietetic Registration [CDR], 2016a). However, no research currently exists to demonstrate that the completion of an accredited, 1,200-hour supervised practice experience and passing of the credentialing examination makes an individual competent to practice in nutrition and dietetics. An alternative approach in the development of competence is to consider is if competence comes much later in one's career trajectory. Competence and expertise are both on the continuum of one's career path with an estimation of how many hours until competence is reached and an unknown amount of hours until expertise is reached (Academy of Nutrition and Dietetics [AND], 2010). Similarly, the framework of deliberate practice assumes that 10,000 hours of practice is the minimal requirement to become an expert (de Bruin et al., 2008; Ericsson, 2014; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007). Deliberate practice serves as a potential framework to address the activities and timing needed in the development of competence.

The Academy of Nutrition and Dietetics (AND) has published a Dietetics Career Development Guide establishing five stages of skills acquisition — novice (didactic knowledge), beginner (supervised practice), competent (first three years of practice), proficient, and advanced practice/expert. Although not based in formalized research, the Dietetics Career Development Guide serves as a guide for the number of accumulated hours until dietetic professional progresses to the expert level of practice similar to the

framework of deliberate practice. According to the skills acquisition model, an individual will be in the competent phase of practice once successful completion of a supervised dietetics education program and the successful passing on the credentialing examination (Academy of Nutrition and Dietetics, 2010). Prior to entering the profession, an individual has obtained 1,200 hours of supervised practice during the dietetic internship piece of the education model. As professionals progress through the competent phase of the skills acquisition model, three years of time passes. To equate this to accumulated hours of practice, if one full-time equivalent is 2,080 hours (Gregoire, 2013), then an individual has obtained 7,460 hours of accumulated practice time by this point in his or her career (1,200 hours for the internship and 6,240 hours for the three years in the competent phase of the skills model at the start of practice after registration). The next stage, proficient, occurs between the stages of competent and advanced practice/expert. The Academy does not define how long an individual practices within the proficiency stage before moving to the expert stage (Academy of Nutrition and Dietetics, 2010). However, an individual would only need approximately 2,560 additional hours before reaching the minimum required 10,000 hours based on Ericsson et al.'s (1993) second assumption of deliberate practice as it relates to becoming an expert.

Research on being qualified to practice within the dietetics arena has been focused on what makes an individual successful on the credentialing examination for dietitians. Researchers have explored academic markers, such as undergraduate grade point average; nutrition grade point average; science grade point average; and academic testing, such as the Graduate Record Examination (GRE), to predict success on passage of the

RD credentialing examination (Bode & Gates, 2001; Bradley & Deaton-Conner, 1993; Farkas, Gregoire, Lafferty, & Hartney, 2010; Fournet & Harrison, 1994; Haubrick, 1995, 2015a, 2015b). Research on predicting success on the RD credentialing examination, although helpful to admit the most qualified student into an internship, does not address what types of educational activities make one successful or competent to practice in dietetics.

Determining those activities, which constitute deliberate practice in dietetics education is important for a variety of reasons. First, deliberate practice has never been defined or even researched in dietetics as it has been in nursing, medical school, teaching, and aviation. Second, providing an initial definition of deliberate practice lays the foundation for further validation studies of the final constructed definition of deliberate practice in dietetics with the benefit of outlining which practice activities are appropriate in the education of a RD. Lastly, the information gained from this research can be utilized in future research studies to compare which activities within supervised dietetics practice produce a safe and competent practitioner and potentially provide support for the Dietetics Career Guide. Therefore, an instrument based on the framework of deliberate practice is necessary to define deliberate practice in supervised dietetics education.

The overall goal of this research study is to develop a valid and reliable instrument to define deliberate practice in supervised dietetics education, based on the opinions of practitioners and educators in dietetics and allied health professions, similar to the domains of gaming and sports with the following research objectives described below.

Research Objectives

1. Explore the concept of deliberate practice and how deliberate practice potentially can be defined within allied health education.
2. Classify concepts of deliberate practice into categories reflective of deliberate practice within dietetics supervised practice education.
3. Develop an instrument to confirm construct definitions of deliberate practice in dietetics.
4. Validate construct definitions of deliberate practice within dietetics supervised practice education.

CHAPTER II – REVIEW OF LITERATURE

Deliberate practice provides a plausible framework for exploring potential dietetics education activities to prepare a safe and competent Registered Dietitian (RD). Additionally, the framework of deliberate practice will be defined and discussed in relation to previous research in this area, and methodologies used in previous deliberate practice research studies, including music, competitive sports/games, and professional practice will be explored. Literature on outcomes-based and time-based competency education programs will also be presented. Lastly, literature encompassing the number of hours of supervised practice required for demonstrating competence as a safe practitioner and possible characteristics of a competent practitioner will be discussed.

History of Dietetics Education

Formalized dietetics education dates back to the discussion of the first educational plan of courses for dietitians in 1923 (Accreditation Council for Education in Nutrition and Dietetics [ACEND], 2015a). In 1927, leaders of the American Dietetic Association (ADA, [now the Academy of Nutrition and Dietetics]) approved the *Outline for Standard Course for Student Dietitians in Hospitals*. The standards required students complete a minimum of a baccalaureate degree with coursework in food and nutrition along with a minimum of a six-month traineeship under the supervision of a dietitian. Between the years of 1927 and 1947, the number of hospital-based traineeship programs increased (exact number of programs not provided), and leaders of the association realized the need to ensure course quality of the hospital-based traineeship programs; thus, the beginning of evaluating dietetics education programs arose. Site visits for the hospital-based

traineeship programs were conducted bi-annually by a three-member team from the ADA (ACEND, 2015a).

Starting in 1947 and spanning until 1987, five plans of education (Plans I – V) were developed and revised. Plan I outlined the minimum academic standards to be eligible for entrance into a dietetic internship. With the acceptance of Plan I, traineeship programs changed names and were classified as dietetic internships. In dietetic internship programs, students were required to complete a minimum of a baccalaureate degree in addition to completing a dietetic internship for eligibility to sit for the credentialing examination. By the development of Plan IV in 1971, competency-based minimum academic requirements were established. In 1974, the minimum qualifications for support personnel and dietetic technicians in the dietetic profession were established. In that same year, the ADA gained recognition from the United States Department of Health, Education and Welfare (now the United States Department of Education [USDE]) and implemented program accreditation for coordinated undergraduate programs and dietetic internships. In 1986, the first independent organization within the ADA organized to conduct standards development and accreditation. The organization was named the ADA Council on Education. The ADA Council on Education has undergone many organizational and name changes to what is now known as ACEND. The Knowledge Requirements for Dietitians were introduced and implemented with the release of the Standards for Education in 1987. The Standards for Education were the minimum quality indicators that must be met by all dietetics education programs (ACEND, 2015a).

The current Didactic Program in Dietetics (DPD) educational model was introduced in 1991 and replaced the numbering system for the educational plans (Plans I – V). Knowledge requirements for entry-level dietitians were introduced with the designation of a DPD. As noted above, students need to complete a dietetic internship after completion of the DPD requirements (Commission on Dietetic Registration [CDR], 2015a).

The quality of the educational process is maintained by the development of educational standards and enforced through the accreditation process. The Dietetic Education Standards (Coordinated Program, Didactic Program in Dietetics, and Dietetic Internships) are revised approximately every five years as a requirement by the USDE (ACEND, 2015a). The Accreditation Council for Education in Nutrition and Dietetics' Standards review coincides with CDR conducting a Practice Audit. The 2002, 2008, and 2012 Eligibility Requirements and Accreditation Standards were released following the completion of the 2000, 2005, and 2010 Practice Audits, respectively (ACEND, 2015a; CDR 2015b). The Educational Standards have been reviewed following the 2015 CDR Practice Audit with release in 2017 (ACEND, 2015b).

Relationship between Accreditation and Credentialing

The Academy of Nutrition and Dietetics (AND) is the parent trade organization that houses the administratively autonomous accreditation and credentialing arms of the profession. The Accreditation Council for Education in Nutrition and Dietetics is the accreditation arm with 15 governing board members. ACEND is federally recognized by the USDE as the accrediting agency for dietetics education and is responsible for all

aspects of governance, educational standards developmental, and program decisions in regards to dietetics education (ACEND, 2015a).

The Commission on Dietetic Registration (CDR) is the credentialing arm of the AND, with 11 governing commission members CDR is fully accredited by the National Commission for Certifying Agencies, the accrediting arm of the Institute for Credentialing Excellence. The primary functions of CDR include administering valid and reliable credentialing examinations, establishing examination eligibility criteria, and re-certifying nutrition and dietetics practitioners (CDR, 2015c). At the time of CDR's inception in 1969, 19,457 dietitians were grandfathered in as a RD to the Commission's database as Registered Dietitians without having to take an exam (CDR, 2015d). In 1970, CDR administered the first credentialing examination to 56 candidates and granted the RD credential to those who successfully passed. By 1972, CDR implemented a process for updating the exam content and revising the examination blueprint or test specifications. As of November 2015, the CDR registry included 94,220 RDs (CDR, 2015e).

The relationship between ACEND and CDR balances on the initiation of the Practice Audit cycle. The Commission on Dietetics Registration conducts a Practice Audit every five years to survey entry-level (five years or less of practice) nutrition and dietetics practitioners. The Practice Audit has the ultimate goal of gaining insight on current, entry-level practice of RDs and Dietetic Technicians, Registered (DTR) for exam question development (CDR, 2015b). The Practice Audit also assists ACEND in its role to conduct a review of the educational standards (including the knowledge requirements and competency statements: minimum level of performance required to provide safe and

optimal care or services to patients) necessary to train students for entry-level practice. Concurrent to revising the educational accreditation standards, CDR revises the test specifications, or testing blueprint, for the RD exam, develops new test items (questions) and reviews the test item pool for accuracy, currency, and relevance based on the findings of the practice audit (CDR, 2015b).

Registration Eligibility Requirements for Dietitians

Three routes exist for one to become eligible for the RD exam. The first route, the most streamlined, is accomplished by completing a Coordinated Program (CP) in Dietetics. A CP in dietetics incorporates both the didactic learning (knowledge requirements) and a minimum of 1200 hours of supervised practice at either the baccalaureate or graduate level (ACEND, 2015d; CDR 2015a). Supervised practice, commonly called experiential education in other healthcare professions, encompasses planned learning experiences aimed at competency development (ACEND, 2015a). After completion of the program, the student is eligible to take the RD registration exam.

The second route to become eligible, and the most prevalent, for the RD registration exam incorporates a two-pronged system. Students must first complete a DPD, either at the baccalaureate or graduate level and obtain a DPD verification statement. The verification statement, completed by the DPD Program Director, confirms a student has completed the minimum coursework to be eligible to enter a dietetic internship program. Students must then complete a minimum of 1200 hours of supervised practice and receive a second verification statement, completed by the Director of the Dietetic Internship (DI). Students can complete the supervised practice experience through a DI or an Individualized Supervised Practice Pathway (CDR,

2015a). The then Commission on Accreditation for Dietetics Education (CADE) Board (now ACEND), with the intention to add supervised practice capacity through already existing accredited dietetics education programs, approved Individualized Supervised Practice Pathways in 2011 (CADE, 2011). Individualized Supervised Practice Pathways (ISPPs) were approved with the intention to allow those qualified students who did not match to a traditional internship but who possess a DPD verification statement the possibility to complete the experiential learning component. ISPPs are considered an additional track of existing accredited ACEND programs — a CP, DPD, or DI can house an ISPP track (CADE, 2011).

The third route to become eligible for the RD exam focuses on individuals who have been awarded a doctoral degree but may not possess a DPD verification statement. Doctoral students undergo an assessment of prior learning by the program to determine if additional coursework is needed and/or which ACEND competencies the doctoral student may have already accomplished. The student in this route is qualified by the completion of their doctoral degree along with the completion of assessment of prior learning. The doctoral students can complete their supervised practice requirement through an ISPP and thus, become eligible to sit for the RD credentialing exam (CDR, 2015a).

Supervised practice, with foundations in the didactic knowledge, is needed so students can demonstrate necessary skills needed to perform at a competent level of practice. Moreover, little detail has been given in relation to the type of practice that is required to be at a competent level of practice. Other disciplines have started to evaluate the idea of deliberate practice; however, little has been explored in the area of deliberate

practice in the training of health professionals with no research conducted specifically in the field of dietetics.

Deliberate Practice

Focused, intense, structured activities with the goal of achieving expert performance are qualities distinct to the idea of deliberate practice. Deliberate practice provides the framework for explaining how one achieves expert performance in domains such as chess, music, competitive sports, and professional development. In these activities, individual innate talent is juxtaposed with focused practice to create expert performance (Ericsson et al., 1993). Deliberate practice encompasses two basic assumptions. The first is that the amount of time an individual spends improving skills (with deliberate practice activities) is monotonically related to the achieved level of performance (de Bruin et al., 2008; Ericsson, 2014; Ericsson et al., 1993; Ericsson & Ward 2007). The second assumption is that expert performance will not be met until at least 10 years or 10,000 hours of practice in the profession or domain (Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996).

Throughout multiple research studies, the definition of deliberate practice has been adapted for use, with each authors' rendition of the definition derived from Ericsson et al.'s (1993) seminal study. However, researchers have gathered common quality indicators for activities in achieving expert performance throughout their own research. These characteristics, as defined by previous research, are instrumental to understanding the concept of deliberate practice as well as being able to assess the overall qualities of deliberate practice.

Characteristics of Deliberate Practice

For activities to be considered deliberate practice, the characteristics of the specific activities must meet the quality and intensity parameters of being deliberate in nature. Based on the findings of multiple researchers, activities that include the following characteristics can be considered deliberate practice activities: (a) highly structured with purposeful goals, (b) repetitive, (c) provide feedback with active remediation, and (d) lack of enjoyment with a high concentration (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Law et al., 2007; McKinney & Davis, 2003; Moulaert et al., 2004; Sonnentag & Kleine, 2000).

Highly Structured with Purposeful Goals. One of the characteristics for activities to be considered deliberate practice is being highly structured with purposeful goals. The deliberate tasks should be specific, focused, challenging, and developed with the goal of gradually improving performance. The learning tasks should be adapted to the skills of each specific learner and chosen with the ultimate goal of improving a particular skill (Charness et al., 2005; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Haag-Heitman, 2008; Johnson et al., 2006; Moulaert et al., 2004; Sonnentag & Kleine, 2000). For example, if an individual is focusing on improving his or her chess game skills, the learning tasks should be developed based on the technical requirements and gaming strategies of chess. Thus, all learning tasks with regards to improving one's chess game will be concentrated on that specific focus. Deliberate practice tasks, dependent on the domain, must be well defined and at a challenging level to aid in

continued skill development. Moreover, deliberate practice refers to the explicit goal of competency attainment and improvement (Sonnentag & Kleine, 2000).

Repetitive. The second characteristic for activities to be considered deliberate practice is the activity being repetitive, allowing for refinement of skill. To achieve the level of an expert or world class performer, the skill or task at hand must come naturally and become second nature to the individual, which only comes from repeating the tasks multiple times. Repeating tasks incorrectly does not obtain the outcome of expert performance; thus, feedback on how to improve the task and active remediation to properly perform the tasks is necessary to ensure skills are being developed correctly. (de Bruin et al., 2014; Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004).

Feedback and Active Remediation. The use of feedback in improving one's performance is vital to achieving expert performance. Modification in improving one's skills is derived from actively learning from one's failures. During each deliberate practice session, incremental improvement is made from the feedback and active remediation with gradual improvement to a higher level of performance (de Bruin et al., 2008; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004). For example, if the goal is to increase performance in chess, then having the ability to repeat the learning task(s) over and over again is imperative while receiving feedback and active remediation (i.e. what is not correct and how to make the correction). Repetition alone may not guarantee success in learning the task because the individual may continue to incorrectly perform the given task.

Outside of deliberate practice literature, feedback has been shown to improve one's performance, specifically in the area of teacher education. Codding, Livanis, Pace, and Vaca (2008) explored performance feedback given to teachers within a special education program in a public school who were implementing a behavior plan for children who had been diagnosed with emotional problems. During baseline data collection, researchers noted correct implementation of behavior plans across teachers was 0 to 57% of the time. During the performance feedback phase, implementation of the behavior plans dramatically improved to 50% - 100% correct; however, statistical significance was not noted. Improvements were also noted in teachers' performance in student evaluations.

Within the sport of rowing, immediate stroke feedback was shown to significantly increase performance consistency when compared to receiving no feedback. Detailed feedback was provided to the participants of the study during row trials, including actual kinematic data gathered during each rowing stroke and was provided to the rower. The results of the study revealed stroke performance consistency was significantly increased with detailed feedback when compared to no feedback ($p<.01$) and compared to summary feedback (results after the completion of each stroke; $p<.05$). The authors also noted no significant difference ($p=0.173$) between summary feedback and no feedback (Anderson, Harrison, & Lyons, 2005).

Lack of Enjoyment with High Concentration. The last characteristic of deliberate practice activities is lack of enjoyment with high concentration. Lack of enjoyment occurs because deliberate practice activities require full attention and maximal effort of the participant. With complete concentration, the practice of the skills is often difficult,

unpleasant, and un-enjoyable. One should not partake in deliberate practice activities for long periods of time. Optimally, shorter, more frequent segments of deliberate practice activity are ideal due to the intensity and necessary feedback loop for improvements (Campitelli & Gobet, 2008; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Moulaert et al., 2004).

Innate Talent as Compared to Developed Talent

With deliberate practice, expert performance is not solely dependent on the ability of the individual to participate in the activity; the ability of the performer also must be considered. In 1869, Sir Francis Galton recognized the importance of innate or genetic factors when achieving expert performance. Galton noted that training and practice were necessary for achieving expert performance levels, but training alone was not sufficient in achieving expert performance (Galton, 1979). Galton was the first scientist to postulate that experts were likely to have close relatives who were also experts in differing and the same fields with the assumption genetic factors of exceptional performance were shared between family members (Ericsson et al., 1993).

Galton's (1979) view on achieving expert performance can be classified as the nature view where those who achieve expert performance did so because of their innate abilities and talents. Evidence to support the nature view in achieving expert performance is limited. The theory of nature to explain excellence may be more indicative in domains such as sports, where genetic traits play a role in success. For example, height is typically a benefit to being successful in sports, and those who are not

of adequate height usually do not participate in a sport where being tall is advantageous (Ericsson et al., 1993).

Oppositely, Ericsson et al. (1993) proposed that expert performance does not hinge solely on innate talents or abilities. The authors noted that expert performance is more easily and rapidly achieved when individuals have natural abilities plus focused training and practice (i.e. nurture). Ericsson et al. (1993) compared three groups during their research including *elite, good,* and *music teacher* violinists and pianists. Within their research, *elite* violinists and pianists accumulated more hours of deliberate practice time when compared to the *good* group and *music teacher* group (p at least $<.05$). The individuals within the elite violinists and pianists groups had the most hours of focused training, which highlights the relationship between training and practice (nurture) in addition to having some natural abilities (nature) for playing the violin and piano.

Using Deliberate Practice to Develop Skill

An individual must progress through multiple phases of deliberate practice (the purposeful practices of a particular skill or activity) to be successful in the development of a particular skill (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Law et al., 2007; McKinney & Davis, 2003; Moulaert et al., 2004; Sonnentag & Kleine, 2000). In order to be successful in deliberate practice, an individual needs to have highly structured activities with defined goals, repetition of the activities, immediate feedback with remediation, and high concentration with lack of enjoyment. Activities of deliberate practice encompass professional reading,

individual and group practice, individual and group study, as well as recreational activities in competitive sports, gaming, music, and professions (Campitelli & Gobet, 2008; Charness et al., 2005; Gobet & Campitelli, 2007; Moulaert et al., 2004; Ward, Hodges, Starkes, & Williams, 2007).

Phases of Development in Deliberate Practice. Ericsson and Charness (1994) and Ericsson et al. (1993) described four phases of skill development within the model of deliberate practice. The first phase starts with the individual introduced to activities within a specific domain and ends with the start of formal instruction and deliberate practice activities. An example of the first phase is a young child showing talent while playing the viola at home without having any formal lessons from an instructor. The next phase starts with the individual beginning formal instruction and engaging in deliberate practice activities to improve performance. This phase covers an extended period of time and ends when the individual is committed to pursue activities in a chosen domain on a full-time basis. An example of the second phase is the point in time when the individual begins formal instruction on playing the viola until the individual went on to pursue playing the viola as a full-time, life activity. The third phase begins with the individual undertaking full-time dedication to improving viola performance and ends when the individual can secure an acceptable annual salary to live as a professional performer in their chosen domain. The fourth phase begins when the individual goes beyond the instructor's knowledge and makes unique contributions to the domain with continued deliberate practice activities (Ericsson & Charness, 1994; Ericsson et al., 1993). Although an individual's level of knowledge in their chosen domain has not been directly quantified in literature, expert performance is reached when the student surpasses the

instructor in knowledge and contributions to the profession (Ericsson & Charness, 1995; Ericsson et al., 1993).

Deliberate Practice Use. Sports, gaming, music and professional development are domains in which deliberate practice was studied. Researchers found mixed results for accumulated hours of deliberate practice in domain of sports, specifically with supportive results in soccer and rhythmic gymnastics and non-supportive results in swimming. Within the domains of gaming, music, and professions, deliberate practice activities were supportive in achieving expert performance.

Sports

Examining the relationship between deliberate practice and achieving elite performance has been studied in the domain of sports — soccer, swimming, and rhythmic gymnastics (Ford et al., 2009; Hodges, Kerr, Starkes, Weir, & Nananidou, 2004; Johnson et al., 2006; Law et al., 2007; Ward et al., 2007). However, the support for deliberate practice necessary to achieve elite status differs based on the type of sport performed. Athletes who accumulated more deliberate practice time and participated in more deliberate practice activities performed at higher levels in sports such as soccer and rhythmic gymnastics (Ford et al., 2009; Law et al., 2007; Ward et al., 2007). For example, participants who spent less time in playful activities as they age (between 14-18 years of age) were more likely to achieve elite status. In a study of soccer players, sub-elite players accumulated 2,890 hours in playful soccer related activities and invested only 998 and 1,102 in team and individual practice compared to elite soccer players who spent 2,484 hours in team practice and 2,058 hours individually practicing.

In rhythmic gymnastics, elite athletes significantly (p=.001) participated less in sporting activities outside of rhythmic gymnastics (less than two activities) compared to the sub-elite group (two to three activities; Law et al., 2007). Elite athletes started to compete at the regional level at an earlier age than did the sub-elite group (p=.03) and had a steeper increase in training hours across the four periods of development (ages 6-8, 9-12, 13-15, 16 and older). Additionally, the average accumulated number of practice hours (warm-up, ballet, technique training, and conditioning) by the age of 16 was significantly higher (p=.000) for the elite group (M = 18,815 hours) when compared to the sub-elite group (M = 6,686 hours; Law et al., 2007).

Interestingly, not all sports showed the same patterns. Research in the area of swimming did not support deliberate practice in achieving elite performance. Johnson, Tenenbaum, and Edmonds (2006) discovered swimmers with more deliberate practice hours did not necessarily achieve high levels of elite performance. Moreover, gender, not practice time, played a more vital role in predicting elite performance of swimmers, which and potentially supports Galton's theory of nature playing a role in developing expertise (Hodges et al., 2004).

Gaming

Chess is another field in which deliberate practice has been studied to predict achievement of world ranking scores. Like sports, in the use of deliberate practice to develop expertise in chess is variable. Gobet and Campitelli (2007) examined the effects of handedness, amount of deliberate practice time, and the 10,000-hour rule for acquisition of expert chess performance. The sample included 104 chess players (101 males and 3 females) across the spectrum of world rankings in chess. All eight variables

studied (coaching and logarithmic transformation of group practice time, age, serious age, starting age, individual practice time, club age, and number of books) were entered into the multiple regression equation in no particular fashion. The variable logarithmic transformation of group practice time (β=.272, p<.05) and presence of a coach (β=.264, p<.03) accounted for the most variation in predicting expert performance in chess skill (R^2 = .412, R^2_{adj} = .345, F(8,70) = 6.14; p = <.001). The authors concluded total hours of deliberate practice time and feedback from a coach were needed to obtain expert performance.

Other researchers in the field of chess found support for deliberate practice necessary for achieving expert performance using regression modeling (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008). Campitelli and Gobet (2008) found differing results to their earlier work; variables including logarithmic transformation number of books (β=.403, p<.001), presence of a coach (β=.233, p<.02), and logarithmic transformation of speed games (β=.190, p<.05) contributed significantly to achieving expert performance in chess (R^2 = .310, R^2_{adj} = .288, F(3,91) = 13.64; p=<.001). Similar to the findings of Gobet and Campitelli (2007) and Campitelli and Gobet (2008), total logarithmic transformation of hours of serious study (β=.36, p<.01), total years of private instruction (β=.15, p<.01), current hours per week of serious study (β=.12, p<.01), and current hours per week of tournament play (β=.13, p<.01) were significant predictors (R^2 = .34, R^2_{adj} = .33, F(6,368) = 32.13; p<.01) of chess skill (Charness et al., 2005). Deliberate practice was also found to have an immediate and monotonic effect on performance when measured at one-year intervals. Participant

performance level steadily increased, beginning at around 12 years of age, with the engagement of deliberate practice activities (de Bruin et al., 2008).

Music

The foundation of deliberate practice began with examining the relationship of deliberate practice and expert performance in music (Ericsson et al., 1993). With the publication of his seminal article, Ericsson and colleagues provided support for the two assumptions of deliberate practice — deliberate practice hours are monotonically related to expert performance and achievement of expert performance requires at least 10,000 hours or 10 years. The authors discovered that as time since introduction to the domain (in this case music) and deliberately practicing elapsed, performance levels increased, and experts accumulated more deliberate practice hours. The results of Ericsson and colleagues (1993) were similar to other results when the relationship between deliberate practice and music was examined (Krampe & Ericsson, 1996; Meinz & Hambrick, 2010). Maintaining a high level of acquired skill in music requires a continued need of practice activities, which are focused, concentrated, and high level. Older, amateur pianists showed similar age-graded decline on music-related tasks, but this result was not consistent with older, expert pianists. The older, expert pianists' performances on music-related tasks were only slightly below young, expert pianists (Krampe & Ericsson, 1996).

Continuing to evaluate piano-playing skill, deliberate practice activities (β=.672, p<.01) significantly accounted for the variance in sight-reading performance when evaluating deliberate practice and working memory capacity (R^2 = .451, F(1,55) = 45.24; p=<.01; Meinz & Hambrick, 2010). However, working memory capacity (β=.273, p<.01) accounted for an additional 7.5% (R^2 = .074, F(1,54) = 8.48; p=<.01) in sight-

reading performance and thus supports other variables influence expert performance in piano sight-reading performance (Meinz & Hambrick, 2010).

Professions

Most professions do not have objective markers of achieving expert performance as does competitive sports (Olympic medalists, national champions, world record holders), gaming (high ranking world class chess players), and music (concert pianist). Achieving expert performance has been classified differently across varied professions. For example, in medical school, nursing, teaching, and insurance sales, achieving expert performance has been traditionally measured by years of experience (Dunn & Shriner, 1999; Haag-Heitman, 2008; Moulaert et al., 2004; Sonnentag & Kleine, 2000). While in aviation, achieving expert performance has been measured by the number of flight hours, which included practicing drill malfunctions (McKinney & Davis, 2003).

Deliberate practice and achieving expert performance has been studied in the field of medical school education. Participants included undergraduate medical school students from the Netherlands. The total undergraduate curriculum was completed within six years, with the first four years devoted to didactic/theory-based knowledge and the last two years focused on experiential/clinical learning. A total of 777 students participated in the study (90%) with a mean age of 21.7 (SD= 2.5 years) and were mostly female (66.2%). Student progress was examined as progression through the medical school curriculum occurred. Results indicated student hours spent on study-related activities, which were not defined in the article, and self-directed study were significantly and positively correlated (p <.05) with the results on the three achievement tests utilized within the program (Moulaert et al., 2004).

Using a purposive sampling method, two Midwestern healthcare systems served as a setting for participants identifying potential deliberate practice factors modulating achievement of expert performance of clinical nurses along the pathway of novice to expert (Haag-Heitman, 2008). The participants used a variety of deliberate practice methods to improve their level of performance including formal education, clinical in-services and seminars, specialty certifications, teaching/coaching others, and written references and electronic resources. Three themes from the interviews emerged related to deliberate practice — choosing diverse and dynamic work, lifelong self-directed focus, and positive and engaged demeanor. Immediate feedback was determined important to improve one's skill level. The authors also noted the number of years of experience supported the conclusion that around year five, nurses typically attain the expert stage of performance in their skill level. This conclusion is consistent with what is seen in the profession of dietetics from the Dietetics Career Guide, where expertise is gained after multiple years of practice in a specific area (AND, 2010).

Teaching is another professions domain in which deliberate practice has been studied. Teachers from 14 low- and middle-income neighborhoods employed in private elementary schools in northwest Ohio and southeast Michigan were included in a study that attempted to identify potential deliberate practice activities in teaching for the main purpose of providing optimal opportunity for learning and skill acquisition (Dunn & Shriner, 1999). Questionnaires were utilized to identify the potential deliberate practice activities. Preparing materials for instruction, mentally planning teaching strategies and activities, evaluating student progress using graded written work and projects, informally evaluating students through observational and non-graded performances, written

planning, and evaluating student progress using teacher-made tests were activities with high rankings for relevance, effort, and frequency and best reflected characteristics of deliberate practice in teaching. Authors concluded participation in deliberate practice activities allowed for deliberate self-improvement and improving overall teaching (Dunn & Shriner, 1999).

Sonnentag and Kleine (2000) conducted research with the purpose of identifying the role of deliberate practice in relation to performance of insurance agents. Participants included 100 sales agents working for ten different German insurance sales companies. Data were collected through structured interview questions as well as participants maintaining and returning diary sheets to record time spent on activities. Authors concluded current time (weekly amount) spent on deliberate practice activities contributed to improved work performance (β=.29, p<05) and number of cases handled by the agent (β=.40, p<.01). When evaluating cumulative time (retrospective total amount) spent on deliberate practice activities, cumulative time spent on support activities and deliberate practice did not contribute to work performance. The only significant predictor when evaluating cumulative time spent was the number of cases handled (β=.40, p<.01). Current time spent may be more important than cumulative time spent on deliberate practice activities when evaluating work performance. The practical application of the article conveyed the critical need for employees to participate in regular deliberate practice activities to improve work performance and competence (Sonnentag & Kleine, 2000).

Aviation and the evaluation of crisis management in handling military flight occurrences deliberate practices also have been evaluated. Data included 173 aircraft

mechanical malfunction mishaps from 1980 to 1990. The data set contained both deliberately practiced (routinely practiced drills) and unpracticed malfunction situations. Deliberate practice was measured by the pilot's (a) number of flying hours in the mishap aircraft and (b) total number of flying hours in all military aircraft. Malfunctions were first split into either deliberately practiced or unpracticed malfunction. Three fighter pilot judges with multiple years of experience conducted the separation between practiced and unpracticed malfunctions. Deliberately practiced malfunctions were easy to identify with set protocols in place for a solution. The solutions to the deliberately practice malfunctions were routinely practiced and were evaluated whenever deemed necessary. Unpracticed malfunctions did not have set protocols in place for a resolution. Deliberate practice hours were found to have a positive effect (2,221 total hours compared to 1,480 hours, $p<.025$) on crisis decision-making performance for routinely practice malfunctions; however, the authors found no relationship between deliberate practice and crisis decision-making performance for unpracticed malfunctions (McKinney & Davis, 2003). Thus, pilots cannot deliberately practice for unknown malfunctions and deliberate practice activities did not appear to assist in the training or preparation for such unknown malfunctions.

Researchers within the professions domain have identified potential activities of deliberate practice to begin defining deliberate practice in each given profession, which could possibly be transferable to the dietetics profession. Potential activities of deliberate practice include years in formal education, teaching, and coaching, determination, immediate feedback, informal evaluation, number of discipline-specific books owned, and number of discipline specific journal articles read (Dunn & Shriner, 1999; Haag-

Heitman, 2008; Moulaert et al., 2004). A working definition of deliberate practice is more developed in the domains of sports and gaming yet not in the professional domain. Activities related to the idea of deliberate practice have been identified; however, a working definition of deliberate practice does not exist with the professional domain. Further exploratory research is needed to validate a working definition of deliberate practice, with the focus of this research to validate a working definition of deliberate practice in dietetics to begin to understand what activities lead to competence and expertise and when competence and expertise are reached.

Accumulated Deliberate Practice Time. In the domains where deliberate practice has been studied, including music, competitive sports, and professions, deliberate practice has been supported and necessary in the achievement of expert performance (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Dunn & Shriner, 1999; Ericsson, 2004, 2007, 2008, 2013, 2014; Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Krampe & Ericsson, 1996; Law et al, 2007; Meinz & Hambrick, 2010; Moulaert et al., 2004; Plant et al., 2005; Simon & Chase, 1973; Sonnentag & Kleine, 2000). Expert performance can be classified by many different nomenclatures. Possible examples of expert performance include: obtaining world rankings in chess, becoming an Olympic athlete in rhythmic gymnastics, or surpassing a teacher and earning a full-time salary in music.

The importance of accumulated deliberate practice time can again be seen in the domains of music, competitive sports, and professions. In Ericsson and colleague's research (1993), accumulated deliberate practice hours significantly differed between

elite violinists (defined as the best violinists by the music professors) when compared to good violinists (also determined by the music professors but were not at the performance caliber as the elite group), where the elite violinists accumulated 7,410 practice hours, by the age of 18, as compared to 5,301 hours in the good violinists ($F(1,27) = 4.59$, $p<.05$). Ericsson and colleagues replicated their study in the area of piano performance. The authors discovered expert pianists had accumulated more deliberate practice hours when compared to amateur pianists, 7,606 vs. 1,606 hours, $F(1,22) = 26.29$, $p<.0001$.

Across the domain of competitive sports (specifically soccer and rhythmic gymnastics), accumulated hours of deliberate practice were supportive in achieving expert performance (de Bruin et al., 2008; Law et al., 2007; Ward et al., 2007). Law and colleagues (2007) discovered elite rhythmic gymnasts accumulated a total of 18,838 hours (SD=2,936) of deliberate practice activities by the age of 16 as compared to their sub-elite counterparts, who accumulated a total of 6,686 deliberate practice hours (SD=2,198, $p=.000$). However, accumulated deliberate practice hours necessary to achieve expert performance were not significantly higher than the hours practiced by sub-elite swimmers. Elite swimmers accumulated a total of 7,129 hours of deliberate practice compared to sub-elite swimmers accumulating a total of 7,819 hours (Johnson et al., 2006).

In a study on medical school education based in the Netherlands, hours spent of study related activities, which were not defined by the authors, were significantly correlated to block testing ($r=.23$, $p<.01$), progress testing ($r=.08$, $p<.05$), and skills testing ($r=.20$, $p<.05$). When evaluating hours spent on self-directed study, Moulaert and colleagues (2004) discovered significant correlations between self-directed study hours

and block testing (r=.23, p<.01), progress testing (r=.13, p<.01), and skills testing (r=.11, p<.01). Block testing consisted of approximately 160 true/false knowledge items administered three times per academic year. Progress testing occurred four times during an academic year and consisted of 250 true/false/don't know knowledge items reflecting the final learning objectives of that particular academic year. Assessing clinical skills of each medical student was completed annually during a skills test. The performance of the medical students on their progress, skills, and block testing was beneficially affected by deliberate practice activities (Moulaert et al., 2004).

Use of deliberate practice extends beyond performance on tests. McKinney and Davis (2003) examined the relationship between deliberate practice and crisis management during malfunction scenarios (drills) in aviation. Deliberate practice hours were defined as the number of hours in a specific aircraft and the total amount of career hours in flight, which were found to have a positive and significant effect on crisis decision making (p<.025). However, when deliberate practice was measured against performance abilities in insurance sales, the results were not as positive as those found in medical school and aviation instruction (McKinney & Davis, 2003; Moulaert et al., 2004; Sonnentag & Kleine, 2000).

Professional Readings

Books owned, journal articles read, and number of Internet searches conducted for study related materials have been considered as potential deliberate practice activities. In a study of Argentinean chess players, logarithmic transformation of number of books owned was one variable in a multiple regression analysis, along with several others including coaching and logarithmic transformation of group practice, age, serious age,

starting age, individual practice, and club age, accounting for 34% (p<.001) of the variance in chess performance (Gobet & Campitelli, 2007). In a related study, number of chess books owned was significantly correlated with chess skill (r=.53, p<.01) in a multi-country study (Canada, Germany, Russia, and the United States) of chess players (Charness et al., 2005).

Similar research was conducted in the field of health education. In one study, medical students (n=777) owned an average of 12.3 (SD=10.5) medical books, read 3.4 (SD=4.8) journal articles per month, and searched the Internet for study related material 3.1 (SD=5.2) times per month. In the same study, the number of books owned (r=.08, p<.05) and journal articles read (r=.10, p<.05) produced a weak, yet significant positive, correlation with progress tests (summative information) the students completed during each year of the medical school curriculum (Moulaert et al., 2004). Lower-achieving medical students averaged reading 1.1 fewer articles and owning 2.4 fewer books when compared to their higher achieving counterparts, though results were not significant (Moulaert et al., 2004).

Practice to Improve Performance: Individual and Group

In two related research studies, the effects of individual practice activities (blindfolded reading, use of databases, use of chess programs, and log of number of books) and group practice activities (coaching, blindfolded chess, playing speed chess, and log number of speed chess games) were explored in relation to chess expertise (Campitelli & Gobet, 2008; Gobet & Campitelli, 2007). In an earlier article, Gobet & Campitelli (2007) discovered individual and group practice, grouped with six other variables (coaching, log age, log serious age, log starting age, log club age, and log of

number of books), accounted for 34% (p<.001) of the variance in expert chess performance when entering all of the variables into the regression model simultaneously. Individual practice (r=.42, p<.0001) and group practice (r=.54, p<.0001) were significantly correlated with national chess ratings (Campitelli & Gobet, 2008). Campitelli and Gobet (2007) followed a stepwise regression approach with blindfold reading (individual activity), coaching, and log number of speed chess games (group activities) significantly accounting for 31% of the variance in chess skills (R^2=.310, R^2_{adj}=.288, $F(3, 91) = 13.64$, p<.001).

Individual deliberate practice activities are one method utilized to improve skill. In addition to individual deliberate practice activities, group practice activities have also been measured. Team (group) practice was the most consistent, and often the only, discriminator between the elite and sub-elite soccer groups when examining the effects of deliberate practice and prediction of achieving expert performance in soccer. Discriminate function analysis accurately predicted group membership for 85.3% of the players aged 9 to 11. Group membership also increased prediction ability up to 94.9% for those groups older than 12 years of age (Ward et al., 2007). In the same study, sub-elite participants began individual practice at a later date when compared to elite participants and this difference occurred at 12 years of age (p<.001).

Study to Improve Performance: Individual

An additional potential deliberate practice activity is individual study activities. Moderate correlations were found between chess skill and multiple variables in a multi-country study conducted with participants from Canada, Germany, Russia, and the United States (Charness et al., 2005). The research study included two samples of participants.

Sample one (n=239; 214 males and 23 females) participants were recruited between 1993 and 1995 via newspaper ads, personal contact, and announcements at chess clubs, with no inclusion criteria required in terms of skill level or age. Sample two (n=180; 153 males and 27 females) participants were recruited between 1997 and 1999 using the same methodology as sample one. Inclusion criteria for the second sample were to be at least 18 years of age and have a minimum Elo chess rating of 1,600. Participants of both samples were asked to complete a questionnaire to gather the following information: demographic and chess-rated development milestones, cumulative chess activities, and current chess activities (Charness et al., 2005).

In the first sample, total logarithmic transformation of hours of serious study (r=.54) and chess books owned (r=.53) were significantly correlated to chess skill with p<.01. In the second sample, total logarithmic transformation of serious study (r=.48) was also significantly correlated to chess skill with p<.01. Multiple regression results for sample one showed logarithmic transformation of cumulative hours of serious study alone (β=.33) and total years of private instruction (β=.27) were significant predictors accounting for 39% of the variance in current skill rating, $F(6, 199) = 23.06$, p<0.01. Results of multiple regression for sample two revealed similar results. The logarithmic transformation of cumulative hours of serious study alone (β=.38) was the only significant predictor of current skill rating accounting for 28% of the variance, $F(6, 162) = 12.16$, p<0.01. When analyzing the combined sample (sample one and two, n=375), logarithmic transformation of cumulative hours of serious study alone (β=.36), total years of private instruction (β=.15), current hours/week of serious study (β=.12), and current

hours/week of tournament play (β=.13) were significant predictors accounting for 33% of the variance in current skill rating, F (6, 368) = 32.13, p<0.01 (Charness et al., 2005).

Recreational Activities

Recreational practice or play is much different than deliberate practice and is not considered equitable in quality (Ericsson, 2004; Ericsson & Charness, 1994; Vallerand et al., 2007). Recreational activities are defined as participating in, for example, swimming or tennis for pleasure and require far fewer hours of practice to obtain an acceptable level of performance compared to the number of hours required to become an expert in a field under the framework of deliberate practice. However, once an individual develops his/her skills during recreational activities, he/she loses conscious control in the execution of the skills, making later intentional modifications or improvements difficult. When an individual reaches this development of skill, a plateau is reached and the individual does not make any further improvements. Recreational activities, more than likely, do not have specific goals in place with active remediation during repetitive and concentrated practice time thus not meeting the characteristics of being deliberate practice.

Measurement of Expert Performance

Methods used by researchers to measure expert performance varied by the domain under study; for example, grade point averages and ratings in chess (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; Gobet & Campitelli, 2007); rankings in rhythmic gymnastics and swimming (Johnson et al., 2008; Law et al., 2007), net words per minute in typing (Keith & Ericsson, 2007), and intelligence test scores in chess (de Bruin et al., 2014) have been used. As noted earlier, the professions domain does not have specific measurement scores to determine expert performance, aside from aviation,

which utilizes flight hours as a marker of accumulated practice and expertise during known malfunction exercises/drills. In the professions domain, achieving expert performance levels is more challenging to measure compared to chess ratings or rhythmic gymnastics routine scores, for example, which has standards or objective measures to determine expertise. A chess player can objectively measure improvements in gaming techniques as a result of practice. A rhythmic gymnast can objectively measure improvements in his or her routine as a result of practice. In those particular instances where improvement of goals is not as straightforward, researchers identified achieving expert performance according to years of experience (one to four) in medical school (Moulaert et al., 2004); years of experience in nursing (Haag-Heitman, 2008); and novice teachers versus teachers with ten plus years of experience (Dunn & Shriner, 1999).

Researchers have attempted to utilize different methodological techniques to determine which activities are classified as deliberate practice and the amount of time spent on deliberate practice activities. Interviews, questionnaires, and diaries or logs have been used as vital tools to document deliberate practice activities and hours accumulated of deliberate practice time.

Interviews. Gobet and Campitelli (2007) and Campitelli and Gobet (2008) utilized interviews to guide their research in defining deliberate practice and capturing hours of deliberate practice activities. The same researchers followed similar study procedures for both research publications. The first section of the instrument included demographic related questions such as international rating, national rating, age at which one joined a chess club, and presence of a coach. The second section of the study procedures quantified the hours per week each individual spent on playing chess alone

(individual practice) and with others (group practice). The last section of the study procedure was the Edinburgh Handedness Inventory, which included ten items querying about hand preference for activities such as writing, drawing, or using a knife. Researchers utilized the Edinburgh Handedness Inventory to determine if a participant was either left-handed or right-handed and then compared direction of handedness to achieving expert performance in chess. Limitations within this research included retrospective questioning, correlational design, and the generalizability of the results outside of Argentina. In particular, utilization of retrospective questioning, which does not possess ideal reliability if participants cannot accurately remember the information.

Similar interview questions to Gobet and Campitelli's (2007) and Campitelli and Gobet's (2008) research were developed to capture deliberate practice activities in typing (Keith & Ericsson, 2007). Similarities between the interview questions included measuring skill level, differing practice activities, and capturing accumulated deliberate practice hours. The authors explored the relationship between the contribution of typing abilities, amount of previous experience in typing, deliberate practice activities (attending a typing class and individual practice time), and typing performance. Sixty undergraduate students participated in the study and approximately half of the participants were female (51.7%). The interview portion of the research study was conducted during the second session and included questions pertaining to current (what type and how much) and past (transition events and history of taking a typing class) typing habits. The authors concluded that the amount of typing time since introduction to the keyboard was related to overall typing performance (simple-slope β=.73 $t(56)$=24.41, p<01) and cognitive abilities measured by SAT scores (simple-slope β=.27 $t(56)$=2.07,

$p<05$). The authors noted, similar to Campitelli and Gobet (2008) and Gobet and Campitelli (2007), the necessity to rely on retrospective information; for example, participants' typing experience and deliberate attempts to improve performance (Keith & Ericsson, 2007).

A semi-structured interview tool titled the Development of Expert Performance in Nursing (DEPN) was used to attempt to identify the essential personal and environmental attributes modulating the attainment of expert performance of practicing clinical nurses through the journey of novice to expert (Haag-Heitman, 2008). Through the semi-structured interview, three important deliberate practice themes emerged including choosing diverse and dynamic work, lifelong self-directed focus, and positive and engaged demeanor. Attaining formal education and specialty certifications, attending clinical in-service classes and seminars, and teaching and coaching others were methods used by the participants of the study to achieve higher levels of nursing performance and thus, were considered deliberate practice activities in achieving expertise in nursing.

Haag-Heitman (2008) conducted face and content validity testing of the DEPN. Three nursing experts participated in evaluating and documenting the face and content validity of the interview protocol. Content validity index of .95 was reported for the interview protocol, which is above the threshold of .80 to be considered good (Polit & Hungler, 1999).

Interviews are vital to the process of determining potential deliberate practice activities and capturing accumulated hours of deliberate practice time. Interviews provide direct interaction with research participants and allow for flexibility in the process to allow the researcher to probe in particular areas of interest (Burns & Grove,

2005). However, a limitation of this research is retrospectively collecting the information from the participants.

Questionnaires. In addition to interviews, questionnaires have been utilized successfully to explore the relationship between deliberate practice activities and expert achievement (Dunn &Shriner, 1999; Haag-Heitman, 2008; Moulaert et al., 2004). The Expert Nursing Practice Questionnaire (ENPQ) was used by Haag-Heitman (2008) in the clinical field of nursing. The goal of this study was to identify the essential personal and environmental attributes modulating the attainment of expert performance of practicing clinical nurses through the journey of novice to expert. Of those participating in the study, eight completed a bachelor's degree, one completed a diploma, and one completed a master's degree. Seven participants had 20 or more years of experiences. The author noted the range in the number of years of experience of the sample, although small, supported the conclusion that at around year five, nurses typically attain the expert skill level. Self-directed, engaged, involved in the profession, personal risk taking, and exposure to expert role models and mentors were essential personal and environmental attributes playing a role in the development of expert practice.

Questionnaires were also used to determine which activities best reflected the characteristics of deliberate practice in teaching (Dunn & Shriner, 1999) and medical school education (Moulaert et al., 2004). Dunn and Shriner (1999) designed a questionnaire that presented 15 classroom activities thought to support the performance and increased effectiveness of teachers in the classroom, including, teacher planning and preparation, evaluation of students, interaction with other teachers and professionals, and continued education opportunities. Participants then ranked, on a 9-point scale, the

activities of relevance, effort, and enjoyment to improve performance as either "not helpful" (1, 2, 3), "somewhat helpful" (4, 5, 6), or "very helpful" (7, 8, 9). The participants rated frequency of the activities on a 5-point scale (1 = seldom, 5 = daily). For those expert teachers, the authors concluded deliberate practice was partaking in activities aimed for self-improvement and moreover improving their overall teaching and ensuring reflection of what teaching activities were working, not working, and what adjustments were made in teaching activities to enhance learning in the classroom.

A two-part questionnaire was also used to explore activities which best reflect characteristics of deliberate practice in medical school education (Moulaert et al., 2004). Student achievement was measured by on the sum of three test scores (knowledge, progress, and skills — modeled after the Objective Structured Clinical Examination [OSCE]). Authors noted participants spent an average of 31.9 hours per week on study related activities. Lower-achieving students spent less time on self-directed study activities compared to higher achieving students (2.3 hours, $p<0.05$). Lower-achieving students, on average, read 1.1 less articles and owned 2.4 less books when compared to their higher achieving counterparts. Deliberate practice activities such as self-directed study, reading articles, and owning books were imperative to achieve a higher level of performance when compared to lower performing students.

Face and content validity of the ENPQ were evaluated by Haag-Heitman (2008). Based on results from a panel of nurses, content validity index of .95 was reported for the ENPQ. Moulaert and colleagues (2004) conducted pilot testing of their instrument with eight medical students and eight experts in the field of medical school training. Modifications were made to their instrument based on the comments from pilot testing.

Questionnaires are essential in determining deliberate practice activities within the professions domain, specifically in the areas of teaching, nursing, and medical school education. Questionnaires allow the researcher to obtain participant specific information on attitudes, beliefs, study activities, and reading materials owned.

Diaries or Logs. Quantifying the number of hours of deliberate practice is important when exploring relationships between deliberate practice activities by number of hours and achievement of expert performance (Ericsson et al. 1993; McKinney & Davis, 2003; Plant et al., 2005; Sonnentag & Kleine, 2000). The typical amount of time a participant was asked to log activities was seven days (Ericsson et al., 1993; Plant et al., 2005; Sonnentag & Kleine, 2000). The diaries or logs used in the research consisted of the participants keeping track of their day-to-day activities (usually in 15-minute increments), including personal, recreational, and deliberate practice activities. From the diaries or logs, researchers extrapolated accumulated deliberate practice time. At the conclusion of the seven days, the participants either physically returned or mailed the diaries or logs back to the researchers.

Deliberate practice has been defined as purposeful activities with the goal of achieving expert performance. Common characteristics of deliberate practice activities include highly structured activities with purposeful goals, repetitive practice with feedback and active remediation, and high concentration with low enjoyment. Researchers utilized interviews, questionnaires, and diaries or logs as methods to capture deliberate practice activities as well as document accumulated deliberate practice hours. Competency-based models of supervised education incorporate specific knowledge

requirements, skill development, and development of professional attributes and behaviors, which could potentially be considered deliberate practice in nature.

Competency Based Education

Competency-based education (CBE) is organized around a set of specific knowledge, skills, expected behaviors, and a minimum level of performance consistent with providing patient-centered care (ACEND, 2015e; Allen et al., 2011; Frank et al., 2010; Reeves, Fox, & Hodges, 2009; Ross et al., 2011; Taber et al., 2010). Competency-based education is widely used in the medical profession, where much literature exists on the pedagogy of different competency-based education models. Two examples of competency-based education models are operating at odds with each other — time-based and outcome-based (Frank et al., 2010; Hodges, 2010; Ross et al., 2011). Time-based competency education programs are often referred to as *tea-steeping* programs (Hodges, 2010). The hours within this educational model are fixed and used as a marker of performance; thus, students must complete all of the required hours even if competence has been demonstrated before completing all of the required hours. Outcome-based competency education programs allow students who demonstrate competence the ability to move forward in the program. Thus, each student in an outcome-based competency education program has an *individualized* rotation schedule (Hodges, 2010).

Time-based competency education programs have logistical benefits when compared to outcome-based competency education programs (Frank et al., 2010). For example, the configuration of student rotation scheduling is much less chaotic and more structured with the knowledge that each student is going to spend a set or fixed amount of time within each specified rotation. The resources for teaching infrastructure and

assessment of student progress are much more established and well known in time-based education when compared to outcomes-based education. Moreover, the need for new educational technologies, new modules, and new assessment tools are less needed when compared to outcomes-based education.

Outcomes-based competency education programs greatly differ from traditional time-based competency education programs. This newer approach focuses more on the competence or demonstration of skill of the student rather than on the amount of time taken to be able to demonstrate competence. Student rotation scheduling is much more complex when compared to time-based programs due to the need to individualize each student rotation dependent on the student's time to demonstrate skill (Frank et al., 2010; Hodges, 2010). For example, Student A may need the maximum amount of three weeks to demonstrate a particular skill such as placing a nasogastric feeding tube. Student B may need only one week to demonstrate the same skill. Using the time-based competency education model, both students would stay within the rotation three weeks. However, with the outcomes-based competency education model Student B would be able to progress on to the next rotation only after one week. Thus, differing rotation times lead to differing scheduling times in addition to differing assessment times for preceptors.

Benefits of outcomes-based competency education programs include: (a) focus on frequent assessments with feedback, (b) a mechanism to promote an undergraduate to residency program continuum in medical education, (c) support for a learner-centered curricula, and (d) de-emphasize time (Frank et al., 2010; Hodges, 2010). Time-based competency education program downfalls include: (a) timing of alignment of learning the

didactic with the application, (b) lacking of immediate feedback (note definition of deliberate practice), and (c) assessing of competence can be problematic with end-of-rotation evaluations, end-of-year evaluations, or high stake final examinations. In addition, time-based competency education programs tend to focus on admission criteria and curriculum content versus student learning, progress, and assessment (Hodges, 2010).

With most changes, there are unintended consequences, which must be considered when making a major paradigm shift, such as with the shift from time-based to outcomes-based competency education models. First, the current system relies on funding based on a time-based competency education model. With the current system, government or other payer funded residency positions are based on fixed blocks of time. Next, with an outcomes-based competency education program, students can complete the program, in theory, quicker and thus be out in the workforce faster. Lastly, if using an outcomes-based competency education program, there is the potential need for greater accountability in the assessment of the student. Students complete experiences at differing times and thus, consistent benchmarks to ensure competence is necessary before a student moves to another learning opportunity (Taber et al., 2010).

Although not described in CBE literature, both models of CBE (time-based and outcomes-based) have the potential to be considered deliberate practice. Specific skills, as outlined by the required competencies for the profession, must be deliberately practiced before skill achievement can be mastered regardless of the time requirement. Further research is needed to determine what activities might be considered deliberate practice due to the definition of deliberate practice not fully established in health-related professions.

Competency-based education was established in dietetics education in the early 1970's (ACEND, 2015a). The current experiential learning requires students to complete a minimum of 1,200 hours of supervised practice (ACEND, 2015e). Students must complete all of the required hours to complete the program even if competency can be demonstrated at an earlier level and by definition would be considered time-based competency education programs.

Preparation of a Safe and Competent Practitioner

Many professions, such as dietetics, nursing, and athletic training, require supervised practice hours (defined period of time in which students must demonstrate acquisition and mastery of domain-specific competencies) as a part of the overall curriculum and eligibility to sit for credentialing examinations (ACEND, 2015e). Minimal research is available regarding recommendations for number of hours required. In order to prepare an individual to be a safe and competent practitioner, supervised practice hours must be fulfilled to demonstrate acquisition of skill. In addition to activities related to competency statements, other *soft skills* (such as patient-centered care and communication) supporting the development of a safe and competent practitioner are important considerations (Ross et al., 2011).

Dietetics

Current dietetic education competency statements were established during the 2012 Eligibility and Standards update and encompass clinical, research, management, and community topics. In addition to the prescribed knowledge and competency statements, dietetic programs (who offer supervised practice) must also develop competency statements in the program's concentration area — each program must

establish a concentration area reflective of the program's respective mission (ACEND, 2015a). The required number of hours of supervised practice required to achieve the competencies listed was elevated to 1,200 hours from 900 hours in the 2008 Eligibility and Standards (Skipper, Young, & Mitchell, 2008). The move to increase the number of supervised practice hours in the 2008 standards was based on a statistical analysis of programs' five-year pass rates (n=291) on the RD credentialing examination; programs with higher amounts of supervised practice hours correlated, weakly, to higher passing rates on the RD credentialing examination, r=.35; 95% confidence interval 0.25 – 0.45, p<0.0001 (Skipper et al., 2008).

The current supervised practice education model for dietetics is that of a time-based competency education (ACEND 2015a, 2015e) model. Students must complete a minimum of 1,200 hours of supervised practice during a time period established by the program. Also, each student must demonstrate proficiency of the various competencies statements indicated by ACEND during the 1,200 hours. Once competence has been reached, students must continue clocking time to reach required hours. As discussed earlier, after successful completion of the required 1,200 hours of supervised practice, each student is then eligible to sit for the credentialing examination for RDs. The number of supervised practice hours and exam success (r=.35, p<0.0001), have not formally been assessed to determine if competence can actually be achieved in a lower number of hours or if competence is reached at the 1,200 hours. A minimum scaled score of 25 out of 50 is needed to successfully pass the RD credentialing exam to ensure an individual is safe and competent to practice (CDR, 2015f). With an outcomes-based competency education model, if the number of supervised practice hours were reduced or based on

demonstration of student competency, dietetic education programs could potentially matriculate additional students through their programs by having accelerated rates of completion or rolling admissions (Hale, 2003).

Since the increase in supervised practice hours, no further research has been published to date to determine if the increase of 300 supervised practice hours improved the RD examination pass rate. In dietetics, successful passage of the RD credentialing exam is correlated to and predicted by undergraduate grade point average (GPA), discipline specific (dietetics) GPA, science GPA, and Graduate Record Examination (GRE) scores (Bode & Gates, 2001; Bradley & Deaton-Conner, 1993; Farkas et al., 2010; Fournet & Harrison, 1994; Haubrick, 1995, 2015a, 2015b). Aside from ACEND published data (2008), there is no published pass rate data analyzing the relationship between supervised practice hours and performance on the RD exam across all supervised practice program types. Limited research has been conducted on the success of the RD credentialing examination and various academic and testing parameters. The number of supervised practice hours in dietetics education has never been examined to assess competence through specific practice activities to improve performance. The deliberate practice framework would provide the structure to conduct such research.

Athletic Training

Middlemas, Manning, Gazzillo, and Young (2001) and Turocy, Comfort, Perrin, and Gieck (2000) examined the relationship between the number of clinical hours and passage of the credentialing examination in the field of athletic training. Middlemas and colleagues (2001) mailed out 1,360 questionnaires to first-time test takers on the athletic training credentialing examination. A total of 270 participants (20%) responded to the

questionnaire and reported a mean of 1,550 clinical hours. Multiple regression analysis was used to predict performance on the credentialing examination and GPA, number of clinical hours, sex, and route to certification. The model indicated a significant difference of route to certification (either curriculum or internship route) and predicting performance on the credentialing examination (R^2=0.0723, p=.047), but authors noted caution in interpreting the findings because of the low portion of explained variance.

Turocy and colleagues (2000) revealed similar results as Middlemas and colleagues (2001) with predicting success on the credentialing examination for athletic trainers. In this retrospective research study, a total of 269 participants were included (22.25% of all first-time test takers for the credentialing examination in athletic training for the June and November 1993 examination dates). Authors reported clinical hours were not predictive of scores on any section (written, p=.9057; oral/practice, p=.0746; and written simulation, p=.6848) of the athletic training credentialing examination. Results demonstrated a lack of any significant relationship between clinical hours and first-time success on the athletic training credentialing examination.

Nursing

Nursing educators have become more interested in the discussion about clinical hours to become a competent practitioner (Bray & Koozer-Olsen, 2009; Chandekar, 2012; Hallas, Biesecker, Brennan, Newland, & Haber, 2012; Hale, 2003; Hart & Macnee, 2007; Licqurish & Seibold, 2013; Mallabur & Turner, 2006). When reviewing the literature on clinical hours and nursing, issues without definitive answers to support the number of clinical hours completed and when a practitioner is competent, including: is there scientific evidence to support required minimum hours of clinical practice to

establish competency, are those entering nursing prepared to practice with didactic learning, and how to define supervised practice.

In an attempt to provide scientific evidence to support a required minimum number of clinical hours to practice competently in nursing, Hallas, Biesecker, Brennan, Newland, and Haber (2012) examined the relationship between the requirement to complete a minimum number of supervised practice hours in a master's level nurse practitioner (NP) program and compared this requirement to completing the required core clinical competencies. In their research of NP programs (n=295), a standardized definition of clinical hours could not be established. Some programs reported only direct care hours as clinical hours while other programs were using a combination of direct care, simulations, and laboratory skills (Hallas et al., 2012).

The debate on the required number of clinical hours brings about an interesting question regarding the amount of scientific evidence to support the required number of hours to become a competent NP (Bray & Koozer-Olsen, 2009). In NP programs, the amount and type of clinical hours to become a NP is dependent on NP specialty area and certifying agency; ranging from 500 to 600 hours requiring the 500 hours to be faculty-supervised hours. Some state licensures have also established explicit standards of minimum hours to practice; yet, other states do not have specific minimum hours to practice. In 2001, Texas required that any program preparing NPs must include a minimum of 500 hours of clinical experience. The mean hours of clinical experience for NP programs in Texas (n=12 programs) is 697 hours compared to the mean hours of clinical experience nationwide (n=82 programs) of 686. Through the authors' review of literature, no scientific data upon which to base the number of hours of clinical

experience for an NP was established with minimum hours of clinical experience determined by the state licensure laws. The outcomes of this research warrant further in-depth review to establish minimum clinical hours for a competent and safe NP (Bray and Koozer-Olsen, 2009).

Hart and Macnee (2007) and Chandekar (2012) specifically addressed preparedness for entering the profession of nursing in their research questions. Hart and Macnee (2007) examined the relationship of preparedness when entering the NP profession, with Chandekar examining the relationship of preparedness when entering the midwifery profession. Hart and Macnee (2007) administered a questionnaire, containing items related to an individual feeling prepared and competent to practice after completing their NP education, to attendees (n=562) at two large national NP conferences. Participants were asked to rate their overall level of preparedness after completing their NP program and then asked to rate their overall level of preparedness and importance of the 25 clinical content areas. The authors discovered that approximately 50% (n=261) of those surveyed perceived that they were only somewhat or minimally prepared to practice as a NP. No significant differences between current age, years since graduation, age when starting and finishing the program, and those who completed a master's level NP program and preparedness were noted. For those who felt they were very well prepared to practice (10%, n=51), years employed as an RN before graduating ($p<.01$), type of NP program ($p<.05$), teaching strategies during the NP program ($p<.05$), and time it took to feel competent ($p<.001$) were all significantly associated.

Chankdekar (2012) revealed similar results to Hart and Macnee (2007) in the field of nurse midwifery. A total of 1,356 clinical hours were required to become a midwife in

India. The total number of participants was 195, 91.42% were between 20 to 23 years of age, and 85% were female. Of those surveyed, 89.1% felt the allotted clinical hours were adequate; however, 89.1% expressed the need for more experience to work independently. Moreover, 77.2% of those surveyed felt the present curriculum was inadequate with the need for more input (feedback) and the in-service education should be longer than three months.

Within the nursing practice of midwifery, Licquirsh and Seibold (2013) examined students' experiences in achieving all of the professional competency standards, prior to enter into the field, for midwifery and meeting the minimum practice requirements. In Australia, the midwifery curriculum was designed at the bachelor's level. The sample size was small (n=19, all female) and included students who completed the program from 2005 to 2008. Students were not required to complete a set or minimum number of clinical hours; however, students were required to reach a competent level through assessor ratings, and students must have had documentation of a minimum number of experiences from the curriculum (i.e. 40 normal vaginal births as the primary accoucheur). In interviews, students reported difficulty achieving the minimum midwifery experience requirements within the clinical practicum hours provided in the curriculum and was dependent on the facility where the students were placed. The students were so focused on achieving the final number of expected experiences in their last rotation placement (aka *chasing the numbers*), they were not focused on the journey through the curriculum. Many students needed to complete additional experiential hours to meet the minimum requirements of the curriculum.

Soft Skills

In addition to a minimum number of experiential, clinical, or supervised practice hours to become a competent practitioner, other soft skills (those skills outside the minimum expectations of competency statements) may play a role in the equation of developing a competent and safe practitioner (Ross et al., 2011). Demonstrating professionalism, the ability to interpret and apply research, patient-centered care, and cultural competence are such soft skills necessary to becoming a competent and safe practitioner (ACEND, 2015e; AND, 2013; Bruening et al., 2015). The AND provides a Code of Ethics and Standards of Professional Practice for all members. These particular documents identify necessary professional requirements to be a successful and safe practitioner (ADA, 2009; Bruening et al., 2015). The Scope of Practice in Nutrition and Dietetics is published by the AND to make nutrition and dietetics professionals aware of the "range of roles, activities, and regulations within which nutrition and dietetics practitioners perform" (AND, 2013, p. S11). The Institute of Medicine (IOM) report of 1999 *To Err is Human: Building a Safer Health System* supports the Academy's work on establishing documents to guide professional activity.

The ability to correctly interpret and apply research is another skill that should be fostered when developing a competent and safe practitioner. Within AND, the Code of Ethics, Standards of Practice and Standards of Professional Performance, and Scope of Practice in Nutrition Dietetics identify research as a core practice of the profession (ADA, 2009; Bruening et al., 2015; AND, 2013).

Patient-centered care and cultural competence are skills also important in developing a competent and safe practitioner. Published literature recommends that

patients become the center of care to improve patient outcomes and patient satisfaction, improve patient safety (meeting linguistic needs), and regulatory agencies are becoming acutely aware of the need for patient-centered care and thus practitioners need to become aware and skilled in this area (Beach, Saha, & Cooper, 2006; IOM, 1999; United States Department of Health and Human Services, 2015a). Cultural competency training is vital in the development of a competent and safe practitioner to overcome language barriers and access to healthcare, promote an understanding of the social and culture influences that affect the quality of medical services and treatment, strong evidence of racial and ethnic disparities, and cost of racial and ethnic disparities to the health care system (Agency for Healthcare Research and Quality, 2011; IOM, 2002; United States Department of Health and Human Services, 2015b).

The ACEND Standards of Education leading up to the RD credential require dietetics education programs to incorporate soft skills such as critical thinking, leadership & decision-making, communication skills (verbal and oral), collaboration, and teamwork using a variety of learning or educational activities (ACEND, 2015e). Didactic program directors develop learning activities to demonstrate critical thinking and decision-making aligned with core competencies for the RD.

Conclusion

Research on the preparation to become an RD has been limited to evaluating student success on the credentialing examination for RDs. Furthermore, previous research has specifically focused on utilizing academic and achievement markers as predictors of success (Bode & Gates, 2001; Bradley & Deaton-Conner, 1993; Farkas et al., 2010; Haubrick, 1995, 2015a, 2015b). According to CDR and ACEND, individuals

who successfully complete an accredited supervised practice program and pass the RD credentialing examination are competent to safely practice as RDs (CDR, 2016a). However, according to the Dietetics Career Guide, an individual is within the competent phase for one to three years post completion of the education experience and credentialing exam with progression to a proficient practitioner and then later an expert practitioner. Contradictions exist between the 1,200 hours of supervised practice as opposed to the 10,000 hours of deliberate practice. If competence is fully achieved later in one's career path, as indicated by the Dietetics Career Guide, additional practice hours must be accumulated. As additional practice hours accumulate, an individual is on the trajectory of Ericsson et al. (1993) second assumption of deliberate practice, which is to accumulate at least 10,000 hours of practice. The framework of deliberate practice, by providing practice, development, and demonstration of skills necessary to become an RD, may be applicable to the study of determining competence in dietetics, since by the definition of deliberate practice, individuals are developing skills to achieve a higher level of performance. Also, deliberate practice provides a framework to monitor accumulated practice hours, which is an important factor in determining the time of when competence occurs or does not occur.

Research within the framework of deliberate practice supports the assumption that an individual will improve performance with extensive amounts of deliberate practice. The importance of deliberate practice can be seen in music, competitive sports and games, and professional activities (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Dunn & Shriner, 1999; Ericsson, 2004, 2007, 2008, 2013, 2014; Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ericsson &

Ward, 2007; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Krampe & Ericsson, 1996; Law et al., 2007; Meinz & Hambrick, 2010; Moulaert et al., 2004; Plant et al., 2005; Simon & Chase, 1973; Sonnentag & Kleine, 2000;). Other studies within deliberate practice literature attempt to provide other explanations for improved performance aside from deliberate practice (Campitelli & Gobet, 2011; de Bruin et al., 2014; Hambrick et al., 2014; Hodges et al., 2004; Macnamara, Hambrick, & Oswald, 2014; Ruthsatz, Detterman, Griscom, & Circullo, 2008; Ruthsatz, Ruthsatz, & Ruthsatz-Stephens, 2014).

The current dietetics education model appears to provide the required learning activities to demonstrate competence in being a safe and competent practitioner. The characteristics of the definition of deliberate practice, highly structured goals, repetitiveness, feedback and remediation, and lack of enjoyment with high concentration, can be transferrable to characteristics of the dietetics education process. Activities of deliberate practice varied across the domains, and can include professional reading (Charness et al., 2005; Gobet & Campitelli, 2007; Moulaert et al., 2004), individual and group practice (Campitelli & Gobet, 2008), and individual and group study (Charness et al., 2005; Moulaert et al., 2004), which could be necessary in dietetic education preparation.

Research within the realm of DP and supervised dietetics practice does not exist. Little research is available, outside of academic markers, to determine skills necessary to become a competent dietetics practitioner. Thus, we need to ask whether the concept of DP can be applied to dietetics and if a working definition of DP can be developed in the field of dietetics. Also, not all research supported the DP model (i.e. beneficial activities

of DP and accumulated DP time); however, because of the novelty of applying the DP model to supervised dietetics practice all potential activities, attributes, and characteristics within the literature were considered. Research to validate a working definition of deliberate practice in dietetics and what activities lead to competence and expertise and when competence and expertise are reached would be beneficial. The body of deliberate practice knowledge may benefit from research that provides further exploratory research in an allied health profession, develops an initial definition of deliberate practice in supervised dietetic education, and develops other traits that may be important in a student's success in dietetic education preparation.

CHAPTER III - METHODOLOGY

Research Design

The design for this research study was a mixed methods approach using both qualitative and quantitative research methods. Qualitative research, represented by words, pictures, or non-numerical data, aims to collect data from interviews, focus groups, or observations, which offer a broad perspective on how participants feel and/or think (Burns & Grove, 2009; Jackson, Harrison, Swinburn, & Lawrence, 2015, Johnson & Christensen, 2012; Marshall & Rossman, 2006; Munhall, 2001; Wyse, 2011). Quantitative research is dependent on the collection of numerical information, by some form of a questionnaire or survey process, into useable statistics (Johnson & Christensen, 2012; Oak Ridge Institute for Science & Education, n.d.; Wyse, 2011). Data collection methods of quantitative research are much more structured when compared to qualitative research data collection methods (Wyse, 2011). Utilizing a mixed method approach combines both the wide lens techniques of qualitative research with the narrow-angled lens focus of quantitative research methodology to more fully understand the topic being researched (Johnson & Christensen, 2012).

Research segments for this study include:

- Segment one: Conducting semi-structured interviews with designated participants. Segment one supports the first research objective, which was to explore the concept of deliberate practice and identify characteristics of deliberate practice within allied health education. Semi-structured interviews were conducted to ascertain potential activities of deliberate practice in dietetics supervised practice education with dietetic educators of supervised

practice programs, dietetic preceptors, practitioners, and non-dietetic educators.

- Segment two: Completing an individual, closed card sort. Segment two supports the second research objective, which was to classify concepts of deliberate practice into categories reflective of deliberate practice within dietetics supervised practice education. The perspective or funnel begins to narrow with the closed card sorting as dietetics preceptors, those who have direct interaction with students, sorted the concepts of deliberate practice using the categories provided for them.
- Segment three: Creating the instrument. Segment three supports the third research objective, which was to develop an instrument to confirm construct definitions of deliberate practice in dietetics. The instrument, including demographic information and the scale, underwent a preliminary item review with a convenience sample of dietetics educators.
- Segment four: Validating the definition of deliberate practice. Segment four supports the fourth research objective, which was to validate construct definitions of deliberate practice within dietetics supervised practice education. Dietetic educators, faculty, and preceptors were asked to validate the activities presented to begin to define deliberate practice in supervised dietetics education.

Human Subjects Protection Approval

Approval was obtained from The University of Southern Mississippi's Institutional Review Board Committee (Appendix A). Informed consent was obtained from all participants before data collection process began.

Segment One: Semi-Structured Interviews

Interviews, one of the central data collection tools for qualitative research, offer the ability to gather rich, targeted information that otherwise might not be captured on a questionnaire (Wyse, 2011). When conducting interviews, the researcher has the ability to be flexible and explore issues or areas as the interviewee describes them. Another advantage in conducting interviews is the ability to obtain concrete examples during the process of data collection (Burns & Grove, 2009; Spencer, 2009).

In this research study, semi-structured interview questioning was conducted to generate ideas of deliberate practice activities in dietetics education. The interview questions were derived from previous research about deliberate practice. For example, professional readings, practice to improve performance, and individual study skills were found to be beneficial deliberate practice activities. Questions pertaining to specific topics, in addition to others, were developed and utilized during the semi-structured interviews. Inductive reasoning was used for this research study, with smaller instances about the phenomenon of deliberate practice gathered during the individual interviews and then combined to create larger, more general statements about deliberate practice (Burns & Grove, 2009; Johnson & Christensen, 2012). The interviews, being the foundation and knowledge-gathering phase, aided in exploring potential deliberate practice activities for classification into like groupings during the second segment (Burns

& Grove, 2009; Oak Ridge Institute for Science & Education, n.d.; Walonick, 2010; Wyse, 2011).

After semi-structured interviews were completed, the researcher shared results with respondents to assure interpretive validity. Interpretive validity refers to the degree to which the researcher portrayed the research participants' thoughts, feelings, emotions, experiences, viewpoints, and intentions (Johnson & Christensen, 2012). Participant feedback was the technique used to assure interpretive validity.

Study Participants and Recruitment

A convenience sample of five or more from each group of (a) dietetic educators — DI or CP Directors, (b) dietetic preceptors, (c) dietetic practitioners who do not currently act as a preceptor or who have not acted in the capacity of a preceptor within the last five years, and (d) non-dietetics allied health professional educators was recruited for the semi-structured interview segment of this research study or until data becomes repetitive. To control for bias, no more than two participants from Group B and Group C practiced in similar fields. For example, in the dietetic preceptors group (Group B) the maximum number of clinical dietetics preceptors was two. The other participants came from other fields in dietetics such as management, community, and research. The inclusion of non-dietetics allied health professionals supported the need to gather the perspective of those outside of dietetics and gain an external view. The external view of the non-dietetics allied health professional is important as it provided richness in the data, a global perspective, and the potential to identify something new that might not be provided by someone working in dietetics. Semi-structured interviews aided the

researcher in the development of an initial framework of deliberate practice in dietetics (Green & Thorogood, 2004; Patton, 1990, 2002).

Question Guide Development

Semi-structured interview questions (Appendix B) guided this preliminary and knowledge seeking stage and generated potential deliberate practice activities in supervised practice education. Topics discussed during the interview sessions were gleaned from the review of literature related to deliberate practice in developing an expert or high performer. The interview questions explored activities and practices related to the education and training of healthcare professionals and not the interviewees' own educational and experiential learning development so as not to bias the results. An overview of the topics included during the interview included the following:

- Practice activities within the educational curriculum (Campitelli & Gobet, 2008)
- Number of textbooks and journals read and owned (Campitelli & Gobet, 2008; Charness et al., 2005; Dunn & Shriner, 1999; Moulaert et al., 2004)
- Attendance at seminars/workshops (Dunn & Shriner, 1999; Haag-Heitman, 2008)
- Studying — self-study and study techniques (Charness et al., 2005; de Bruin et al., 2008; Keith & Ericsson, 2007; Moulaert et al., 2004)
- Remediation and feedback (de Bruin et al., 2008; Dunn & Shriner, 1999; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004)

- Innate abilities (Ericsson et al., 1993; Galton, 1979)
- Faculty/preceptor relationship with student (Haag-Heitman, 2008)
- Practice time (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Ericsson, 2004, 2007, 2008, 2013, 2014; Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Dunn & Shriner, 1999; Haag-Heitman, 2008; Johnson et al., 2006; Krampe & Ericsson, 1996; Law et al, 2007; Meinz & Hambrick, 2010; Moulaert et al., 2004; Plant et al., 2005; Simon & Chase, 1973; Sonnentag & Kleine, 2000)
- Additional factors not discussed within the framework of deliberate practice; however, deemed important through the review of literature (ADA, 2009; ACEND, 2015e; Agency for Healthcare Research and Quality, 2011; AND, 2013; Beach et al., 2006; Bruening et al., 2015; IOM, 1999, 2002; United States Department of Health and Human Services, 2015a, 2015b)

In addition to questions related to the topic of deliberate practice, questions were asked related to developing a safe and competent practitioner who will provide high-quality care. Topic areas, such as professionalism, the ability to interpret and apply research, patient-centered care, and cultural competency were reviewed and were of benefit to further explore since these topic areas are also important in developing a competent practitioner.

Research and Data Collection Procedures

The interview session took place by telephone. The researcher took notes during the interview session and supplemented the notes with voice recordings so as to not lose

important information supplied by the interviewee (Johnson & Christensen, 2012). Basic demographic information obtained included the following: (a) age, (b) gender, (c) educator (program director or faculty) or preceptor or practitioner, (d) type of allied health profession, (e) years in the profession, (f) highest degree obtained, and (g) current entry-level degree requirement for that profession.

Data Analysis

The interview sessions were transcribed and analyzed by this researcher. Data were segmented into meaningful key themes using a question-by-question coding technique related to deliberate practice in dietetics education, and coded with descriptive words or category names. A master list was kept of all codes used in this research study (Johnson & Christensen, 2012). Once the data were analyzed and interpreted, the summary and main themes of the interviews was sent to 25% of the participants to review and obtain feedback utilizing an evaluation form (Appendix C) judging the soundness of qualitative research (Guba, 1981; Web Center for Social Research Methods, 2006). The main themes from the coding of the interview sessions were then utilized in the next segment of research.

Segment Two: Card Sorting

The technique of card sorting is commonly used in the field of information architecture and psychology, which is to organize, group, and label like information for others' use (Spencer, 2009). Card sorting has many uses including learning how individuals categorize information, exploring how individuals perceive a certain topic, determining similar or different categories for information, exploring what information goes together and what does not (patterns), and generating lists of words to describe the

categories of information (Spencer, 2009). Card sorting is a process in which participants sort information into groups that make logical sense. Researchers find value in card sorting by highlighting patterns within the information being presented. Open and closed sorting are the two primary methodologies to conduct card sorting (Doubleday, 2013; Ross, 2011; Roth et al., 2011; Spencer, 2004, 2009).

During an open card sort, participants are allowed to sort the cards into groups by what is similar and what is not. After the participant has sorted the cards into similar groups, the participant is to then describe the categories made using key words or short phrases. Open card sorting allows the participants the freedom to create the architecture of the grouping (Doubleday, 2013; Ross, 2011; Spencer, 2004, 2009). After the open card sort, the researcher combines similar grouping labels into standardized terms. Providing standardized terms for the categories makes the sorting process more meaningful and consistent when attempting to explore for patterns within the information. The standardized term should be the one that was most used by the individuals who participated in the open card sort or the term most clearly representing the idea (Spencer, 2009).

Closed card sorting is similar to open card sorting except the categories are provided to the participants (Doubleday, 2013; Ross, 2011; Spencer, 2004). Participants were asked to sort each item into the predetermined categories reflective of deliberate practice. Closed cart sorting does not have the flexibility of open card sorting since participants must use predetermined categories (Doubleday, 2013; Ross, 2011; Spencer, 2004). In this study, the total number of themes was higher than traditionally seen in an open sort; therefore, it was decided that a closed sort was more appropriate. The

rationale for only conducting a closed sort included: increased burden on participants to complete an open card sort; apprehension of not securing enough participants to complete an additional sort; and the potential for participants to sort the 100 cards into an infinite number of categories and then having the task of defining all of those potential categories.

Card sorting can be completed individually or within a group. Group participation has the benefit of group dynamics and working together as a team to sort the items into the determined categories. The disadvantage of a group sort is that of "group behavior"—at times a dominant participant may take over the sort or some team members may make compromises when sorting the information versus discussing through the differences (Ross, 2011; Spencer, 2009). Individual sorts are beneficial for obtaining a larger number of responses since you get double the information if participants complete a sort individually when compared to a group. Also, individual sorts are easier to coordinate than are group sorts; therefore, individual card sorting was utilized for this research (Spencer, 2009).

Both open and closed sorts can be conducted face-to-face or using on-line programs designed for information architecture. A sort is completed by using a physical set of cards during a face-to-face interaction (e.g., index cards). The content is typed, or handwritten, on the card. Participants physically manipulate the cards into groups with similar themes.

There are many choices when it comes to choosing a program to conduct an on-line card sort. OptimalSort © was the on-line platform chosen for this research (OptimalSort, n.d.). OptimalSort © caters to both open and closed sorts, has a number of

analysis options, does not limit the number of cards participants can sort, and has reasonable pricing (OptimalSort, n.d.; Spencer, 2004, 2009). The advantages of using an online tool include: ability to reach many participants, unlimited number of participants, participants can complete the close card sort at their leisure, and ability to generate many powerful analysis tools from the software system (Ross, 2011; Spencer, 2009). Disadvantages of using an online tool include: size of the computer screen to see the cards, lack of a researcher present for questions and observations, and some computer programs do not have the functionality to rename a card, remove a card, add a new card, or put a new card into more than one category (OptimalSort, n.d.; Ross, 2011; Spencer, 2009).

OptimalSort © does not offer the functionality for participants to add or create their card or put the card in more than one category. To compensate for this lack of functionality, a questionnaire was provided at the end of the card sorting process to allow participants to provide details if they wanted to add or create their own card, remove a card, or if they wanted to put a card in more than one category. Participants had the option to not sort all of the cards; if that is the case the participant would simply leave any unsorted cards in the original list of cards on the screen. For either card sorting technique, the typical number of cards to be included in the sort range from 30 to 100 cards. Having too few cards will not allow for enough overlap to create groups. More than 100 cards could potentially fatigue the person conducting the sort (Spencer, 2009).

A researcher can use exploratory and/or statistical analysis of the card sort data dependent on the purpose of the research (Spencer, 2009). Exploratory analysis allows the researcher to look for connections or patterns of behavior within how the information

was sorted. A researcher can evaluate the actual groups participants created during the open sort, determine if participants placed the cards in similar groupings, or confirm expectations on how the information would be categorized. Exploratory analysis is acceptable for most card sorts and was used during this research (Spencer, 2009).

Study Participants and Recruitment

A convenience sampling of Didactic Program in Dietetics (DPD) Directors were contacted via email and requested to forward a recruitment email onto those preceptors within their program who are high functioning (defined by the researcher as preceptors who provide outstanding experiences for their students and create an exceptional student-to-preceptor relationship as identified by the program director). Preceptors were asked to identify other high functioning preceptors who would be willing to also to participate in the research. Through this snowball sampling technique, preceptors were chosen because they are the individuals who work closely with dietetics students during their supervised practice experience and provide the training necessary to meet competence. The snowballing technique was chosen due to the need to find highly functioning preceptors, which is a difficult sample population to find (Johnson & Christen, 2012). A minimum of 40 participants was secured to participate in the card sort activity.

Research and Data Collection Procedures

Participants gained access to the online platform utilizing a unique hyperlink provided in the recruitment email. OptimalSort © offered the ability to download results to an Excel spreadsheet as well as other analysis tools, such as the Popular Placement Matrix which neatly provided the percent agreement of each card for each category. The following demographic information was during the card sorting activity, which included:

age, years in the profession, and years as a preceptor. Participants sorted the 100 cards into the nine pre-established categories — characteristics of preceptor-student relationship, supervised practice activities that need more time to develop skills, supervised practice activities that need less time to develop skills, activities that promote lifelong learning, student possesses natural abilities to be successful in the profession, methods of coaching or precepting, methods a student uses to improve performance, professional attributes of a successful individual, and foundational activities to be a successful practitioner. If participants determined any respective card did not fit any of the categories provided to them, they were then able to sort any card into either ambiguous, redundant, eliminate, or does not fit any category—but need to keep.

Data Analysis

OptimalSort © generated a results matrix, the Popular Placements, for interpretation. The matrix provided the percent agreement of all cards into the respective categories. The matrix visually displayed the level of agreement between cards by the degree of shading — the cards with darker shading have a higher level of agreement. The demographic information was downloaded into an Excel © spreadsheet (OptimalSort, 2015). For items (cards) to be considered for use in segment three, greater than or equal to 75% agreement was needed. Items scoring an agreement of 43% to 74% were retained if the researcher had theoretical justification that the items belong. Items scoring less than 42% agreement were removed from the scale and were not be included unless strong representation of the theoretical framework is determined (Huye, 2011; Spencer, 2009).

Segment Three: Creating the Instrument

An instrument was created in segment three of this research study to validate a definition of deliberate practice in dietetics. During this segment, face and content validity were also tested. The instrument included basic demographic data (such as sex, years in dietetics practice, age, highest degree obtained, and state of residence) as well as a developed scale to confirm construct definitions of deliberate practice in dietetics. The stem items used in the scale were gleaned from the outcomes of the card sorting activities—deliberate practice activities with high agreement or low to medium agreement with strong representation of the theoretical framework were included.

A Likert-type scale was developed to determine the agreement in the proposed activities to define deliberate practice in dietetics education (Dunn & Shriner, 1999; Likert, 1932; Moulaert et al., 2004). Agreement anchors such as strongly disagree, disagree, agree, and strongly agree were appropriate for the proposed stem questions (Burns & Grove, 2009; Patten, 2011).

A comprehensive multi-step process using classic test theory was utilized in construction of the scale and items. Using semi-structured interviews and a card sorting method, the goal was to first define or provide a clear understanding of the deliberate practice concepts. Next, the scale was designed to be reflective of the desired concepts from the semi-structured interviews and card sorting process. The scale was then piloted tested with qualified participants. Lastly, a field test and item analysis was conducted (Burns & Grove, 2009; University of Wisconsin Survey Center, 2010; Walonick, 2010).

Segment three of the methodology was designed to evaluate face and content validity of the scale. Face validity, the instrument giving the appearance of measuring

the information intended to measure, is not considered acceptable evidence of validity. However, ensuring face validity is an important aspect in understanding the usefulness of an instrument (Lynn, 1986; Thomas, Hathaway, & Arheart, 1992). Content validity was used to ensure the items on the scale measured what was being attempted to be measure and irrelevant items were eliminated (Johnson & Christensen, 2012). Face and content validity were assessed utilizing the evaluation form in Appendix D during the preliminary item review.

Preliminary item review aimed to (a) eliminate any ambiguous questions, (b) catch grammatical errors, (c) validate the stated completion time, (d) evaluate the overall flow of the scale, and (e) evaluate statements for clarity and appropriateness. Participants in the preliminary item review completed the instrument and were asked to offer suggestions for improvement (Johnson & Christensen, 2012).

Study Participants and Recruitment

A convenience sampling of faculty members in the Nutrition Program at the University of Houston and in the Medical Nutrition Program at the University of Nebraska Medical Center who had experience in dietetics supervised practice education were asked to participate in the preliminary item review of the instrument. The two particular programs were chosen for a convenience sample due to having a personal relationship with the researcher. A minimum of 20 to 30 participants was suggested to participate in a preliminary item review (Johnson & Christensen, 2012).

Research and Data Collection Procedures

Participants were requested to complete the instrument using the on-line platform Qualtrics ©. After completing the instrument, participants were asked to evaluate the

instrumentation on flow and layout, content clarity, time necessary to complete the instrument, and grammatical errors. Evaluation was conducted by asking the participants yes/no and follow-up open-ended questions (Appendix D).

Data Analysis

The draft instrument was revised based on the open-ended comments provided by the preliminary item review participants. The revised instrument was utilized during the next segment of the research methodology. Also, the instrument was initially evaluated to ensure reliability, using Cronbach's α. An internal consistency goal of 0.70 or higher was desired, which provided initial identification of items not fitting within the proposed constructs (Burns & Grove, 2009).

Segment Four: Validating the Definition of Deliberate Practice in Dietetics

The final draft form of the instrument (Appendix E) was administered to a larger sample size to establish validity of the definition of deliberate practice in dietetics. Burns and Grove (2009) noted that a minimum of 100 to 200 participants is needed during the validation stage; however, another method would be to have at least ten participants for each item on the scale. For example, if the scale had 21 items, 210 participants (21 x 10) would be needed in the sample. Another method to determine the number of participants needed would be to follow the guidelines outlined in Mertler and Vannatta (2013), which were to have between 200 ("fair" estimated factor reliability) and 300 ("good" estimated factor reliability) participants. Internal consistency reliabilities (Cronbach's α) were evaluated to assess to the sub-scale interrelation of the items. Exploratory factor analysis was conducted to assess construct definitions of deliberate practice within dietetics supervised practice education.

Study Participants and Recruitment

Members of the Academy of Nutrition and Dietetics Practice Group—Nutrition and Dietetics Educators and Preceptors (NDEP)—were asked to participate in the testing of the instrumentation to validate construct definitions of deliberate practice within dietetics supervised practice education. The membership of NDEP includes educators and preceptors who work within the confines of dietetics supervised practice and have an understanding of the learning activities partaken during supervised practice. Thus, members of NDEP are an appropriate group to sample to determine if they agree with the proposed activities to define deliberate practice. The instrumentation was distributed, via a link, in an email to members of NDEP.

Research and Data Collection Procedures

For the validation testing, the finalized instrument was distributed electronically to the participants of the study using Qualtrics ©. There are currently close to 1,100 members of NDEP in the organization (NDEP, 2015). An initial email request for participation was sent to all members of NDEP email listserv and approximately two weeks later a reminder email was sent to the same group. Basic demographic information (age, gender, years in the profession, highest degree obtained, and location) was obtained to provide descriptive statistics of the sample.

Data Analysis

Exploratory factor analysis (EFA) was conducted to validate the definition of deliberate practice. An EFA is performed to examine relationships between the different items on a scale. Individual constructs were determined by those items that load or cluster together in a factor (Burns & Grove, 2009; Field, 2009; Johnson & Christensen,

2012; Mertler & Vannatta, 2013). An EFA was beneficial in this particular research because there were no expectations set forth about the factor structure since this was a new concept. (Burns & Grove, 2009).

An EFA involves multiple steps in the data analysis and was used to determine construct validity (Burns & Grove, 2009; Johnson & Christensen, 2012). Principal axis factoring was chosen over principal component analysis for this research. Both tend to produce similar solutions; however, the goal of principal component analysis is data reduction and the goal of principal axis factoring is identification of constructs (Field, 2009). During this step, the researcher evaluated scree plots for the number of potential factors, amount of variance explained by each factor, and the loading for each item on the factor — the minimal acceptable cut off point for factor loading, in an unknown model, is 0.30 (Burns & Grove, 2009; Mertler & Vannatta, 2013). The goal of EFA was to achieve simple structure with items loading only on one construct, which theoretically load together. Simple structure was chosen over parallel analysis and Velicer's minimum average partial (MAP) since parallel analysis tends to over select loading and Velicer's MAP tends to under select loading structure (O'Connor, 2000). The last step in EFA is determining factor rotation. Since it was anticipated the constructs correlate based on their theoretical overlap, an oblique factor (direct oblimin) rotation was utilized (Burns & Grove, 2009; Field, 2009; Mertler & Vannatta, 2013).

Conclusion

In conclusion, the four segments in the methodology of this research proposal aimed to meet the established research objectives, which were to (a) explore the concepts of deliberate practice and how deliberate practice potentially can be defined within allied

health education, (b) classify concepts of deliberate practice into core constructs and define each core construct of deliberate practice within dietetics supervised practice education, (c) develop and instrument to confirm construct definitions of deliberate practice in dietetics, and (d) validate construct definitions of deliberate practice within dietetics supervised practice education. Analysis of interview data, card sorting, participant feedback, preliminary item review, internal consistency, and EFA, were the tools utilized to meet the research objectives of this project with the overall goal of providing a definition of deliberate practice in the professional domain of dietetics based on the opinions of practitioners and educators in dietetics and allied health professions.

CHAPTER IV – MANUSCRIPT I: QUALITATIVE METHODS TO DEFINE DELIBERATE PRACTICE IN SUPERVISED DIETETICS EDUCATION

Introduction

Focused, intense, structured activities with the goal of achieving expert performance in a given domain are qualities distinct to the idea of deliberate practice (DP). Within the field of supervised dietetics education, DP has never been defined within the literature. DP provides a framework for explaining how one achieves expert performance in domains such as professional development, competitive sports, and chess. In these activities, individual innate talent is juxtaposed with focused practice to create expert performance (Ericsson et al., 1993). DP encompasses two basic assumptions. The first is that the amount of time an individual spends improving skills utilizing DP activities is monotonically and positively related to the achieved level of performance (de Bruin et al., 2008; Ericsson, 2014; Ericsson et al., 1993; Ericsson & Ward, 2007). The second assumption is that expert performance will not be achieved until at least 10 years or 10,000 hours of DP is achieved (Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996).

For activities to be considered DP, the characteristics of the specific activities must meet certain quality and intensity parameters. Based on the findings of multiple researchers, activities that include the following characteristics can be considered DP activities: highly structured with purposeful goals, repetitive, provide feedback with active remediation, and lack of enjoyment with a high concentration (Campitelli & Gobet, 2008; Charness et al., 2005; de Bruin et al., 2008; de Bruin et al., 2014; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996;

Ericsson & Ward, 2007; Ford et al., 2009; Haag-Heitman, 2008; Johnson et al., 2006; Law et al., 2007; McKinney & Davis, 2003; Moulaert et al., 2004; Sonnentag & Kleine, 2000). Additionally, expert performance is not solely dependent on the ability of the individual to participate in the activity; the ability of the performer also must be considered (Galton, 1979).

Examining the relationship between DP and achieving elite performance has been studied extensively in the domain of sports — soccer, swimming, and rhythmic gymnastics (Ford et al., 2009; Hodges, Kerr, Starkes, Weir, & Nananidou, 2004; Johnson et al., 2006; Law et al., 2007; Ward et al., 2007). In sports, support for the amount of DP necessary to achieve elite status is divided. Athletes who accumulated more DP time and participated in more DP activities performed at higher levels in sports such as soccer and rhythmic gymnastics (Ford et al., 2009; Law et al., 2007; Ward et al., 2007). However, Johnson et al (2006) discovered swimmers with more DP hours did not necessarily achieve levels of expert performance. Chess is another field in which DP has been studied to predict achievement of an expert in world ranking scores. In addition to hours of accumulated practice time, study, instruction, and tournament play, the feedback from one's coach, and the number of books read in the field are important DP activities in chess (Campitelli & Gobet, 2008; Charness et al., 2005; Gobet & Campitelli, 2007).

Determining educational activities, attributes, and characteristics leading to an expert in the field are important for the student in experiential learning. Professional readings (books owned and journal articles read), lifelong learning, individual study skills, innate talents, acceptable student & mentor relationship, and preparing for instructional time are qualities that have been defined previously in other professions as

DP activities, attributes, and characteristics (Dunn & Shriner, 2009; Haag-Heitman, 2008; Moulaert et al., 2004). DP has never been defined or even researched in dietetics as it has been in nursing, medical school education, and teacher training.

Within the professions of nursing, teaching, and insurance sales, researchers have attempted to define DP within their fields to determine activities, attributes, and characteristics necessary to develop an expert in each respective profession (Dunn & Shriner, 1999; Haag-Heitman, 2008; Sonnentag & Kleine, 2000). Choosing diverse and dynamic work, lifelong self-directed focus, and positive and engaged demeanor, preparing materials for instruction, mentally planning teaching strategies and activities, evaluating student progress using graded, written work and projects, informally evaluating students through observational and non-graded performances, written planning, evaluating student progress using teacher-made tests, and consistent practice activities to improve work performance and competence were activities best reflective of those DP activities in the respective professions. However, it is unknown if the same activities, attributes, and characteristics can be translated into the practice required for training of a Registered Dietitian (RD).

This manuscript describes the preliminary research to determine the key attributes for DP in the dietetics profession based on the opinions of practitioners and educators in dietetics and allied health professions. The purpose of this research was to (a) explore the concept of DP and how DP can be defined within dietetics education and (b) classify concepts of DP into core constructs and define each core construct of DP within dietetics supervised practice education.

Methods

A qualitative research approach was utilized for this research with data obtained from semi-structured interviews and a card sort activity. The Institutional Review Board at The University of Southern Mississippi approved the project.

Semi-Structured Interviews

A convenience sampling of five individuals from each group of (a) dietetic educators who are program directors of programs providing supervised dietetics practice—Dietetic Internship (DI) or Coordinated Program (CP), (b) dietetic preceptors, (c) dietetic practitioners who have not acted as a preceptor or who have not acted in the capacity of a preceptor within the last five years, and (d) non-dietetics allied health professional educators were utilized for the semi-structured interview segment of this research study (n=20). Dietetics educators, preceptors, and practitioners were included to gain the larger perspective of dietetics education and the profession with all three constituencies participating in the interview process. To control for bias, no more than two participants from Group B and Group C practiced in similar fields. For example, in the dietetic preceptors group (Group B) the maximum number of clinical dietetics preceptors (i.e. working as a clinician in an acute care facility) was two. The other participants in Group B came from other fields in dietetics such as management (i.e., working as a food service director in a hospital or school), community (i.e. working as a Women's, Infant's, and Children [WIC] dietitian), and research (i.e. working as a field researcher). The inclusion of non-dietetics allied health professionals also supports the need to gather the perspective of those outside of dietetics and identify potentially relatable concepts to dietetics education (Green & Thorogood, 2004; Patton, 1990;

Patton, 2002). The interview questions were sent to the participants prior to the interview session to allow participants the ability to review the questions and prepare for the interview.

Question Guide Development. Semi-structured interview questions (Appendix B) guided the knowledge seeking stage to generate potential DP activities in supervised practice education. The interview questions, developed from activities, attributes, and characteristics identified in the literature, explored participants' opinions of activities and practices related to the education and training of health care professionals, not the interviewees' own educational and experiential learning development. Topics discussed during the sessions included: (a) types of practice activities within an educational curriculum, (b) number of textbooks and journals read and owned by students, (c) required attendance at or number of seminars/workshops, (d) studying alone and study techniques, (e) remediation and feedback, (f) innate abilities, (g) student /preceptor relationship, (h) additional time needed for specific activities, and (i) additional factors related to developing a competent practitioner (i.e. professionalism, ability to interpret evidence-based research, patient-centered care, and cultural competence) within related dietetics literature (ADA, 2009; ACEND, 2015e; AND, 2013; Agency for Healthcare Research and Quality, 2011; Beach et al., 2006; Bruening et al., 2015; Campitelli & Gobet, 2008; Charness et al., 2005; deBruin et al., 2008, 2014; Dunn & Shriner, 1999; Ericsson, 2004, 2007, 2008, 2013, 2014; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericson & Ward, 2007; Ford et al., 2009; Galton, 1979; Haag-Heitman, 2008; IOM, 1999, 2002; Johnson et al., 2006; Keith & Ericsson, 2007; Krampe & Ericsson, 1996; Law et al., 2007; Meinz & Hambrick, 2010; Moulaert et

al., 2004; Plant et al., 2005; Simon & Chase, 1973; Sonnentag & Kleine, 2000; United States Department of Health and Human Services, 2015a, 2015b).

The interview sessions were conducted by telephone and digitally recorded. Basic demographic information was obtained and included: age; gender; professional role (educator, preceptor or practitioner); health profession in which employed; years practicing in the profession; highest degree obtained; and current entry-level degree requirement for respective profession.

The interview sessions were transcribed and two researchers (K.H. and E.M.) analyzed the transcripts. Training on analyzing the data was provided by E.M. and H.H. Responses were segmented into meaningful key themes using a question-by-question inductive content analysis coding technique (Elo & Kyngäs, 2007). Once the data were analyzed and interpreted, a summary of the main themes identified during the analysis were sent to 25% of the participants. These participants provided feedback to assure the items and themes were adequately documented, utilizing a standardized evaluation form (Guba, 1981; Web Center for Social Research Methods, 2006). The themes identified in the interviews were modified slightly to fit the purpose of the next segment (card sorting). See Appendix Table A1 for a crosswalk between the themes and the cards. For items (cards) to be considered for use in future pilot testing, greater than or equal to 75% agreement was required. Items scoring an agreement of 43% to 74% were retained if the items had strong theoretical justification. Items scoring less than 42% agreement were removed from the scale and were not included unless strong representation of the theoretical framework was determined (Huye, 2011; Spencer, 2009).

Card Sorting

The technique of card sorting is commonly used to organize, group, and label like information (Spencer, 2009). Card sorting is a process in which participants sort information into like groupings to make logical sense out of the information. A closed card sort is a mechanism to conduct a sorting activity whereby participants group the information by the pre-determined categories provided (Doubleday, 2013; Ross, 2011; Roth et al., 2011; Spencer, 2004; 2009). The researcher then evaluates the percentage agreement results of how the participants sorted the information to determine what items are retained for further evaluation.

Optimal Sort © was the on-line card sorting platform chosen for this research (Optimal Sort, 2015). One disadvantage of utilizing Optimal Sort © was the fact that program does not have the functionality to rename a card, remove a card, add a new card, or put a new card into more than one category (Optimal Sort, 2015; Ross, 2011; Spencer, 2009). To compensate for this lack of functionality a questionnaire was provided at the end of the card sorting process to allow participants to provide details of adding, removing, or multiple placement of the card(s). Participants were instructed to sort all of the cards in the categories provided for them. For a card sorting activity, the typical number of cards to be included in the sort range from 30 to 100 cards. The current project included 100 cards for participants to sort. Due to the large number of cards to sort, it was decided to only conduct a closed card sort to decrease burden on the participants, reduce apprehension of not securing enough participants to complete an additional sort, and reduce the potential for participants to sort the 100 cards into an

infinite number of categories and then having the task of defining all of the potential category names.

Results

Interviews

Twenty (five of each) dietetic educators, preceptors, practitioners, and non-dietetic allied health educators (from athletic training, nursing, physical therapy, pharmacy, and speech therapy) participated in the semi-structured interviews. The mean age was 45.5 years (SD $\pm$ 14.0) with the group being predominately female (*n*=18). The mean years of experience in their respective profession for the group was 21.1 years (SD $\pm$ 14.5). A total of eight participants completed a master's while nine completed a doctorate degree. The average length of the interview sessions was 48:18:35 minutes (SD $\pm$17:04:00).

Studying. Within the construct of self-study and study techniques, participants vocalized the importance of the student studying in a group setting. The frequency of reporting the importance of group study activities was dispersed evenly across all of the groups. One practitioner noted, "I personally think group study is beneficial if you are with the right group." Additionally, preceptors and practitioners voiced the importance of utilizing an outline when studying compared to only two dietetics program directors and two non-dietetics allied health professional educators.

Reading. Practitioners and non-dietetics allied health professional educators more frequently reported the student benefitting from participation in weekly reading of professionally related material compared to dietetics program directors and preceptors. Weekly reading of materials was also the most frequently suggested amount of time

students should spend reading professionally related material compared to daily/on-going and bi-weekly to monthly. Participants also tended to agree that textbooks provide the necessary foundational information in the dietetics curriculum.

Professional Attributes of a Successful Individual. The need to have students exposed to and/or immersed into another culture was a popular reported theme within the construct of professional attributes. Preceptors and practitioners reported the need for cultural competence more often when compared to dietetics and non-dietetics educators. Dietetic program directors and practitioners more frequently reported the need for preceptors to model appropriate behavior when compared to preceptors and non-dietetic allied health educators. When asked, a dietetics program director said, "Absolutely lead by example. And if your dietitian is unprofessional, that is what your student learns." The two groups, preceptors and practitioners, who were not in a formal educational role, most frequently reported the importance of case studies as a vital activity to develop critical thinking and decision-making abilities.

Natural Abilities. Essential to the framework of DP, natural abilities (or innate talent) aligns with the need for focused practice activities such as reading, studying, and specific dietetics educational curriculum activities (Campitelli & Gobet, 2008; Charness et al., 2005; deBruin et al., 2008; Dunn & Shriner, 1999; Ericsson et al., 1993; Galton, 1979; Keith & Ericsson, 2007; Moulaert et al., 2004; Ward et al., 2011). Of the many characteristics an individual with natural abilities to be successful might possess, participants overwhelming noted students must be internally driven to achieve their goals. Participants reported additional innate characteristics of success such as creating a positive relationship between the intern and the preceptor, being organized, and

demonstrating maturity. Interestingly, all five practitioners who partook in the interviews reported the characteristic of being organized as important of an individual with natural abilities. When asked about characteristics of natural abilities, one practitioner said "Somebody who is organized and a list maker." Having the opportunity to receive additional feedback and repeat activities were noted as highly important to close the performance gap between those with a natural ability compared to those who do not possess that natural ability. Dietetics program directors, preceptors, and practitioners reported the importance of having the preceptor provide a more challenging environment for those was also beneficial only to students who possess more natural abilities in the practice setting.

Characteristics of Student-Preceptor Relationship. Responses related to the theme of providing adequate time to their students for questions, follow up, and developing open lines of communication was the most frequently reported characteristic of a positive and beneficial preceptor-student relationship. The reporting of this theme was consistent across the interview groups, with the majority of positive comments about the relationship reported by the preceptor and practitioner group. A statement made by a preceptor related to this characteristic included, "I think it is important the mentor [preceptor] is available but not too available. So, you know, allows them [the preceptor] the chance to answer the questions but [the intern to] be stretched a bit." Participants also stressed the importance of the preceptor and student having mutual respect for each other. The frequency of the responses was consistently reported between the groups with the following supportive statement for a positive preceptor-student relationship made by a dietetics program director, "Respect in both directions." Also important to the

participants was the need to provide the student with a learning environment that is safe, challenging, and positive.

Methods of Coaching and Precepting. The mere act of providing remediation and feedback is a core factor, within the literature, when defining DP (De Bruin et al., 2008; Dunn & Shriner, 1999; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004). One of the positive characteristics of delivering successful feedback provided by the participants was the availability of feedback to the students on an on-going basis. "They [the preceptors] give immediate and specific feedback, like at the end of the day, and not waiting until the end of the rotation. Do not be afraid to give them feedback to improve. They [the students] are not perfect and that's why they are interns." Additionally, the need for adequate supervised practice time to allow for the repetition of experiences to improve performance and remediation to increase knowledge was an important theme. Other factors, such as preceptors providing feedback in a one-on-one environment and having a designated time to provide feedback, were also reported, although not as frequently as the others, as important factors with the category of remediation and feedback.

Activities that Promote Lifelong Learning. Lifelong learning activities are a common requirement in any professional career. Participants reported the importance of joining a professional organization or specialized practice group after entering practice as a beneficial activity to start the process of being a lifelong learner as well as attending professional meetings and conferences and reading to stay abreast of current topics. Other important beneficial activities to start the process of being a lifelong learner

included involvement in a professional organization, participation in webinars, and attending networking events.

Educational Practice Activities. Educational practice activities such as completing case studies and conducting literature reviews are imperative within the dietetics educational curriculum to prepare an entry-level practitioner. When specifically asked about activities within curriculum to help with the training of an evidence-based practitioner, the vast majority of the respondents highlighted the importance of conducting literature reviews. Completing case studies was consistently reported, across all of the groups, as an important activity in learning how to assess the specific needs of a patient or client and develop patient-centered plans of care and reported by over half of the participants as a beneficial activity that prepares an individual for supervised practice. One practitioner provided this commentary:

> I think activities where you are, thinking more along the lines of medical nutrition therapy, given case study type things where you actually have to relate the information from class and the textbook and even if you are not using actual patients that you are using the type of information you need to know if you were going to see patients.

Supervised Practice Activities Requiring More or Less Time to Develop Skill. As previously noted, one of the assumptions of DP entails the need to gain around 10,000 hours of practice within a profession or domain. Thus, the questions within the time construct of this research study related to activities the participants believed required more time or focus within the curriculum. The activities frequently reported by the participants as needing more time included: advanced clinical nutrition skills, nutrition

assessment skills, and general clinical nutrition activities. Statements made by participants related to activities needing more time included "Nutritional assessment because that is the basis of our practice" and "Honestly, I think clinical ought to be the focus of the supervised practice." Table 1 summarizes each of the categories reflective of the core constructs of DP and most frequently reported themes.

Table 1

Categories reflective of the core constructs of deliberate practice and most frequently reported themes during interviews with frequency

Category reflective of the core constructs of deliberate practice	Themes	Frequency
Studying	Participation in group activities	14
	Utilizing practice exams	13
	Reviewing notes from coursework	9
	Utilizing an outline when studying	9
Reading	Foundational knowledge provided by course textbook	13
	Good blend of reading materials used in the dietetics education program	9
	Participation in weekly reading	9
Professional attributes of a successful individual	Cultural competence	16
	Preceptors modeling	13
	Critical thinking and decision making	11
Natural abilities	Drive to achieve their goal(s)	15
	Additional feedback provided to students	11
	Repetition of activities	10
	Providing a more challenging environment	10

Characteristics of preceptor-student relationship	Adequate time for questions, follow up, and open communication	16
	Safe, challenging, and positive learning environment	15
	Mutual respect	13
Methods of coaching or precepting	Ongoing feedback	13
	Repetition to improve performance	11
	Remediation to increase knowledge	10
Activities that promote lifelong learning	Join a professional organization or specialty group	9
	Attend professional meetings and conferences	9
	Read to stay abreast of current topics	9
Educational practice activities	Conducting a literature review	16
	Case studies: assess patient/client needs	14
	Case studies: preparing for supervised practice	12
Supervised practice activities requiring more or less time to develop skill	Advanced clinical nutrition skills (including critical care and nutrition support)	8
	Nutrition assessment skills	7
	General clinical nutrition activities	5

Results of the semi-structured interviews resulted in a total of 100 themes (items) to be included in the card sorting activity. Upon review of the themes identified, only one participant provided the recommendation to add two items that were not captured during the interview sessions. The missing items included: clear expectations for the student and boundaries for both the intern and the preceptor and resiliency of the student.

Based on the findings of the interviews, the closed card sort utilized the following categories reflective of DP: characteristics of preceptor/intern relationship; activities requiring more or less time; lifelong learning activities; natural abilities; methods of coaching and precepting; methods to increase performance; and professional attributes (soft skills). The closed card sort also included categories for ambiguous or redundant cards, one category for cards to eliminate, and one category for cards that do not fit any category but need to keep.

Card Sorting

Of the 109 participants who initiated the card sorting activity, 45 fully completed the closed sort. Twenty participants partially completed the card sorting activity and then abandoned the session, and 44 participants abandoned the card sorting activity without sorting any of the cards. Only those participants who fully completed the card sort were included in the data analysis. The mean age of the participants was 42.9 years (SD $\pm$ 12.6). The mean years in the profession were 17.6 years (SD $\pm$ 12.2) and 11.2 years serving as a preceptor (SD $\pm$ 8.8). The average time to complete the card sorting activity was 41:09 minutes (SD $\pm$34:33).

A total of five items were retained with high agreement ($\geq$ 75%) amongst the participants during the card sorting activity. The majority of items (*n*=45) retained were due to medium agreement (>43% and <74%) amongst the participants and having strong representation of the theoretical framework of DP. Two items were retained from the items with low levels of agreement (<42%) amongst the participants, as the items were deemed to have strong representation of the theoretical framework. The card sorting activity resulted in total of 52 retained items.

The second research objective of this study was to classify the activities, attributes, and characteristics of DP gleaned from the interview sessions into categories reflective of the core constructs of DP and begin to define what the core constructs of DP look like within dietetics supervised practice education. Table 2 aligns the activities, attributes, and characteristics of DP retained from the card sorting activity by category reflective of the core constructs of DP with corresponding percentage level of agreement. Of the items retained, five items had greater than 75% agreement. Retained items with greater than 75% agreement were in the categories of activities needing more time (*n*=2), methods to increase performance (*n*=1), and characteristics of a student-preceptor relationship (*n*=2). Many of the retained items fell within the range of >43% and <74% agreement. Two retained items had percentage agreement <42%; those items included reading to stay abreast of current topics and students needing ongoing feedback.

Table 2

Concepts of deliberate practice by category from the card sort activity

Category	Items	Percentage agreement
Natural abilities	Student displays natural academic abilities	74%
	Internal motivation to learn is displayed within the student	70%
	Student is resilient	65%
	A student, who enters a healthcare profession, possesses the yearning to help other people.	65%
	Student displays emotional intelligence	63%

	Student demonstrates maturity	63%
	The student is able to connect with others to create a positive relationship	61%
	Student is driven to achieve their goal(s)	61%
	Student is culturally competent in their personal communications	52%
	Student demonstrates professionalism in practice	50%
	Student is organized	50%
	A positive attitude is displayed in the student	50%
	Confidence is displayed in a student	48%
	Student works hard to achieve goal(s)	46%
Methods of coaching or precepting	Provides ample opportunities to practice	50%
	Preceptor provides a formal end of rotation evaluation	50%
	A student who does not possess natural and academic abilities is provided additional feedback	46%
	Preceptor models skills to assess the needs of patients/clients and to develop patient centers plans of care	46%
Supervised practice activities that need more time	Nutrition support activities	78%
	Advanced clinical nutrition activities	76%
	Critical care activities	72%
	Participate in staff relief activity	52%

	Nutrition assessment skill activities	48%
	Supervised practice time allows for repetition of experiences to improvement performance	43%
Methods to increase performance	Student utilizes practice exams	76%
	Student utilizes flash cards	63%
	Student utilizes an outline when studying	63%
	Student reviews notes from coursework	61%
	Student develops their own case scenarios as a study guide	57%
	Student has a quiet and conducive environment to study	52%
	Student established a dedicated study schedule	52%
	In a group, students utilize practice exams	43%
Characteristics of student-preceptor relationship	Preceptor and student have mutual respect for each other	96%
	Symbiotic relationship between student and preceptor	87%
	Preceptor develops expectations and hold students accountable	65%
	Student seeks feedback from preceptor	59%
	Feedback is constructive and positive	54%
	Preceptor provides adequate time to their students for questions, follow up, and open communication	52%
	The learning environment is safe, challenging, and positive	50%

	Preceptor has designated time to provide feedback	50%
	Sets common goals	48%
	Preceptor provides feedback in a one on one setting	46%
	Preceptor provides a more challenging environment for students who possess a more natural ability	50%
	Student needs ongoing feedback	39%
Lifelong learning	Participate in webinars	50%
	Attend professional meetings and conferences	50%
	Join a professional organization or specialized practice group to further develop knowledge	46%
	Read to stay abreast of current topics	41%
Educational activities	Didactic coursework lays the foundation for supervised practice	63%
	A good blend of reading materials (textbooks, evidence reviews, and journal articles) are used in a dietetics education programs	57%
	Within the dietetics curriculum, journal articles provide students exposure to specialty information and assist in developing an understanding of research and statistical methodology	50%
	Textbooks provide necessary foundational information in a dietetics curriculum	43%

	Conducting a literature reviews (identifying articles, synthesizing literature, and making recommendations) is an activity to having the student participate in evidence-based practice	43%
Professional attributes	Network with others in the profession to further develop knowledge	52%

Discussion

The purpose of this research included exploration of the concept of DP and gathering potential activities, attributes, and characteristics of DP in dietetics supervised practice education through semi-structured interviews. Interviews served as the preliminary and knowledge seeking stage to uncover potential DP activities, attributes, and characteristics with supervised dietetics education.

Core constructs of natural ability, methods of coaching or precepting (feedback), and the activities that require more time align directly to previous definitions of DP. With DP, innate talent is balanced with external factors to achieve expert performance (Ericsson et al., 1993). Training alone is not sufficient to achieve expert performance, but innate abilities are equally important to achieve expert performance (Galton, 1979). Similar to the need to have innate abilities as described by Sir Galton, the results of the card sorting activity retained multiple items centered around the natural abilities of an individual in supervised dietetics education, which included: internal motivation, resiliency, emotional intelligence, maturity, drive to achieve goals and organization.

The use of feedback in improving one's performance is vital to attain expert performance and was indicated as important from the interviews and card sorting results of this research. Improvements are made to one's skill level from actively learning from one's failures. With each DP session, incremental improvement is made from the feedback and active remediation with gradual improvement to a higher level of performance (de Bruin et al., 2008; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004). Need for ample opportunities and additional feedback as well as providing a formal evaluation were items identified in the interviews and retained from the card sorting within the constructs of methods of coaching and precepting consistent with providing feedback to an individual as described in the literature. Gobet and Campitelli (2007) highlighted the importance of the coach's feedback to improve performance. Interestingly, other items pertaining to feedback, such as being constructive, positive, and well timed were retained within the category of characteristics of student-preceptor relationship.

One assumption within the framework of DP is that expert performance will not be met until at least 10-years or 10,000 hours of practice in the profession or domain (Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996). Time was included in this particular research as a construct; however, researchers did not seek to enumerate a time value but rather to identify areas of practice, which may require more time to develop competent skill. There were medium to high levels of agreement for the need to have more time spent on clinical nutrition, nutrition support, and nutritional assessment activities in supervised practice. The focus of educators and preceptors on

time spent training in clinical dietetics is consistent with practice activities outlined in the 2015 Practice Audit for RDs as well as a large percentage (40%) of the credentialing examination for Registered Dietitians focused on clinical nutrition content (CDR, 2015b, 2016b). The large percentage of content dedicated to clinical nutrition on the credentialing examination is potential support for the increased focus in developing and refining nutrition support, nutritional assessment, and overall general clinical nutrition skills.

Findings from this study indicate that participants identified reading and studying as beneficial DP activities to improve performance, which is consistent with the literature (Campitelli & Gobet, 2008; Charness et al., 2005; Gobet & Campitelli, 2007; Moulaert et al., 2004). During the semi-structured interviews, specific questions focused on the frequency of reading or studying, how to study, or what type of materials (textbooks, journal articles, evidence reviews) to read in order to be more successful in academic performance (Moulaert et al., 2004). After the interview sessions, reading and studying were combined into one category for the card sorting activity since both constructs included didactic methods of increasing performance. At the conclusion of the card sorting activity, the only cards sorted with medium to high level of agreement in the category of methods to increase performance were those cards pertaining to studying. The participants sorted none of the cards related to reading with medium to high levels of agreement. Multiple authors highlighted the importance of reading in the development of an expert performance; however, the findings within this research were inconsistent with the literature. Continued research needs to be conducted within this area to determine the importance of reading to increase performance within supervised dietetics education

(Campitelli & Gobet, 2008; Charness et al., 2005; Dunn & Shriner, 1999; Moulaert et al., 2004; Ward et al., 2011).

Themes identified in the interviews and items retained from the card sort display beneficial attributes and characteristics, such as mutual respect, developing expectations and holding students accountable, seeking feedback, and providing a safe learning environment, to support the development of a positive student-preceptor relationship. The results of a positive and engaged relationship between the student and the coach were consistent with what is described in the literature (Haag-Heitman, 2008). Therefore, the relationship between the student and preceptor is important to consider when defining deliberate practice within supervised dietetics education.

In the present study, lifelong learning and practice activities within the education curriculum were shown to be important in the construct development of DP, which is supported in the DP literature (Campitelli & Gobet, 2008; Dunn & Shriner, 1999; Haag-Heitman, 2008). Examples of lifelong learning activities supported by the findings included: attending seminars, workshops, clinical in-services, and completing a specialty certification (Dunn & Shriner, 1999; Haag-Heitman, 2008). Similar results to the literature were found, at the conclusion of the card sorting activity, including the need to participate in webinars, attend professional meetings and conferences, join professional organizations or specialty groups, and read to stay abreast of current topics.

Additional factors, such as professionalism, the ability to interpret and apply research, patient-centered care, and cultural competency, although not specifically discussed within the framework of DP, were deemed important to include through the review of literature on activities that support development of a competent and safe

Registered Dietitian (ADA, 2009; ACEND, 2015e; Agency for Healthcare Research and Quality, 2011; Beach et al., 2006; Bruening et al., 2015; IOM, 1999; IOM, 2002; JAND, 2013; United States Department of Health and Human Services, 2015a; United States Department of Health and Human Services, 2015b; Ward et al., 2011).

Limitations

Limitations were noted in this study. First, in the semi-structured interviews portion of this research, participants included a convenience sample of colleagues or personal contacts of colleagues. Obtaining perspectives outside of those within connections of the researcher may provide additional or alternative perspectives to the question responses because of similar ideologies between the researcher and participants. Second, all of the Registered Dietitians who participated in the semi-structured interviews were female with only two male participants who were non-dietetics, allied health educators. The perspective between genders may be different and therefore, having more of a balance of males to females may alter the responses. Third, participants were sent the semi-structured interview questions ahead of the scheduled interview and asked to review and prepare prior to the interview. The researcher could not guarantee all participants prepared at the same level and therefore the amount of detail provided in response to each of the semi-structured interview questions may vary from one participant to the next. Next, with the card sorting activity, there were multiple categories for the participants to select from as well as a vast number of cards being requested to sort. Spencer (2009) recommends no more than 100 cards to be used in a card sorting activity; this research study included 100 cards, which was at the upper limit of the recommended number of cards for inclusion and could have led participants to

abandon the card sorting activity. Participants also noted that several items from the card sorting activity could have fit into more than one category, which may have also led to the increased number of multiple medium agreement of items as compared to the lower number of items with high agreement. From review of the interview themes, the above factors were pooled together in a category of professional attributes. At the conclusion of the card sorting activity, only one item was sorted into the category of professional attributes at a percent agreement above 43%. One participant commented after the card sorting was complete "some [items] seemed to fit in multiple categories —such as lifelong learning activities and professional activities [attributes]." Due to many items having the ability to fit multiple categories, this may have been the reason for only one of the items fitting in this category at a percentage above 43%. Another potential reason for such low numbers of items into this category includes the fact that professional attributes, although important to the profession of dietetics, is not specifically aligned to the fundamental definition of DP. Lastly, the time commitment to complete the semi-structured interviews, as well as the card sorting activity, was burdensome. Interviews took on average, 45 minutes to complete and the card sorting activity took 41 minutes.

Conclusion

In conclusion, semi-structured interviews and a card sort activity served as the data-gathering mechanisms for this research. In an effort to describe DP for this group, researchers explored potential learning activities, attributes of the educational process, and characteristics of the profession. Next, participants classified the activities, attributes, and characteristics from the interview sessions into core constructs reflective of DP in supervised dietetics education. As a result, a beginning definition of DP in the

dietetics profession was formed based on the opinions of practitioners and educators in dietetics and allied health professions. Results of this research could be used to develop an instrument to quantify DP. However, a series of studies to validate and confirm categories that are reflective of the core constructs of DP in supervised dietetics education will be needed.

CHAPTER V MANUSCRIPT II: CONFIRMING DELIBERATE PRACTICE IN DIETETICS EDUCATION

Introduction

Deliberate practice (DP) serves as a potential conceptual framework to explore activities, attributes, and characteristics leading to expertise in a given field or domain, such as in the education of a Registered Dietitian (RD). First studied by Ericsson, Krampe, and Tesch-Romer (1993), DP encompasses attentive, concentrated, carefully planned activities fundamentally supporting the development of expertise in one's chosen field or domain. The concept of DP was studied across the domains of sports, gaming, music, and allied health professions for the purpose of understanding the key elements of the framework. Practice activities are considered DP under the following conditions: highly structured with purposeful goals; repetitive; feedback with active remediation; and lack of enjoyment with high concentration (Campitelli & Gobet, 2008; Charness, Tuffiash, Krampe, Reingold, & Vasyukova, 2005; de Bruin et al., 2008; de Bruin, Kok, Leppink, & Camp, 2014; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford, Ward, Hodges, & Williams, 2009; Haag-Heitman, 2008; Johnson, Tenenbaum, & Edmonds, 2006; Law, Côte, & Ericsson, 2007; McKinney & Davis, 2003; Moulaert, Verwijnew, Rikers, & Scherpbier, 2004; Sonnentag & Kleine, 2000).

In attempts to define DP, researchers have investigated which activities such as, professional reading, individual and group practice, and individual and group study, embody DP. Keith and Ericsson (2007) used interviews to highlight those activities, which could be defined as DP, as it related to the ability to typing. The interview

questions surveyed participants' skill level, practice activities, and accumulated DP hours. The authors explored the relationship between the contribution of typing abilities, amount of previous experience in typing, DP activities (attending a typing class and individual practice time), and typing performance. In a similar attempt to define DP in nursing, Haag-Heitman (2008) developed an interview tool to identify essential personal and environmental attributes modulating the attainment of expert performance in practicing clinical nurses. Choosing a diverse and dynamic work, lifelong self-directed focus and positive and engaged demeanor were the three important DP themes within the profession of nursing.

In addition to interviews, questionnaires have been developed to successfully explore the relationship between DP activities and expert achievement in the fields of teacher education, nursing, and medical school education (Dunn & Shriner, 1999; Haag-Heitman, 2008; Moulaert et al., 2004). Similar DP themes between the two professions emerged when comparing the fields of nursing and teaching. Dunn & Shriner (1999) and Haag-Heitman (2008) highlighted the need for continued professional development, lifelong learning, and ensuring self-reflection to improve one's overall performance. The DP activities in medical school education focused on academic aspects of training future physicians and highlighted the importance of including questions on self-directed studying techniques, type and amount of reading professional literature, and type and number of books owned. The methodologies of interviews and questionnaires have been used in similar studies to explore DP in other fields and are important to consider since a comparable instrument in supervised dietetics education has never been developed to define DP (Dunn & Shriner, 1999; Haag-Heitman, 2008; Moulaert et al., 2004).

In previous research, semi-structured interviews were employed to identify a list of activities that encompass DP within an allied health education program, specifically within a dietetics education program. Over 100 activities, attributes, and characteristics of DP emerged. The identified elements were classified into categories reflective of the constructs defined in DP research. Based on the results of a closed card sort, those items with acceptable levels of agreement were included in the development of an instrument to define DP in supervised dietetics education. Deliberate practice has been defined in areas such as chess, sporting activities, and music, as well as multiple professions but never before in dietetics. Determining important activities, attributes, and characteristics leading to expert is of value to the body of knowledge of deliberate practice and fills a gap, which exists between deliberate practice and the professional domain arena. The purpose of this manuscript is to evaluate reliability and validity of an instrument defining DP in dietetics supervised practice based on the opinions of practitioners and educators in dietetics and allied health professions.

Methods

Card sorting, which categorizes like information, was utilized in previous research to group like activities, attributes, and characteristics into the core constructs reflective of DP. After the completion of the card sorting activity, cards with acceptable levels of percent agreement (e.g., 43% and higher) and theoretical support were used to develop items for a draft instrument. The items used represented DP activities, attributes, and characteristics. A total of 55 items, plus four randomly inserted validation (bogus) check items, were included in the draft instrument for use in the preliminary item tryout phase (Huang, Curran, Keeney, Poposko, & DeShon, 2012; Meade & Craig, 2012). The

instrument included basic demographic data (i.e., sex, years in dietetics practice, age, highest degree obtained, role in the dietetics profession, and state of residence).

A 7-point Likert-type scale was used to determine the level of agreement with the listed activities in order to define DP in dietetics education (Dunn & Shriner, 1999; Likert, 1932; Moulaert et al., 2004). The draft instrument underwent face and content validity testing to assure understanding of the instrument by the participants and to eliminate irrelevant items (Lynn, 1986; Thomas, Hathaway, & Arheart, 1992). Other items reviewed during the face validity testing included grammar, typical completion time, usefulness of the scale in assessing agreement, and clarity of statements (Burns & Grove, 2009; Johnson & Christensen, 2012; University of Wisconsin Survey Center, 2010; Walonick, 2010). Participants were allowed to provide suggestions to include any items they felt were missing. To encourage participation, a drawing for one $50 gift card was offered to those who completed the review.

The draft instrument was revised based on the feedback provided during the face validity testing. The instrument was initially evaluated to ensure reliability using Cronbach's α. An internal consistency goal of 0.70 or higher was desired to help identify items that did not fit within the proposed categories of DP activities (Burns & Grove, 2009).

After revisions, 1,100 members of the Academy of Nutrition and Dietetics' Practice Group—Nutrition and Dietetics Educators and Preceptors (NDEP)—were used as the sample for the larger testing. An email request to participate was sent to all members of NDEP listserv. A hyperlink to the instrument was included within the email request. In addition to the initial email request, a two-week reminder email was also sent

to NDEP members via the listserv. The membership of NDEP includes dietetics educators and preceptors who work with students during practicum with a general understanding of the learning activities partaken during supervised practice. Additionally, members were requested to send the questionnaire out to other educators and preceptors who may not be a member of NDEP to increase the number of potential participants. To encourage participation, a drawing for one $100 gift card and a drawing for two $50 gift cards were offered to those who completed the review. Basic demographic information (age, gender, years in the profession, highest degree obtained, role in the profession, and location) was included. To assure at least fair estimated factor reliability, a sample size of 200-300 was the goal for this portion of the research (Field, 2009; Mertler & Vannatta, 2013).

An exploratory factor analysis (EFA) was used to determine construct validity of the revised instrument (Burns & Grove, 2009; Johnson & Christensen, 2012). Principal axis factoring was chosen over principal component analysis because of the primary goal of identification of constructs (Field, 2009). During this step, scree plots for the number of potential factors, amount of variance explained by each factor, and the loading for each item on the factor were evaluated. The minimal acceptable cut off point for factor loading in an unknown model is 0.30 (Burns & Grove, 2009; Mertler & Vannatta, 2013). Stevens (2002) recommended for a sample size of 200 a loading of at least 0.364 to be considered significant and a sample size of 300 a loading of at least 0.298 to be considered significant. Therefore, a cutoff point for factor loading was established at 0.35.

The goal of the factoring was to achieve simple structure with items loading only on one construct; therefore, simple structure was chosen over parallel analysis and Velicer's minimum average partial (MAP) to avoid over- or underloading of items into a construct (O'Connor, 2000). Since it was anticipated the constructs would correlate based on their theoretical overlap, an oblique factor (direct oblimin) rotation was utilized (Burns & Grove, 2009; Field, 2009; Mertler & Vannatta, 2013). Cross-correlations between the extracted factors as well as Cronbach alphas were calculated after the factor solution. SPSS® (version 23) was used to analyze the data (SPSS Statistical Software, Version 23).

Results

A total of 23 individuals participated in the preliminary item tryout. Of the participants, 22 were female and all held the Registered Dietitian (RD) credential. The majority of the respondents (*n*=16) were practitioners, with two respondents employed as program directors of an accredited ACEND program (one from a Dietetic Internship and one from a Didactic Program in Dietetics) and four faculty members. The mean age of the respondents was 39.6 years (SD $\pm$ 14.3) with 14.1 years of experience (SD $\pm$ 13.2).

Of those respondents who completed the evaluation of the instrument for face and content validity, 100% (*n*=21) reported the instructions for the instrument were clear, items were written clearly, the overall layout and flow was clear and easy to understand, and the length of the instrument was appropriate. The majority of respondents preferred to use the term "intern" (*n*=13) compared to "student" (*n*=8); therefore, the term "intern" was used in the final instrument. Respondents were asked if there were any items they would exclude from the instrument and 3 out of 21 respondents stated "yes" to this

question. However, only one respondent provided an actionable comment indicating that some statements only elicited positive responses. After reviewing the frequency report for responses, six scale items were identified with 100% responses of either agreed or strongly agreed responses. These items were rewritten to make the statements elicit responses across the scale spectrum compared to eliciting only highly positive responses. For example, "A learning environment is safe, challenging, and positive" was rewritten to "A learning environment that supports the intern."

Cronbach alphas were calculated to determine construct consistency for items of the proposed instrument (Table 3). All values were above the threshold of .70 except for "Methods of coaching or precepting," which was .302. When considering the strong theoretical backing for this construct, researchers elected to retain in the scale. Thus, the 55 initial items were included in the final instrument.

Table 3

Reliability of constructs from preliminary item tryout

Construct	Number of items in construct	Cronbach alpha
Student possesses natural abilities to be successful in the profession	14	.866
Methods of coaching or precepting	4	.302
Supervised practice activities that need more time	6	.807

Methods to increase performance	7	.845
Characteristics of student-preceptor relationship	13	.779
Activities that promote lifelong learning	4	.873
Foundational education activities to be a successful practitioner	6	.746
Total	55[a]	.926

The category of "Professional attributes of a successful individual" had only one item retained after the card sort; therefore, Cronbach alpha could not be determined and thus is not included in the above table.

Although the current membership by the NDEP was reported to be 1,100 members, a total 1,316 NDEP members received the initial email request (Appendix F). Of 1,316 potential participants, 430 individuals opened the initial email request (32.7%). Two weeks later, a reminder email (Appendix G) was sent out to all members of NDEP. At this point, 1,318 members received the reminder email request and 489 members opened the email (37.1%). The initial email request and two-week reminder email were sent to the same pool of participants; therefore, no method was available to know how many members of NDEP opened both messages. Additionally, researchers requested that NDEP members pass the email along to other professionals in their network who may be interested in responding. Utilizing this snowball sampling technique may have added to the total number of potential participants, which cannot be quantified.

A total of 323 individuals launched the instrument link. Of those, 255 (79.0%) respondents completed the instrument with an additional 68 (21.0%) partially completed responses, which were excluded from final analyses. Data from participants who did not

complete or accurately complete 75% (three out of four) of the validation check questions were also eliminated from the data set (*n*=11/4.3%). A total of 244 usable responses were available for data analysis. Prior to data analysis, missing data points were replaced with the linear trend point of each item of the scale (Field, 2009).

The participants who completed the instrument held the RD credential (99.2%), were predominately female (97.5%), were between the ages of 51-60 (27.0%), and had 31-40 years of experience (26.2%). More than half of the participants had earned a masters (60.2%) and nearly a third held a doctorate (27.9%) degree. See Table 4 for a complete demographic profile of the participants.

Table 4

Demographic profile of participants (N = 244)

Characteristics	*n*	Percent
Gender[a]		
Male	6	2.5
Female	236	97.5
Credentials[b]		
RD or RDN	242	99.2
DTR or NDTR	2	0.8
Other	19	7.8
Years in practice		
0-10	62	25.4
11-20	57	23.4
21-30	55	22.5
31-40	64	26.2
>40	6	2.5
Age[a]		
21-30	18	7.7
31-40	61	26.1
41-50	51	21.8
51-60	63	27.0
61-70	38	16.2
>70	3	1.3

Role in dietetics[a]		
Program Director[a]	100	41.2
DPD (Didactic Program in Dietetics)	26	26.0
DI (Dietetic Internship Program)	61	61.0
CP (Coordinated Program)	10	10.0
DT (Dietetic Technician Program)	2	2.0
Faculty member	68	30.0
DPD	31	45.6
DI	16	23.5
CP	14	20.6
DT	6	8.8
Other	1	0.2
Practitioner	49	20.1
Practitioners (current preceptors)	43	87.8
Practitioners (not current preceptors)	6	12.2
Other	26	10.7
Highest degree obtained		
2 year degree	0	0.0
4-year degree	29	11.9
Masters	147	60.2
Doctorate	68	27.9
NDEP Region		
1	45	18.4
2	30	12.3
3	27	11.1
4	50	20.5
5	33	13.5
6	28	11.5
7	31	12.7

[a]Category is missing data points

[b]Participants could select more than one option

Initial visual evaluation of the scree plot indicated extraction of five to nine factors. The most widely utilized tool for factor extraction is The Kaiser's Criterion, which recommends extraction of all factors with eigenvalues greater than one. Unfortunately, Kaiser's Criterion tends to over-estimate the number of factors to extract (Field, 2009); therefore, parallel analysis and Velicer's minimum average partial (MAP) were calculated. Parallel analysis, which tends to over-identify, indicated to retain an eight-factor solution. Velicer's MAP, which tends to under-identify, indicated to retain a

six-factor solution (Field, 2009; O'Conner, 2000). Because of the potential over and under estimations of parallel analysis and Velicer's MAP, the need for factors to make theoretical sense, and the goal of simple structure, extraction of seven factors were retained in the final analysis with a factor loading cut-off of 0.35.

Items were eliminated during analysis of the factor solution utilizing a systematic process. First, items not loading to any factor were eliminated (n = 9; Questions: 5, 8, 16, 21, 26, 28, 37, 55, 57). Next, those items with triple loading (n = 3; Questions: 4, 35, 38) and then double loading (n = 7; Questions: 6, 15, 20, 30, 48, 51, 54) were removed. Finally, items not 'fitting' with the theoretical foundation of DP were removed (n = 4; Questions: 1, 10, 36, 44). While each of the four removed items were reflective of one of the core constructs of DP, each item did not load with other items that were of similar theoretical makeup.

The Kaiser Meyer Olkin (KMO) measure verified the sampling adequacy of the analysis. The KMO measure was equal to .827, which is considered "good" (Field, 2009). Barlett's test of sphericity chi-square (496) = 3084.178, $p < .001$, which indicated correlations between items were sufficiently large for principal axis factoring. Table 5 details the factors of the seven-factor simple structure model, which explained 59.72% of the variance.

Factor one, "Methods to increase performance," centered on studying, study skills, and study techniques for improving academic performance. Factor one communalities ranged from .309 to .549. Factor two included attributes and characteristics of one's natural abilities for expert performance and thus labeled "Natural abilities." Factor two commonalities ranged from .348 to .603. Continuing, factor three,

"Activities requiring focused time," highlighted the aspect of time; in particular those aspects of a supervised dietetics education that require more time in the curriculum compared to other curricular activities with commonalities from .409 to .742. Factor four concentrated the activities of the remediation and the feedback process between an intern and a preceptor; therefore, named "The coaching process." Factor four commonalities ranged from .298 to .440. Next, factor five, "Educational activities within the curriculum," centered on the educational activities requiring a focus within the curriculum with commonalities from .453 to .512. Factor six highlighted activities of lifelong learning and professionalism and thus termed "Lifelong learning." Factor six commonalities ranged from .532 to .552. Lastly, the instrument items for factor seven, "The learning environment," centered on characteristics of providing a positive and safe environment for an intern to develop skills in the supervised practice setting with commonalities from .400 to .517.

Table 5

Factor loadings for a seven-factor structure including eigenvalues and percentage shared variance

Factors	Loading	λ	% Shared variance
Factor one: Methods to increase performance		6.99	21.83
Q33. A dedicated study schedule	.754		
Q27. Intern reviews notes from coursework	.665		
Q25. A quiet and conducive environment for studying	.612		
Q13. Studying with flash cards	.589		
Q47. Outlines to assist the intern when studying	.573		

Q18. Intern-developed case scenarios used as a study guide	.437		
Q03. Individual and group practice exams	.430		
Factor two: Natural abilities		3.11	9.71
Q09. Emotional intelligence to cultivate positive relationships	-.850		
Q14. Positive relationships where the intern is able to connect with others	-.609		
Q12. Personal interactions allowing the intern to demonstrate mature character	-.510		
Q19. Intern communicates to clients/patients in a culturally competent manner	-.509		
Q07. Resiliency in a difficult situation	-.397		
Factor three: Activities requiring focused time		2.67	8.34
Q17. More time spent on critical care activities as compared to all other activities	.916		
Q23. More time spent on advanced clinical nutrition activities as compared to all other activities	.856		
Q02. More time spent on nutrition support activities as compared to all other experiences	.704		
Q45. More time spent on nutrition assessment skills as compared to all other experiences	.570		
Factor four: The coaching process		2.07	6.47
Q49. Designated time for the preceptor to provide feedback	.625		
Q46. Preceptors provide feedback in a one on one setting	.574		
Q42. Formal, end of rotation evaluations	.512		
Q43. A common set of goals established between the intern and the preceptor	.502		
Q50. Additional feedback is provided when a intern who does not possess natural and academic abilities	.488		
Q59. Preceptors provide ongoing and daily feedback	.437		

Factor five: Educational activities within the curriculum		1.84	5.75
Q41. Develop an understanding of research and statistical methodology by reading journal articles	.809		
Q40. Exposure to specialty information by reading journal articles	.704		
Q58. Required readings to stay abreast of current topics	.555		
Q56. A literature review used as part of evidence-based practice	.527		
Factor six: Lifelong learning		1.30	4.05
Q39. Professional meetings and conferences to further develop knowledge within one's practice area	.734		
Q24. Professional network opportunities to further develop knowledge	.679		
Q53. Professional organization membership to further develop knowledge within one's practice	.678		
Factor seven: The learning environment		1.14	3.57
Q31. Ample opportunities to practice development of skill	-.741		
Q32. A learning environment is safe, challenging, and positive	-.722		
Q22. Preceptors who provide constructive feedback and suggestions for improvement	-.492		

λ = eigenvalues

Table 6 highlights the means and standard deviations for the seven subscales, correlations between the factors, and internal consistency estimates. All factors within the solution have significant low to moderate correlations (ranging from .169 to .475) except for the relationships between activities requiring focused time and natural abilities (r=.089), lifelong learning (r=.097), and the learning environment (r=.113). All factors within the solution demonstrated an acceptable level of internal consistency. The mean differences between factor subscales did not exist between the different groups—educators, practitioners, and preceptors—who participated in the research study.

Table 6

Factor correlations and reliability estimates

Factor	M[a]	SD	1	2	3	4	5	6	7
1. Methods to increase performance (*n* = 7)	4.49	.90	(.82)						
2. Natural abilities (*n* = 5)	6.13	.62	.279[b]	(.80)					
3. Activities requiring focused time (*n* = 4)	4.35	1.12	.301[b]	.089	(.85)				
4. The coaching process (*n* = 6)	6.14	.57	.407[b]	.259[b]	.141[c]	(.73)			
5. Educational activities within the curriculum (*n* = 4)	5.64	.79	.364[b]	.235[b]	.171[c]	.368[b]	(.80)		
6. Lifelong learning (*n* = 3)	5.46	.89	.384[b]	.409[b]	.097	.240[b]	.383[b]	(.73)	
7. The learning environment (*n* = 3)	6.52	.59	.169[b]	.475[b]	.113	.328[b]	.143[b]	.172[b]	(.73)
Total instrument (*n* = 32)	5.46	.49							(.88)

[a]Range from 1.00 to 7.00

[b]Correlation is significant at the 0.01 (2-tailed)

[c]Correlation is significant at the 0.05 (2-tailed)

Cronbach alpha levels appear in parenthesis on the diagonal

Discussion

The factor analysis yielded a seven-factor solution, which provided an initial definition of deliberate practice within supervised dietetics education in order to apply a working definition of deliberate practice to supervised dietetics education. Many of the factors identified—such as methods to increase performance, need for feedback and remediation, and natural abilities—within the factor solution correspond directly to previous results within the literature.

Factors of DP in Supervised Dietetics Education

"Methods to increase performance" was the strongest factor, one of two factors with the most factor loadings, and explained the greatest amount of shared variance. All of the items within this particular factor related to studying, study techniques, and the studying environment. Study techniques are an important aspect to improve performance within DP (Charness et al., 2005; deBruin et al., 2008; Keith & Ericsson, 2007; Moulaert et al., 2004). Moulaert and colleagues noted in their research, participants spent an average of 31.9 hours per week on study-related activities with lower achieving students spending less time on self-directed study activities (2.3 hours, $p < 0.05$). Studying, self-study, study techniques are important when defining DP in supervised dietetics education as indicated by a Cronbach's alpha of .82 and as in the previous DP literature.

One must have innate talent, plus the dedication of practice that is deliberate in nature in order to achieve expert performance (Ericsson et al., 1993; Galton, 1979). Emotional intelligence, positive relationships, mature personal interactions, culturally competent communication, and resiliency were important natural abilities attributes and characteristics in supervised dietetics education. The item *Personal interactions allowing*

the intern to demonstrate a mature character was originally written for a differing construct during the preliminary item try out; however, the item theoretically made sense within the "Natural abilities" construct after the EFA, since having a mature character could be considered a natural attribute of an intern. The inclusion of natural abilities in the equation of obtaining expert performance is highlighted within previous literature; similarly, the results of this research support the inclusion of natural abilities (α=.80) as a part of the definition of DP in supervised dietetics education (Ericsson et al., 1993; Galton, 1979; Hodges et al., 2004).

The concept of time is important because the framework of DP indicates achieving expert performance will occur only after a sufficient amount of practice time (de Bruin et al., 2008; Law et al., 2007; Ward et al., 2007). The items within the factor of "Activities requiring focused time" provide support for the need to focus more time on critical care, clinical nutrition, nutrition support, and nutritional assessment activities when defining DP in supervised dietetics education (α=.85). Activities needing more focused time herein include critical care, clinical nutrition, nutrition support, and nutritional assessment, which converge to craft the more medically complex clinical nutrition activities of a RD. The support for medically complex clinical nutrition activities is in alignment with the proposed 2017 RD national credentialing examination blueprint. The RD exam focuses 40% of the overall test questions on nutritional care for individuals and groups (CDR, 2016b).

Providing active remediation and feedback are important characteristics when defining DP (De Bruin et al., 2008; Dunn & Shriner, 1999; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward,

2007; Ford et al., 2009; Johnson et al., 2006; Law et al., 2007; Moulaert et al., 2004). The outcome of the EFA collapsed the items "Methods of coaching and precepting" and "Characteristics of the intern-preceptor relationship" into one factor named "The coaching process." The factor had the second most number of factor items loaded (n=6) as well as 6.5% shared variance of the overall solution. Therefore, "The coaching process," providing active remediation and feedback, is important when defining DP in supervised dietetics education and within the DP literature albeit a lower alpha coefficient in this construct.

Important to any curriculum are the educational activities, which guide the learning process. Thus, determining practice activities within the educational curriculum to improve performance are a necessary function, and the need is evident through the literature (Campitelli & Gobet, 2008; Ward, Hodges, Starkes, & Williams, 2011). Interestingly, the items within the factor "Educational activities with the curriculum" focused completely on reading information to support foundation knowledge and reading research literature. These particular educational activities are essential when defining DP within supervised dietetics education (α=.80) as they provide the foundation to the learning process. The idea that professional reading is a key activity in DP was supported in areas such as chess, teaching, medical school education, and rhythmic gymnastics (Campitelli & Gobet, 2008; Charness et al., 2005; Dunn & Shriner, 1999; Moulaert et al., 2004; Ward et al., 2011).

Dunn and Shriner (1999) and Haag-Heitman (2008) noted the importance of the lifelong learning process, in particular, attendance at seminars and workshops within their literature. *Attendance at professional meetings, networking opportunities, and*

membership within a professional organization were the items that loaded to the factor of "Lifelong learning." The convergence of the items within this factor provided theoretical support (α=.77) for the need of an individual's continued learning and self-reflection throughout his or her dietetics' career and is supported within the literature (Dunn & Shriner, 1999; Haag-Heitman, 2008).

Lastly, the factor identified as "The learning environment" was not found in previous literature and is a newly proposed construct reflective of DP. Unfortunately, this factor only had three items loaded, loaded last in the EFA, and the smallest percentage shared variance as well as an alpha coefficient close to the threshold of $\geq .70$. Therefore, future testing could include the addition of new items to strengthen this factor or possibly consider eliminating the factor completely from the instrument.

In summary, the instrument described within this paper is a novel instrument measuring the activities, attributes, and characteristics of DP in supervised dietetics education based on the opinions of practitioners and educators in dietetics and allied health professions. The activities, attributes, and characteristics of DP in supervised dietetics education offered many similar, but minor differences in the results compared to the literature. The newly developed instrument included fundamental characteristics of DP such as methods to increase performance, the need for natural abilities, and the importance of feedback and remediation similar to the findings of others defining DP within their chosen field or domain. Also, results indicated the inclusion of educational activities within the curriculum and lifelong learning within the instrument, which were a part of the DP literature reflective of the professional domain but not described within the 'classic' DP literature (Dunn & Shriner, 1999; Haag-Heitman, 2008). Noted differences

of the results indicate the inclusion of elements of the learning environment as well activities requiring focused time. This is the first instrument, to the knowledge of this researcher, measuring DP in supervised dietetics education.

Limitations

There were several limitations to the research. First, the sample size for the EFA (n = 244 participants) was considered "fair" to "good" for estimated factor reliability (Mertler & Vannatta, 2013). To provide improved results for an EFA, a sample size of ≥ 300 would be ideal to strengthen the results. Since not all educators and preceptors are NDEP members, it would be beneficial to determine alternative methods to reach a larger pool of educators and preceptors to increase the sample size to larger than 300 participants. Potentially, administering the questionnaire to all members of the Academy of Nutrition and Dietetics, then filter by categories of educator and preceptor could be an alternative approach to reach educators and preceptors who are a member of the Academy but not a member of NDEP. Lastly, DP has never being defined in supervised dietetic practice and thus there are limited data, within the literature, on defining activities that are required in the development of an allied health professional. The lack of data creates a gap within the literature on the topic of DP in supervised dietetics education.

Conclusion

The purpose of this manuscript was to establish reliability and validity of an instrument measuring DP in dietetics supervised practice, based on the opinions of practitioners and educators in dietetics and allied health education, so that characteristics of DP in dietetics education can be defined. Although DP in dietetics has not been

defined in the literature, the findings of this research indicated a seven-factor solution with adequate factor loadings above +/- .35 and sufficient alpha coefficients. From the outcome of this research, DP within supervised dietetics education can be defined by the following characteristics: (1) regular and systematic opportunities to practice skills and hone knowledge; (2) opportunities embedded within experiential practice to develop innate talent; (3) dedicated time to cultivate skills focused on a high level of patient-centered nutrition care; (4) frequent and ongoing feedback; (5) activities devoted to reading and understanding evidence-based practice literature; (6) professional education and networking opportunities; and (7) a neutral learning environment where the student is free to make mistakes. The definition of DP in supervised dietetics education encompasses many of the important facets outlined from the literature. Due to the limitations outlined in this study, further instrument testing may be needed to confirm the proposed definition of DP in supervised dietetics education.

Future research may first include the development of new items, especially for the constructs outlined above, to strengthen the overall reliability of the instrument. Additionally, predictive validation studies within supervised dietetics education could be accomplished using the identified instrument focusing on student outcomes such as employment rates, employer satisfaction, program completion rates, and credentialing examination scores.

CHAPTER VI – CONCLUSION

Summary of Findings

Four research objectives guided the overall goal of this project, which was to provide a working definition of deliberate practice in the profession of dietetics, based on the opinions of practitioners and educators in dietetics and allied health professions, similar to the domains of gaming and sports. Each research objective was accomplished during one of the segments of this project with each segment building upon each other.

Segment one

In segment one, semi-structured interviews guided the exploration of potential activities, attributes, and characteristics reflective of deliberate practice and how these activities, attributes, and characteristics can potentially be defined in the broader scope of allied health education. A total of twenty participants from within dietetics, including program directors, preceptors, and practitioners, as well as educators from other allied health education programs (i.e. speech therapy, pharmacy, physical therapy, athletic training, and nursing) were interviewed. At the conclusion of segment one, 100 main themes were identified and utilized in segment.

Segment Two

A closed card sorting activity allowed participants to classify the 100 main themes into one of the eight core categories reflective of the constructs of deliberate practice. Forty-five preceptors from differing geographical locations across the United States completed the card sorting activity. For items (cards) to be considered for use in segment three, greater than or equal to 75% agreement was needed. Items scoring an agreement of 43% to 74% were retained if the researcher had reason to believe that the item belongs,

was representative in the theoretical framework or had high agreement in the previous open sort. Items scoring less than 42% agreement were removed from the scale unless strong representation of the theoretical framework was determined (Huye, 2011; Spencer, 2009). At the end of segment two, a total of 55 items were retained for use in creating a scale to validate a definition of deliberate practice in dietetics.

Segment Three

During segment three, the draft scale was developed and administered to a smaller sample size for pilot testing or preliminary tryout. Preliminary item review of a scale before conducting a larger testing of the scale is an important step in scale development (Burns & Grove, 2009; University of Wisconsin Survey Center, 2010; Walonick, 2010). In addition, segment three was designed to test face and content validity of the scale. A convenience sampling of participants completed the scale during the pilot stage. Items were initially tested for internal consistency and were re-written based on the comments obtained in segment three. Preliminary Cronbach alpha levels for all but one of the prospective categories reflective of deliberate practice categories were above acceptable levels ($\geq$.70) for reliability estimates. "Methods of coaching or precepting" was the only category with a lower than desired alpha level; however, because of the preliminary nature of the development of the instrument, it was decided to retain all of items for factor analysis in the next segment. The reliability estimate for the overall instrument was above the recommended point at .926 (Burns & Grove, 2009; Field, 2009).

Segment Four

Lastly, segment four served to validate construct definitions of deliberate practice within the dietetics professions to a much larger sample size. Participants for segment

four were recruited from NDEP as well as other educators and preceptors outside of the NDEP group. A total of 244 participants fully completed the scale in segment four. Exploratory factor analysis was performed to examine the relationships between the different items on a scale. Individual constructs were determined by items that loaded or clustered together in a factor (Burns & Grove, 2009; Field, 2009; Johnson & Christensen, 2012; Mertler & Vannatta, 2013). An EFA was beneficial in this particular research because there were no expectations set forth about the factor structure (Burns & Grove, 2009). Factor solution extraction resulted in a seven-factor, simple structure model, explaining 59.72% of the shared variance. The factors included: "Methods to increase performance;" "Natural abilities;" "Activities requiring focused time;" The coaching process;" "Educational activities within the curriculum;" "Lifelong learning;" and "The learning environment." Factor loadings ranged from absolute values of .397 to .916. The factor of "Methods to increase performance" accounted for the largest portion (21.83%) of the shared variance of the solution. All factors within the final factor solution had acceptable levels of internal consistency ranging from .73 ("The learning environment" and "The coaching process") to .85 ("Activities requiring focused time"). The overall scale's internal consistency was also acceptable at .88. Many of the final factors were evident in the 'classic' deliberate practice literature such as "Methods to increase performance," "Natural abilities," and "The coaching process;" however, new factors, including "Educational activities within the curriculum" and "The learning environment," surfaced.

The overall goal of this research study was to provide a working definition of deliberate practice in the profession of dietetics, based on the opinions of practitioners

and educators in dietetics and allied health professions, similar to the domains of gaming and sports. To accomplish this task, the following research objectives were accomplished:

1. Explore the concept of deliberate practice and how deliberate practice potentially can be defined within allied health education.
2. Classify concepts of deliberate practice into core constructs and define each core construct of deliberate practice within dietetics supervised practice education.
3. Develop an instrument to confirm construct definitions of deliberate practice in dietetics.
4. Validate construct definitions of deliberate practice within dietetics supervised practice education.

In segment one, the concept of deliberate practice and how DP might be defined in the broader scope of allied health education was explored. After completion of the card sorting activity to classify the concepts identified from the semi-structured interview sessions, 55 elements of deliberate practice within supervised dietetic education were identified and retained. The elements identified within the card sorting activity were classified in core constructs reflective of deliberate practice based from the literature. The outcomes of sorting the items provided a preparatory point for use in the instrument for testing and validation. Preliminary tryout of the instrument was beneficial to assure face and content validity as well as provide initial reliability estimates of the instrument. Scale items within the instrument were re-written to improve their testability within use in the larger sample size. Lastly, conclusion of the factor analysis identified an essential

instrument, with 32 items, to define deliberate practice within supervised dietetics education. From the outcome of this research, DP within supervised dietetics education can be defined with the following characteristics: (1) regular and systematic opportunities to practice skills and hone knowledge; (2) opportunities embedded within experiential practice to develop innate talent; (3) dedicated time to cultivate skills focused on a high level of patient-centered nutrition care; (4) frequent and ongoing feedback; (5) activities devoted to reading and understanding evidence-based practice literature; (6) professional education and networking opportunities; and (7) a neutral learning environment where the student is free to make mistakes. All extracted items provide theoretical support for defining deliberate practice in supervised dietetics education.

Strengths and Limitations

The outcomes of this project provided the beginnings of a working definition of deliberate practice within supervised dietetics practice based on the opinions of practitioners and educators in dietetics and allied health professions. To the knowledge of this researcher, this is the first scale of its kind to define deliberate practice in dietetics. Qualitative and quantitative methods were deployed to accomplish the four research objectives outlined in this project. Every attempt was made to include perspectives internal, and external, to dietetics educations and as a profession. There are, however, several limitations to this project.

The first limitation of this project was that participants from segments one, two, and three were convenience samplings of personal colleagues or contacts of personal colleagues. However, during segment four a much larger sampling pool was utilized to validate construct definitions of deliberate practice. Within the card sorting activity,

there were multiple categories for the participants to select from as well as a large number of cards requested to sort. This may have imposed a burden on the participants of this particular segment. The time commitment of completing the semi-structured interview sessions as well as the card sorting activity was cumbersome for participants; on average, it took approximately 45 minutes to complete the interview and 41 minutes to complete the card sorting activity. In spite of the time burden during segments one and two, the time burden was drastically shorted to around 10 minutes to complete the final scale in segment four. The sample size of segment four (n = 244 participants) was between what Mertler and Vannatta (2013) considered "fair" and "good" for estimated factor reliability. To provide improved results for an EFA, a sample size of ≥ 300 would be ideal to strengthen the results. Next, since not all educators and preceptors were NDEP members, it would be beneficial to determine alternative methods to reach a larger pool of educators and preceptors. Therefore, potentially administering the questionnaire to all members of the Academy of Nutrition and Dietetics, then filter by categories of educator and preceptor, may aid to improve the sample size to ≥ 300 participants. Lastly, there is the limitation of deliberate practice never being defined in supervised dietetic practice and not having comparable literature available specifically to this field or professional domain.

Implications and Applications

A gap in the literature was highlighted during the completion of this project. To the knowledge of this researcher, there has been no known scale developed to define deliberate practice in the dietetics profession. Also to note, there is limited information to define deliberate practice in other medical and non-medical professions compared to the

vast amount of literature available in gaming and competitive sports. The outcomes of this research serves to fill the gap in the deliberate practice literature related to professional domains. In time, the scale developed in this research could be used in outcomes research focusing on comparing student employment rates, completion or graduation rates, or RD exam scores to the scores on the aforementioned scale of deliberate practice in supervised dietetics education.

Recommendations for Future Research

The purpose of this project was to define deliberate practice in supervised dietetics education. Even though findings indicated a seven-factor solution with simple structure, adequate factor loadings, and sufficient internal consistency, further refinement of the items within the instrument may be needed, focusing on the specific factors with alpha coefficients on the brink of the recommend threshold of $\geq .70$, including "Lifelong learning" and "The learning environment." Each of these factors only had three items loaded to them and loaded last in the EFA; therefore, additional items may need to be written to further define and develop characteristics and attributes of lifelong learning and the interns' learning environment. The lower reliability estimates, while although acceptable in introductory research on instrument development, may need to be improved as the instrument is further tested.

After validating the instrument against real world practice, research could begin using the instrument in its current (or updated from validating against real world practice) format. Regression analysis could be utilized in outcomes research in dietetics education. Each mean construct response, plus the overall score of the instrument, could be employed to predict such outcomes as employment rates, completion or graduation rates

of interns, placement into graduate school, and/or RD examination scores. Dietetics program directors typically use academic markers, such as undergraduate grade point average; nutrition grade point average; science grade point average; and academic testing, such as the Graduate Record Examination (GRE), to predict success on passage of the RD credentialing examination and potential admittance into their dietetics program (Bode & Gates, 2001; Bradley & Deaton-Conner, 1993; Farkas, Gregoire, Lafferty, & Hartney, 2010; Fournet & Harrison, 1994; Haubrick, 1995, 2015a, 2015b). The research on predicting success on the RD credentialing examination is helpful to admit the most qualified student, yet, it does not aim to address what types of educational activities make one successful or competent to practice in dietetics. Thus by defining deliberate practice in supervised dietetics education important qualitative activities, attributes, and characteristics, which are missing from the research focusing on specific academic markers for success, are highlighted. Merging the qualitative elements of expert performance of this research with the quantitative academic measures could provide further benefit to those involved in the education and training of a Registered Dietitian.

APPENDIX A – IRB Letters

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16041301
PROJECT TITLE: Defining Deliberate Practice in Supervised Dietetic Education: Semi-structured Interviews (segment one of four)
PROJECT TYPE: New Project
RESEARCHER(S): Kevin Haubrick
COLLEGE/DIVISION: College of Health
DEPARTMENT: Nutrition and Food Systems
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 04/13/2016 to 04/12/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board

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- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16052601
PROJECT TITLE: Defining Deliberate Practice in Supervised Dietetic Education: Card Sorting (Segment two of four)
PROJECT TYPE: New Project
RESEARCHER(S): Kevin Haubrick
COLLEGE/DIVISION: College of Health
DEPARTMENT: Nutrition and Food Systems
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 05/26/2016 to 05/25/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board

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NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: CH16052601
PROJECT TITLE: Defining Deliberate Practice in Supervised Dietetic Education: Card Sorting (Segment two of four)
PROJECT TYPE: Change to a Previoulsy Approved Project
RESEARCHER(S): Kevin Haubrick
COLLEGE/DIVISION: College of Health
DEPARTMENT: Nutrition and Food Systems
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 07/07/2016 to 07/06/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16101101
PROJECT TITLE: Defining Deliberate Practice in Supervised Dietetic Education: Preliminary Item Tryout (segment three of four)
PROJECT TYPE: New Project
RESEARCHER(S): Kevin D. Haurbick
COLLEGE/DIVISION: College of Health
DEPARTMENT: Nutrition and Food Systems
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 10/11/2016 to 10/10/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX B – Question Guide Development

MAJOR HEADING	TOPIC AREAS	INTERVIEW QUESTION	CITATION(S)
Practice to improve performance	Practice activities within the educational curriculum	• In a classroom setting, what activities are most likely to help set a foundation for practice in supervised practice? • What are some specific activities that can be used in education and training of a student to help the student participate in evidence-based practice/medicine? • When a student is learning how to assess the specific needs of a patient or client, what activities are most helpful in teaching a student how to participate in this activity? • When teaching a student to create plans of care specific to the client's needs (i.e. Patient-centered care), what activities or assignments are most helpful in teaching a student this skill? • We know that both individual projects and group projects can be both beneficial and detrimental to a student's learning. In your experience, • What are those learning activities that are most beneficial when a student works alone on a project? • On the opposite side, which learning activities are most beneficial when they are completed as part of a group?	• Campitelli & Gobet, 2008; Ward, Hodges, Starkes, & Williams, 2011
Professional reading	Number of textbooks and journals	• When you consider the amount of reading that a student must complete as part of an allied-health program, is there a type of reading activity that you feel would be more beneficial than others (e.g. journal articles vs.	Campitelli & Gobet, 2008; Charness et al., 2005; Dunn & Shriner, 1999; Moulaert et

		textbooks or evidence reviews vs. journal articles)? • In your experience, how much and how frequently does a student need to read professionally related materials in order to become competent to practice?	al., 2004; Ward et al., 2011
Lifelong learning	Attendance at seminars and workshops	• In order for a student to start the process of becoming a lifelong learner, what are some of the most beneficial activities he/she must engage in? • Given the list that you provided above, can you describe any topics that need to be covered during these activities that are more likely to produce a lifelong learner?	Dunn & Shriner, 1999; Haag-Heitman, 2008; Ward et al., 2011
Study to improve performance	Studying—self-study and study techniques	• When a student is actively preparing to enter his/her chosen profession, what are the most beneficial studying techniques that he/she can use? • Can you provide a specific example of a study technique that is more beneficial when working alone? What about as a group?	Charness et al., 2005; deBruin et al., 2008; Keith & Ericsson, 2007; Moulaert et al., 2004
Feedback	Remediation and Feedback	• Have you ever seen where a student has needed to repeat an assignment, activity, or experience in order to become proficient? Can you tell me more about those situations where remediation is most beneficial to the learning of a student, specifically in the practice setting? Were there ever any instances where remediation was not beneficial? • In your experience (either what you have seen or what you have used with a student), what are the most beneficial activities a teacher/peer can use to provide feedback to improve the	De Bruin et al., 2008; Dunn & Shriner, 1999; Ericsson, 2013; Ericsson & Charness, 1994; Ericsson et al., 1993; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Johnson

		performance of a student? (Make sure they provide specific examples)	et al., 2006; Law et al., 2007; Moulaert et al., 2004
Nature vs. nurture	Innate abilities	• In your experience, what are the characteristics of a student who seems to have a natural ability to achieve their goals? • Can you provide examples of activities that you might use to train a student that has those characteristics? • When a student who must work harder to become proficient in practice, what are some activities you might use to help train those students to attain the same level of competence as those that have a more natural ability?	Ericsson et al., 1993; Galton, 1979
Positive and engaged demeanor	Faculty and preceptor relationship with student	• Can you describe the characteristics of a positive relationship between a student and a mentor? • In your experience (either observed or in your own experience), what are some of those activities that can be utilized to help foster a student improve their skills as a practitioner?	Haag-Heitman, 2008
Accumulated time	Supervised practice time	• In your opinion, how much time does a student need to practice activities before becoming ready to enter the profession? • Are there activities that require more practice time than others? If so, can you give specific examples? • How much additional time is needed after the practice that is mandated by education for an individual to achieve competence in practice?	Campitelli & Gobet, 2008; Charness et al., 2005; deBruin et al., 2008; deBruin et al., 2014; Ericsson, 2004; Ericsson, 2007; Ericsson, 2008; Ericsson,

			2013; Ericsson, 2014; Ericsson & Charness, 1994; Ericsson & Lehmann, 1996; Ericsson & Ward, 2007; Ford et al., 2009; Dunn & Shriner, 1999; Haag-Heitman, 2008; Johnson et al., 2006; Krampe & Ericsson, 1996; Law et al, 2007; Meinz & Hambrick, 2010; Moulaert et al., 2004; Plant et al., 2005; Simon & Chase, 1973; Sonnentag & Kleine, 2000
Soft skills	Additional factors not discussed within the framework of deliberate practice; however, deemed important through the review of	• In trying to educate a student to practice professional behaviors, what activities do you feel are most beneficial in instilling these qualities into the student? • When teaching critical thinking and decision making, what are those activities that can help a student to demonstrate these skills in practice? • How, specifically, should a student be trained to understand	ADA, 2009; ACEND, 2015e; Agency for Healthcare Research and Quality, 2011; Beach et al., 2006; Bruening et al., 2015; IOM, 1999;

	literature	how to use data and information for making informed decisions? • What are the most beneficial experiences and activities that can be used when trying to train a student to function as a culturally competent practitioner?	IOM, 2002; JAND, 2013; United States Dept of Health and Human Services, 2015a; United States Dept of Health and Human Services, 2015b; Ward et al., 2011.

APPENDIX C – Assuring Interpretative Validity Evaluation

Thank you for taking the time out of your busy schedule to participate in the semi-structured interview segment of this research project. The semi-structured interviews provide the key themes and deliberate practice activities for the next segment of this research project. I have attached a summary of the main categories, themes, and activities/attributes/characteristics from all participants of the semi-structured interviews. You will see items that you may not have specifically mentioned during your interview; however, I want to make sure that I have adequately captured the overall spirit of the comments made during the interview process. Please take a few moments to read and review the overall summary of main categories, themes, and activities/attributes/characteristics provided and answer the following questions. In continuing, you consent to participate.

Criteria	Yes	No	Comments and/or recommended changes
Did the overall interview **Themes (2nd column)** describe or understand the information of interest from your perspective?			
Do the **Activities/attributes/characteristics (3rd column)** describe or understand the information of interest from your perspective?			
Do you have any other comments to add that were not captured during the interview? If yes, please provide in the comments section.			

Please provide any other comments from your participation in the interview session below. Thank you for your assistance! Kevin

APPENDIX D – Survey Evaluation Form

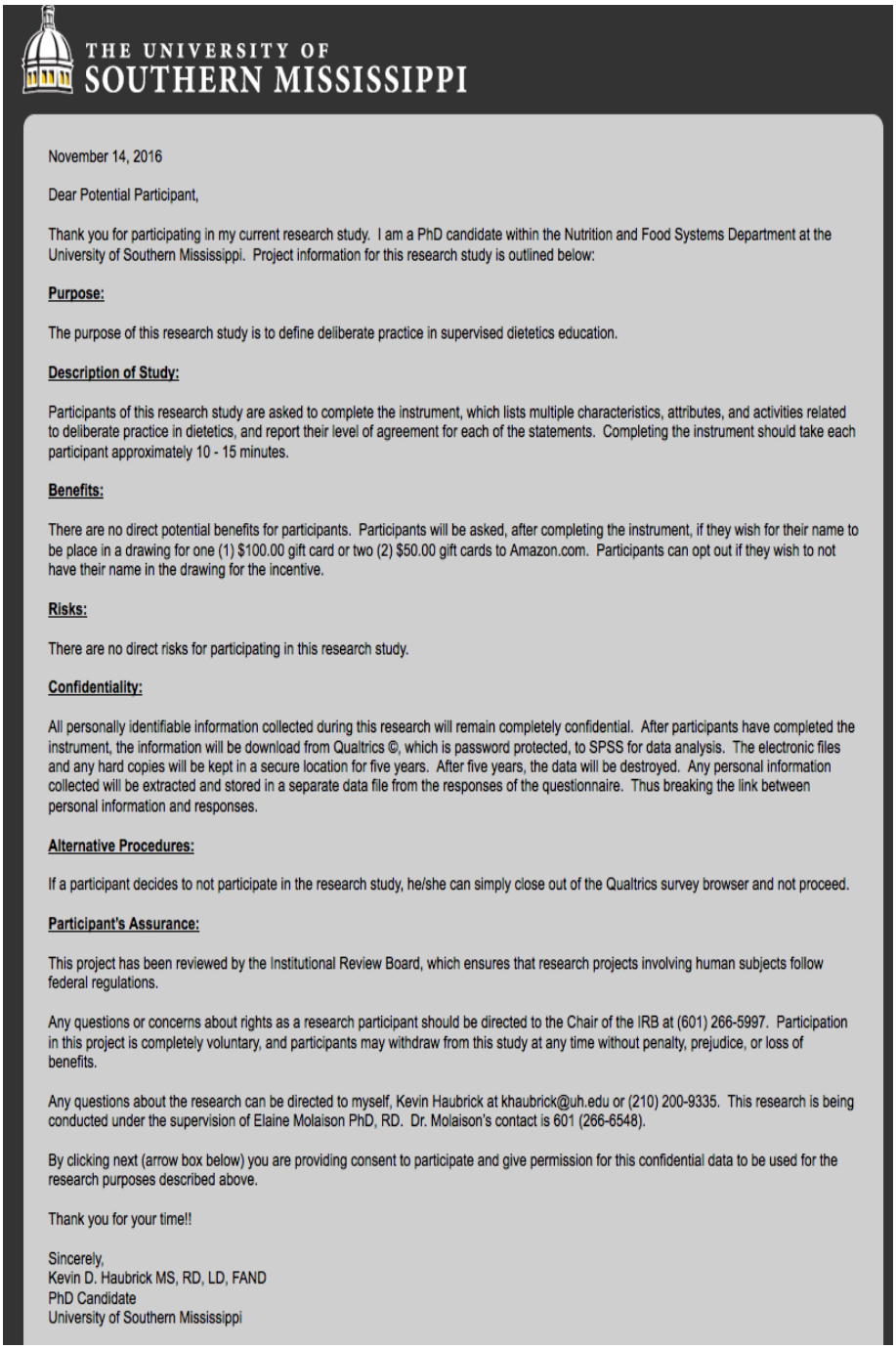
Developing an instrument to validate the definition of deliberate practice in supervised dietetics education

Thank you for volunteering your time to assist us in the development of this questionnaire. Please read each statement carefully and respond yes or no to each question. Also, please provide recommendations for improvement so that revisions can be made to this questionnaire.

Questionnaire	Yes	No	Recommendations for improvement
Were instructions for completing the questionnaire clear? If the instructions were not clear, suggest improvements.			
Were there deliberate practice statements written clearly to understand their meaning? If not, please suggest improvement for each statement that was not clear.			
Were there deliberate practice statements in the questionnaire that you would exclude from the questionnaire? If yes, please indicate the statement(s) that you would exclude.			
Were there any other deliberate practice statements that you would include in the questionnaire? If yes, indicate the statement(s) that you would include.			
Was the overall questionnaire layout and flow clear and easy to understand? If not, suggest improvement(s).			
Was the length of the			

questionnaire appropriate? If not, suggest improvement(s).			
In your opinion, do you prefer to use the term "student" or "intern" in the activities, attributes, and characteristics listed in the questionnaire?			Participants had the choice of student or intern in place the options of yes or no.
Please indicate any suggestions for improvement of the questionnaire. Thank you for your assistance.			

APPENDIX E – Questionnaire



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

November 14, 2016

Dear Potential Participant,

Thank you for participating in my current research study. I am a PhD candidate within the Nutrition and Food Systems Department at the University of Southern Mississippi. Project information for this research study is outlined below:

Purpose:

The purpose of this research study is to define deliberate practice in supervised dietetics education.

Description of Study:

Participants of this research study are asked to complete the instrument, which lists multiple characteristics, attributes, and activities related to deliberate practice in dietetics, and report their level of agreement for each of the statements. Completing the instrument should take each participant approximately 10 - 15 minutes.

Benefits:

There are no direct potential benefits for participants. Participants will be asked, after completing the instrument, if they wish for their name to be place in a drawing for one (1) $100.00 gift card or two (2) $50.00 gift cards to Amazon.com. Participants can opt out if they wish to not have their name in the drawing for the incentive.

Risks:

There are no direct risks for participating in this research study.

Confidentiality:

All personally identifiable information collected during this research will remain completely confidential. After participants have completed the instrument, the information will be download from Qualtrics ©, which is password protected, to SPSS for data analysis. The electronic files and any hard copies will be kept in a secure location for five years. After five years, the data will be destroyed. Any personal information collected will be extracted and stored in a separate data file from the responses of the questionnaire. Thus breaking the link between personal information and responses.

Alternative Procedures:

If a participant decides to not participate in the research study, he/she can simply close out of the Qualtrics survey browser and not proceed.

Participant's Assurance:

This project has been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations.

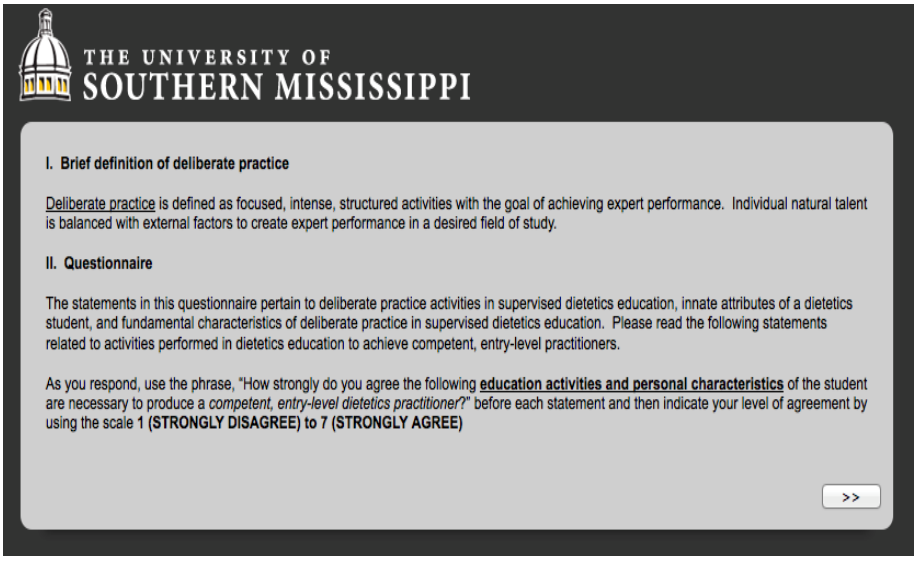
Any questions or concerns about rights as a research participant should be directed to the Chair of the IRB at (601) 266-5997. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits.

Any questions about the research can be directed to myself, Kevin Haubrick at khaubrick@uh.edu or (210) 200-9335. This research is being conducted under the supervision of Elaine Molaison PhD, RD. Dr. Molaison's contact is 601 (266-6548).

By clicking next (arrow box below) you are providing consent to participate and give permission for this confidential data to be used for the research purposes described above.

Thank you for your time!!

Sincerely,
Kevin D. Haubrick MS, RD, LD, FAND
PhD Candidate
University of Southern Mississippi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I. Brief definition of deliberate practice
Deliberate practice is defined as focused, intense, structured activities with the goal of achieving expert performance. Individual natural talent is balanced with external factors to create expert performance in a desired field of study.
II. Questionnaire
The statements in this questionnaire pertain to deliberate practice activities in supervised dietetics education, innate attributes of a dietetics student, and fundamental characteristics of deliberate practice in supervised dietetics education. Please read the following statements related to activities performed in dietetics education to achieve competent, entry-level practitioners.
As you respond, use the phrase, "How strongly do you agree the following education activities and personal characteristics of the student are necessary to produce a competent, entry-level dietetics practitioner?" before each statement and then indicate your level of agreement by using the scale 1 (STRONGLY DISAGREE) to 7 (STRONGLY AGREE)
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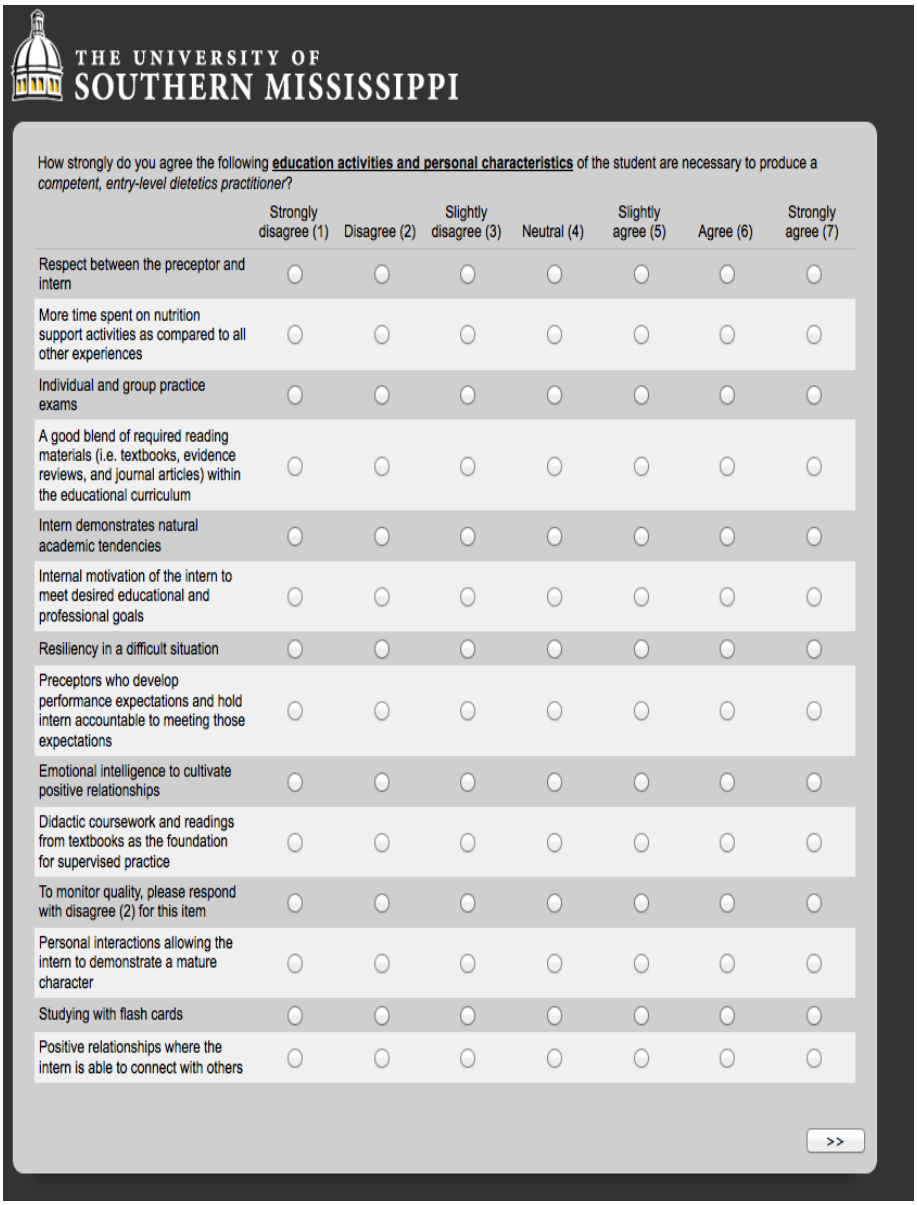

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How strongly do you agree the following **education activities and personal characteristics** of the student are necessary to produce a *competent, entry-level dietetics practitioner*?

	Strongly disagree (1)	Disagree (2)	Slightly disagree (3)	Neutral (4)	Slightly agree (5)	Agree (6)	Strongly agree (7)
Respect between the preceptor and intern	○	○	○	○	○	○	○
More time spent on nutrition support activities as compared to all other experiences	○	○	○	○	○	○	○
Individual and group practice exams	○	○	○	○	○	○	○
A good blend of required reading materials (i.e. textbooks, evidence reviews, and journal articles) within the educational curriculum	○	○	○	○	○	○	○
Intern demonstrates natural academic tendencies	○	○	○	○	○	○	○
Internal motivation of the intern to meet desired educational and professional goals	○	○	○	○	○	○	○
Resiliency in a difficult situation	○	○	○	○	○	○	○
Preceptors who develop performance expectations and hold intern accountable to meeting those expectations	○	○	○	○	○	○	○
Emotional intelligence to cultivate positive relationships	○	○	○	○	○	○	○
Didactic coursework and readings from textbooks as the foundation for supervised practice	○	○	○	○	○	○	○
To monitor quality, please respond with disagree (2) for this item	○	○	○	○	○	○	○
Personal interactions allowing the intern to demonstrate a mature character	○	○	○	○	○	○	○
Studying with flash cards	○	○	○	○	○	○	○
Positive relationships where the intern is able to connect with others	○	○	○	○	○	○	○

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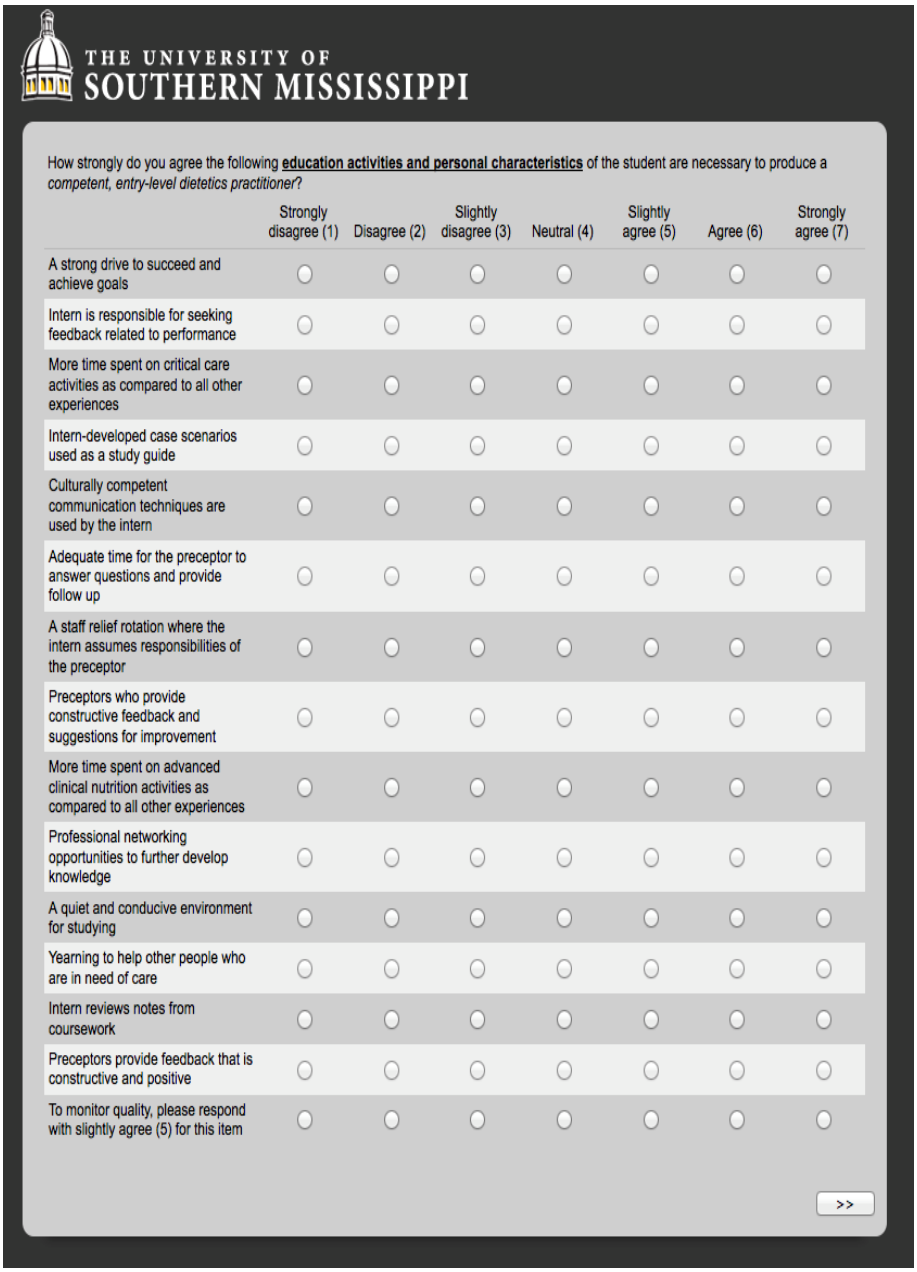

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How strongly do you agree the following **education activities and personal characteristics** of the student are necessary to produce a *competent, entry-level dietetics practitioner*?

	Strongly disagree (1)	Disagree (2)	Slightly disagree (3)	Neutral (4)	Slightly agree (5)	Agree (6)	Strongly agree (7)
A strong drive to succeed and achieve goals	○	○	○	○	○	○	○
Intern is responsible for seeking feedback related to performance	○	○	○	○	○	○	○
More time spent on critical care activities as compared to all other experiences	○	○	○	○	○	○	○
Intern-developed case scenarios used as a study guide	○	○	○	○	○	○	○
Culturally competent communication techniques are used by the intern	○	○	○	○	○	○	○
Adequate time for the preceptor to answer questions and provide follow up	○	○	○	○	○	○	○
A staff relief rotation where the intern assumes responsibilities of the preceptor	○	○	○	○	○	○	○
Preceptors who provide constructive feedback and suggestions for improvement	○	○	○	○	○	○	○
More time spent on advanced clinical nutrition activities as compared to all other experiences	○	○	○	○	○	○	○
Professional networking opportunities to further develop knowledge	○	○	○	○	○	○	○
A quiet and conducive environment for studying	○	○	○	○	○	○	○
Yearning to help other people who are in need of care	○	○	○	○	○	○	○
Intern reviews notes from coursework	○	○	○	○	○	○	○
Preceptors provide feedback that is constructive and positive	○	○	○	○	○	○	○
To monitor quality, please respond with slightly agree (5) for this item	○	○	○	○	○	○	○

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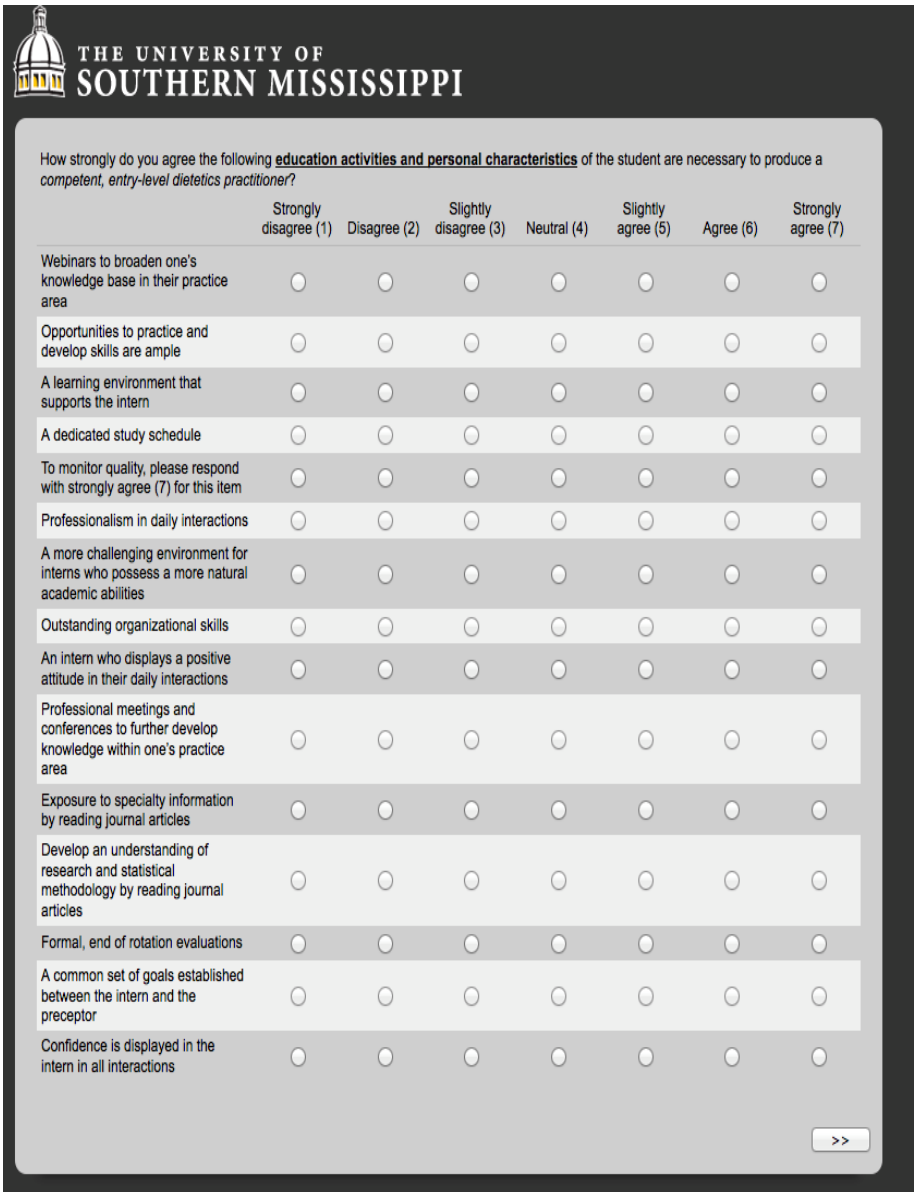

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How strongly do you agree the following **education activities and personal characteristics** of the student are necessary to produce a *competent, entry-level dietetics practitioner*?

	Strongly disagree (1)	Disagree (2)	Slightly disagree (3)	Neutral (4)	Slightly agree (5)	Agree (6)	Strongly agree (7)
Webinars to broaden one's knowledge base in their practice area	○	○	○	○	○	○	○
Opportunities to practice and develop skills are ample	○	○	○	○	○	○	○
A learning environment that supports the intern	○	○	○	○	○	○	○
A dedicated study schedule	○	○	○	○	○	○	○
To monitor quality, please respond with strongly agree (7) for this item	○	○	○	○	○	○	○
Professionalism in daily interactions	○	○	○	○	○	○	○
A more challenging environment for interns who possess a more natural academic abilities	○	○	○	○	○	○	○
Outstanding organizational skills	○	○	○	○	○	○	○
An intern who displays a positive attitude in their daily interactions	○	○	○	○	○	○	○
Professional meetings and conferences to further develop knowledge within one's practice area	○	○	○	○	○	○	○
Exposure to specialty information by reading journal articles	○	○	○	○	○	○	○
Develop an understanding of research and statistical methodology by reading journal articles	○	○	○	○	○	○	○
Formal, end of rotation evaluations	○	○	○	○	○	○	○
A common set of goals established between the intern and the preceptor	○	○	○	○	○	○	○
Confidence is displayed in the intern in all interactions	○	○	○	○	○	○	○

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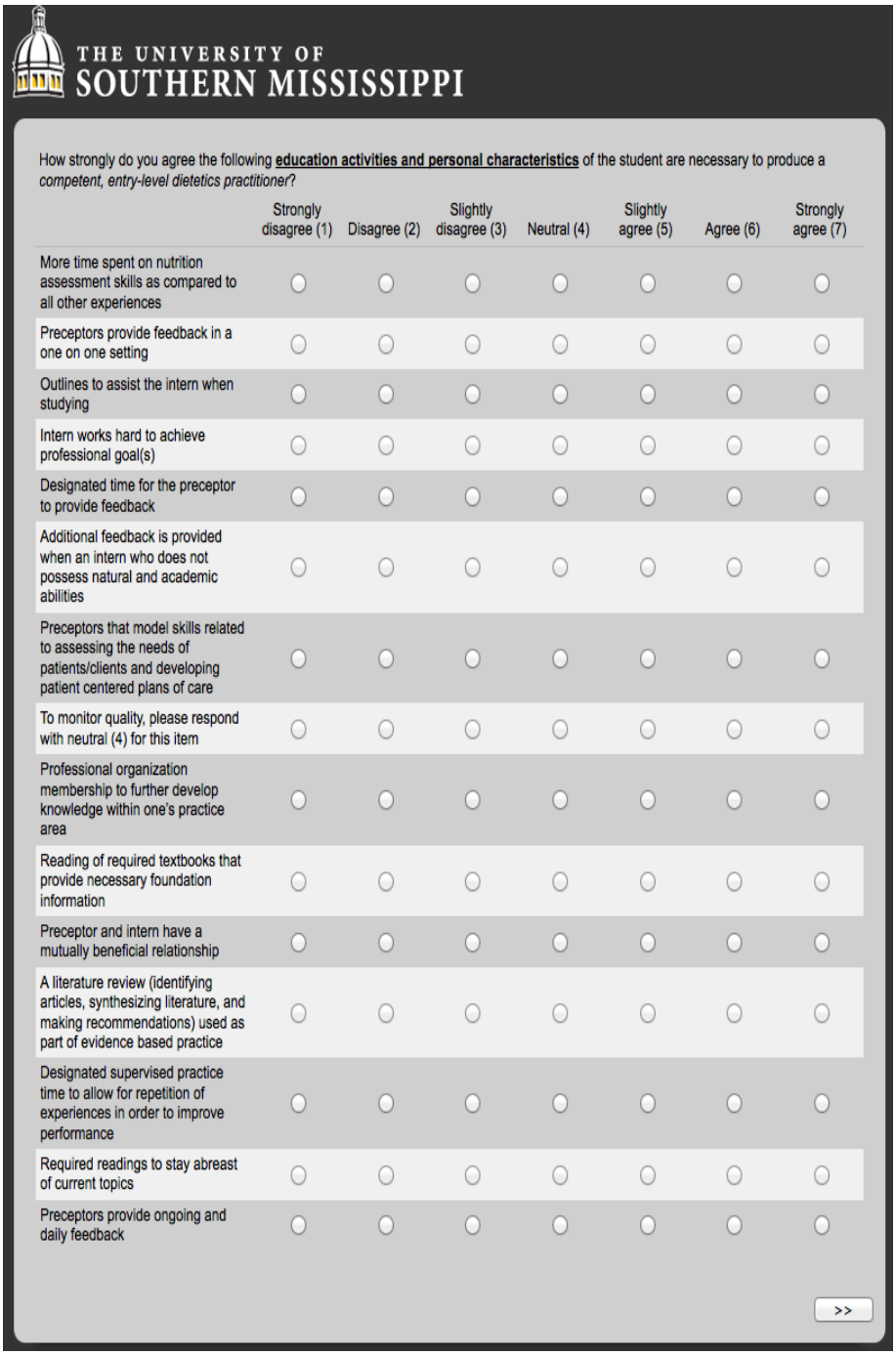

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How strongly do you agree the following **education activities and personal characteristics** of the student are necessary to produce a *competent, entry-level dietetics practitioner*?

	Strongly disagree (1)	Disagree (2)	Slightly disagree (3)	Neutral (4)	Slightly agree (5)	Agree (6)	Strongly agree (7)
More time spent on nutrition assessment skills as compared to all other experiences	○	○	○	○	○	○	○
Preceptors provide feedback in a one on one setting	○	○	○	○	○	○	○
Outlines to assist the intern when studying	○	○	○	○	○	○	○
Intern works hard to achieve professional goal(s)	○	○	○	○	○	○	○
Designated time for the preceptor to provide feedback	○	○	○	○	○	○	○
Additional feedback is provided when an intern who does not possess natural and academic abilities	○	○	○	○	○	○	○
Preceptors that model skills related to assessing the needs of patients/clients and developing patient centered plans of care	○	○	○	○	○	○	○
To monitor quality, please respond with neutral (4) for this item	○	○	○	○	○	○	○
Professional organization membership to further develop knowledge within one's practice area	○	○	○	○	○	○	○
Reading of required textbooks that provide necessary foundation information	○	○	○	○	○	○	○
Preceptor and intern have a mutually beneficial relationship	○	○	○	○	○	○	○
A literature review (identifying articles, synthesizing literature, and making recommendations) used as part of evidence based practice	○	○	○	○	○	○	○
Designated supervised practice time to allow for repetition of experiences in order to improve performance	○	○	○	○	○	○	○
Required readings to stay abreast of current topics	○	○	○	○	○	○	○
Preceptors provide ongoing and daily feedback	○	○	○	○	○	○	○

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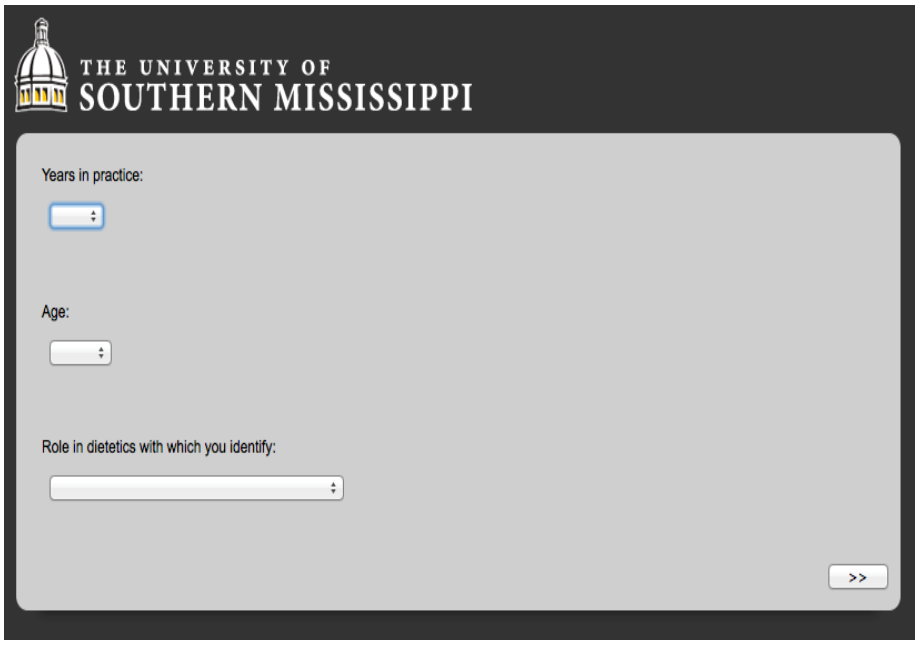
Gender:
Male
Female
Which of the following credentials do you hold? (select all that apply)
RD or RDN
DTR or NDTR
Other
>>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Years in practice:
Age:
Role in dietetics with which you identify:
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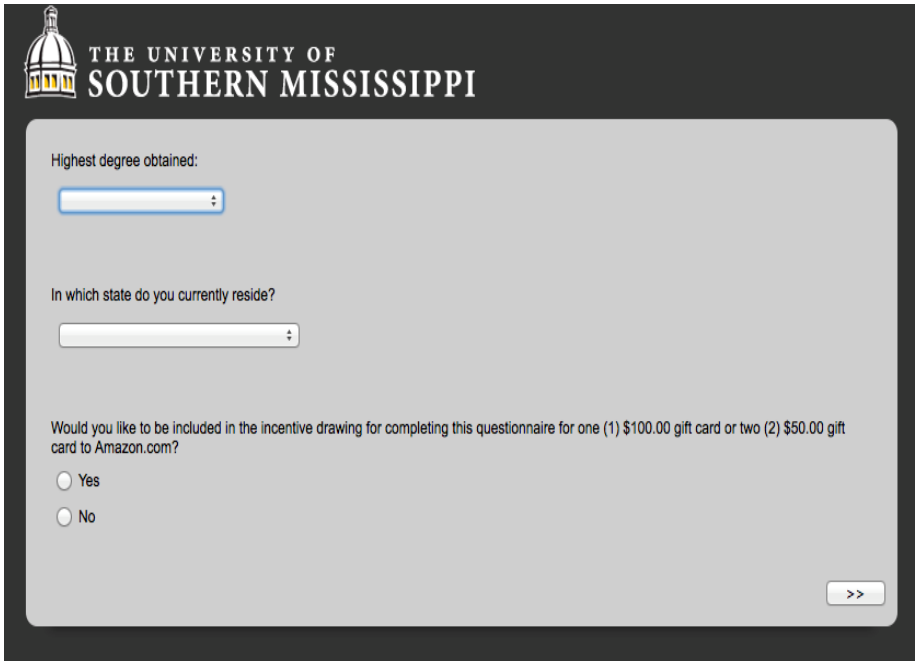
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Highest degree obtained:
In which state do you currently reside?
Would you like to be included in the incentive drawing for completing this questionnaire for one (1) $100.00 gift card or two (2) $50.00 gift card to Amazon.com?
Yes
No
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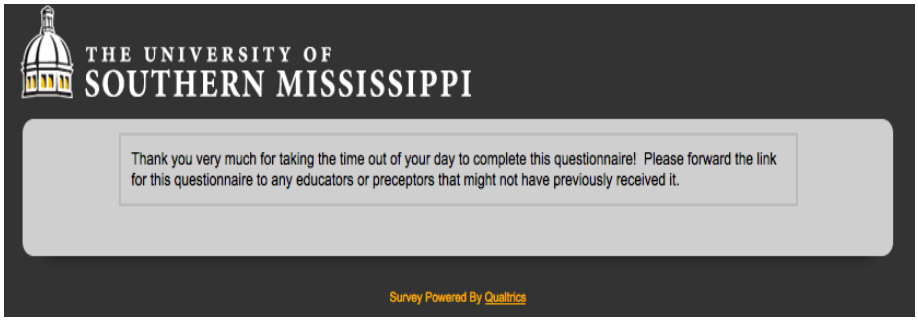
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Thank you very much for taking the time out of your day to complete this questionnaire! Please forward the link for this questionnaire to any educators or preceptors that might not have previously received it.
Survey Powered By Qualtrics

Table A1.

Crosswalk between themes and cards

Interview themes translated to items to use in the card sorting

Category reflective of the core constructs of deliberate practice	Themes from the interviews	Item written for the card sorting
Natural abilities	Confidence	Confidence is displayed in a student
	Hardworking	Student works hard to achieve goal(s)
	Maturity	Student demonstrates maturity
	Seeks feedback	Student seeks feedback from preceptor
	Academic performance	Student displays natural academic abilities
	Professional	Student demonstrates professionalism in practice
	Organized	Student is organized
	Positive attitude	A positive attitude is displayed in the student
	Ability to relate well to others	The student is able to connect with others to create a positive relationship
	Self-evaluate	Student is able to self-evaluate their performance during the learning process
	Emotional intelligence	Student displays emotional intelligence
	Goal driven	Student is driven to achieve their goal(s)
	Made as a suggestion during member checking	Student is resilient
	Push and/or have higher expectations	Preceptor has higher expectations for those student(s) who possess a more natural ability

	Provide a more challenging environment	Preceptor provides a more challenging environment for those student(s) who possess a more natural ability
	Repetition of experiences	A student who do not possess natural academic and practice abilities are allowed to repeat activities
	Additional feedback and remediation	A student who does not possess natural academic and practice abilities is provided additional feedback
Methods of coaching and precepting	Providing a formalized end of rotation evaluation	Preceptor provides a formal end of rotation evaluation
	Ongoing/daily feedback	Student needs ongoing feedback
	Need for feedback at various points within the experience (aside from daily)	Student needs period (weekly or biweekly) feedback
	Preceptors take the time for feedback	Preceptor has a designed time to provide feedback
	Need to provide feedback in a one on one environment	Preceptor provides feedback in a one on one setting
	Feedback must be constructive and positive	Feedback is constructive and positive
	Allow for repetition of experiences to improve performance	Supervised practice time allows time for repetition of experiences to improve performance
	Important to close the learning gap when there is a knowledge or skill deficit	Remediation is used to increase knowledge

	Not beneficial in closing the learning gap if the deficit is a result of a professional or behavior issue	Remediation is used to change behavior
Supervised practice activities that need more or less time	Advanced clinical nutrition, critical care, and nutrition support	Advanced clinical nutrition activities
	Advanced clinical nutrition, critical care, and nutrition support	Critical care activities
	Advanced clinical nutrition, critical care, and nutrition support	Nutrition support activities
	Focus on clinical nutrition	General clinical nutrition activities
	Develop nutrition assessment skills	Nutrition assessment skill activities
	Need for students to have a staff relief	Participate in staff relief activity
Methods to increase performance	Quiet and conducive environment	Student has a quiet and conductive environment to study
	Establish a dedicated study schedule	Student establishes a dedicated study schedule
	Quizzes/practice exams for individuals	Student utilizes practice exams
	Quizzes/practice exams for groups	In a group, students utilize practice exams
	Flashcards	Student utilizes flashcards
	Review notes from coursework	Student reviews notes from coursework
	Group study with appropriate group dynamics	Student participates fully in group activities
	Develop own case scenarios and review/recalculate the information	Student develops their own case scenarios as a study guide
	Create a study outline	Student utilizes an outline when studying

	Daily (on-going) reading	Student participates in daily or on-going reading of material related to food and nutrition
	Weekly reading	Student participates in weekly reading of material related to food and nutrition
	Bi-weekly to monthly reading	Student completes bi-weekly to monthly reading of food and nutrition related material
	Good blend of materials (textbook, evidence reviews, and journal articles)	A good blend of reading materials (textbooks, evidence reviews, and journal articles) are used in a dietetics education program
	Foundational reading provided by textbooks	Textbooks provide the necessary foundational information in a dietetics curriculum
	Summary evaluations provided by evidence reviews	Evidence reviews summarize the current body of knowledge on a specific topic within a dietetics curriculum
	Focused or specialty information provided by journal articles	Within the dietetics curriculum, journal articles provide students exposure to specialty information and assist in developing an understanding of research and statistical methodology
Characteristics of student-preceptor relationship	Goal setting and working towards a common goal	Sets common goals
	Need to provide ample opportunities	Provides ample opportunities to practice

	Adequate time and availability	Preceptor provides adequate time to their students for questions, follow up, and open communication
	Safe, challenging, and positive environment	The learning environment is safe, challenging, and positive
	Open lines of communication	Preceptor provides adequate time to their students for questions, follow up, and open communication
	Provide constructive feedback	Preceptor provides constructive feedback with suggestions for improvement
	Mutual respect	Preceptor and student have mutual respect for each other
	Importance of a good relationship	Symbiotic relationship between the student and preceptor
	Adequate experience in the profession	Experience in the profession is adequate to serve as a preceptor
	Encouraging and empowering	Encouraging and empowering
Activities that promote life-long learning	Join a DPG	Join a professional organization or specialized practice group to further develop knowledge
	Attend professional meetings and conferences	Attend professional meetings and conferences to further develop knowledge
	Webinars	Participate in webinars
	Involvement in a professional organization(s)	Join a professional organization or specialized practice group to further develop knowledge

	Networking	Network with others in the profession to further develop knowledge
	Reading to stay abreast of current topics	Read to stay abreast of current topics
	Volunteering	Volunteer within a professional organization
	Internal motivation for continued education	Internal motivation to learn is displayed within the student
	Yearning to help people	A student, who enters a healthcare profession, possesses the yearning to help other people
Educational practice activities	Didactic coursework to lay the foundation for supervised practice	Didactic coursework lays the foundation for supervised practice
	Delivering a presentation	Delivering a presentation aids to prepare a student for supervised practice
	Case studies (individual)	Case studies help to prepare an individual for supervised practice
	Case studies (group)	Group case studies aid in the preparation of a student for supervised practice
	Role playing to prepare for supervised practice	Role playing prepares an individual for supervised practice
	Food service management (individual)	Food service management projects prepare a student for supervised practice
	Food service management (group)	Group food service management projects prepare a student for supervised practice
	Assignments or projects across disciplines involving a group	Interdisciplinary projects prepare students for supervised practice

	Developing an educational session within a group	Group development and delivery of an education program prepares students for supervised practice
	Interactive group projects or discussions	To aid in preparing a student for supervised practice, group projects or discussions are interactive
	Conducting literature reviews	Conducting a literature review (identifying articles, synthesizing literature, and making recommendations) is an activity to having the student participate in evidence-based practice
	Utilizing the Evidence Analysis Library	Activities utilizing the Evidence Analysis Library are used to immerse students into evidence-based practice
	Participate in Journal Club	Participating in journal club helps a student develop skills in evidence-based practice
	Case studies to participate in evidence-based practice	Completing case studies is an activity to immerse a student into the literature
	Case studies to learn how to assess the specific needs of a patient or client	Case studies are activities to learn how to assess the specific needs of a patient or client and develop patient-centered plans of care
	Role playing to learn how to assess the specific needs of a patient or client	Utilizing role playing activities to develop skills to assess the specific needs of a patient or client and develop patient-centered plans of care

	Real life occurrences	To assess the specific needs of a patient or client and patient-centered plans of care, real life occurrences with a patient or client are beneficial
	Modeling of the preceptor	Preceptor models skills to assess the needs of patient/clients and to develop patient-centered plans of care
	Watching vignettes	Watching vignettes assist to develop skills to assess the needs of a patient or client
	Nutrition Care Process to develop plans of care	Activities utilizing the Nutrition Care Process are used to learn how to develop patient-centered plans of care
	Mock charting to develop plans of care	To learn how to develop patient-centered plans of care, mock charting activities are beneficial
Professional attributes	Develop expectations and hold accountable	Preceptor develops expectations and hold students accountable
	Modeling by preceptor and/or faculty	Preceptor models appropriate behavior
	Networking	Student participates in networking opportunities to foster professional connections
	Conferences	Students attend professional conferences to promote the development of professional connections
	Professional organizations	A student is a member of a professional organization to enhance the development of professional connections

	Self –reflection	Student self-reflects on performance
	Case studies, scenarios, and vignettes	Utilize case studies, scenarios, and vignettes to develop professional attributes
	Activities necessary to develop cultural competency	Student needs to be exposed to and/or immersed into another culture
	Class discussions to develop cultural competence	Discussions, within a class, bring awareness to differing cultures
	Development of communication skills to develop cultural competence	Student delivers patient information using culturally acceptable communication
	Didactic class assignments to develop cultural competence	Student is culturally competent in their personal communications
	Group discussions to develop to develop critical thinking	Group discussions develop critical thinking in students
	Case studies to develop critical thinking	Case studies develop critical thinking and decision-making in students
	Foodservice and/or clinical management assignments	Utilizing activities in foodservice and/or clinical management provide situations where alternative solutions to a problem can be evaluated

APPENDIX F – Initial Email Participation Request

Dear Educators and Preceptors of NDEP ~

Good day! My name is Kevin Haubrick and I am currently conducting research to complete my PhD at the University of Southern Mississippi. For the last segment of my research project, I am attempting to validate construct definitions of deliberate practice as they relate to supervised dietetics education. The instrument has been developed from semi-structured interviews and an extensive card sorting activity. I value your time in completing this process, which should take no longer than 10 - 15 minutes. Research attempting to define deliberate practice in supervised dietetics education has never been done before.

If you choose to participate, your name will go into a drawing to win either one (1) $100.00 gift card to Amazon.com or two (2) $50.00 gift card to Amazon.com.

If you wish to participate, please click on the link below which will take you to the informational and consent letter as well as the questionnaire.

https://usmuw.co1.qualtrics.com/SE/?SID=SV_cGB2uXCHaMSjAK9

Thank you in advance for your time. Happy Holidays to you and yours!!

Please feel free to forward this email to other actively involved educators and/or preceptors who may wish to participate and provide their perspective on this subject matter.

Sincerely,

Kevin

Kevin Haubrick MS, RD, LD, FAND
PhD Candidate
University of Southern Mississippi

APPENDIX G – Reminder Email Participation Request

Dear Educators and Preceptors of NDEP ~

Good day! My name is Kevin Haubrick and I am currently conducting research to complete my PhD at the University of Southern Mississippi. For the last segment of my research project, I am attempting to validate construct definitions of deliberate practice as they relate to supervised dietetics education. The instrument has been developed from semi-structured interviews and an extensive card sorting activity. I value your time in completing this process, which should take no longer than 10 - 15 minutes. Research attempting to define deliberate practice in supervised dietetics education has never been done before.

If you choose to participate, your name will go into a drawing to win either one (1) $100.00 gift card to Amazon.com or one of two (2) $50.00 gift cards to Amazon.com.

If you wish to participate, please click on the link below which will take you to the informational and consent letter as well as the short questionnaire.

https://usmuw.col.qualtrics.com/SE/?SID=SV_cGB2uXCHaMSjAK9

Thank you in advance for your time. Happy Holidays to you and yours!!

Please feel free to forward this email to other actively involved educators and/or preceptors who may wish to participate and provide their perspective on this subject matter.

Sincerely,

Kevin D. Haubrick MS, RD, LD, FAND
PhD Candidate
University of Southern Mississipp

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