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Investigating Need for Cognition and Reflective Thinking with Evidence-Based Practice Beliefs and Implementation Practices among Nurses

by

Jennifer Micham

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy in Foundations of Education: Educational Psychology

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An Abstract of

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Evidence-based practice (EBP) is the integration of the latest scientific evidence with clinician expertise while considering patient values and preferences. It is a complex, problem-solving approach proven to improve patient quality and outcomes. The importance of EBP in healthcare is expressed by the Institute of Medicine's goal of establishing that 90% of all clinical decisions be based on current scientific evidence. Despite this, there remains a research to clinical practice gap. Factors contributing to this gap need to be further explored.

This study examined cognitive factors related to evidence-based implementation practices. The goal was to investigate potential relationships between need for cognition, reflective thinking, and EBP beliefs with EBP implementation. Understanding metacognition as it relates to evidence-based implementation practices may offer insight into practice adoption as well as fill a gap in the literature. A 53-item survey was compiled using scales to measure need for cognition, reflective thinking, EBP beliefs and EBP implementation practices. The survey was disseminated electronically to approximately 5200 acute care registered nurses in a Midwestern healthcare organization. One hundred thirteen nurses initially responded with 75 nurses completing the survey in

its entirety. Descriptive statistics and Pearson bivariate correlation were used to analyze the data.

The results showed a weak, positive correlation between EBP beliefs and EBP implementation. There was no relationship found between need for cognition and reflective thinking with EBP implementation. Further studies are needed to identify cognitive factors that promote EBP implementation.

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List of Abbreviations

EBP……...Evidence-based practice

EBPB……Evidence-based Practice Beliefs

EBPI……..Evidence-based Practice Implementation

IRB……Institutional Review Board

NFC……...Need for Cognition

NCS……...Need for Cognition Scale

Chapter One

Introduction

Statement of the Problem

Healthcare practitioners have a responsibility to protect patients from harm while advocating for the best possible outcomes using the latest science (Gaudiano et al., 2010; Haddad & Geiger, 2020; McGowan et al., 2020). Evidence-based practice (EBP) is a powerful initiative that is driving healthcare policy, education, and practice today (McGowan et al., 2020; Stevens, 2013). EBP is the integration of the latest scientific evidence with the consideration of clinical expertise and patient preferences to support excellence in patient care. This is key to establishing high quality care, lowering healthcare costs and improving patient outcomes (Chien, 2019; Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk et al., 2018; Profetto-McGrath, 2005). Despite research increasingly suggesting EBP is vital to improving patient outcomes and diminishing the research to practice gap, the gap remains (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). It is important to understand why this gap continues.

Even though EBP is a common consideration in the nursing profession, its implementation remains a struggle (Kim et al., 2015; Melnyk, 2018; Nickerson & Thurkettle, 2013). The EBP process involves searching for evidence to a clinical issue and applying the synthesis of the findings to solve the problem (Canada, 2016; Kim et al.,

2015; Melnyk & Fineout-Overholt, 2019). Information searching and applying research evidence alone does not establish the complete picture of what is needed in order to make sound clinical decisions (Kosior et al., 2019; Rousseau & Gunia, 2016). It is the use of cognitive and metacognitive skills to manage the steps of the EBP process that is fundamental (Kosior et al., 2019; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). Cognitive and metacognitive skills help in identifying problems, formulating questions, identifying evidence, critically analyzing and synthesizing, and evaluating solutions to solve problems (Finn, 2011; Kosior et al., 2019; Parrott & Rubinstein, 2015; Profetto-McGrath, 2005). Research is limited in describing metacognitive skills that are needed when performing evidence analysis and integration of EBP (Parrott & Rubinstein, 2015; Sedig et al., 2015). Further exploration of nurses' metacognitive skills might provide some indications of challenges being faced with EBP implementation.

The application of the EBP process requires higher-order thinking skills (Kim et al., 2015; Lumpkin, 2020; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). Higher-order thinking skills exceed the cognitive basics of understanding facts and memorization to include advanced skills of analysis and synthesis (Canada, 2016; Lumpkin, 2020; Rousseau & Gunia, 2016). These skills are products of cognition and metacognition. Both cognition and metacognition work in tandem to produce strategies for effective problem solving in evidence analysis (Kosior et al., 2019; Parrott & Rubinstein, 2015). Cognition is a broad and complex umbrella term that incorporates the collection of mental processes of attention, memory, thinking, reasoning, problem-

solving and decision-making (Kosior et al., 2019; Kuiper & Pesut, 2004). Metacognition is the concept of having the ability to control, reflect and understand thoughts and assists in regulating cognition (Kosior et al., 2019; Parrott & Rubinstein, 2015; Saraff et al., 2020). To appreciate the role of cognitive and metacognitive skills in EBP, it is necessary to understand the steps of the EBP process.

Evidence-Based Practice Process in Nursing

The primary objective of the EBP process is to establish a method of searching for evidence to a clinical problem with the intention of solving the problem by applying the research findings (Kim et al., 2015; Melnyk & Fineout-Overholt, 2019; Profetto-McGrath, 2005; Rousseau & Gunia, 2016). The inclusion of EBP into nursing is important for nurses to make well-informed decisions about issues in clinical care (Canada, 2016; Kim et al., 2015; Melnyk & Fineout-Overholt, 2019; Profetto-McGrath, 2005; Sedig et al., 2015; Stevens, 2013). Kim et al. (2015) indicated that while research and EBP share some similarities, EBP is a broader concept because it is inclusive of both research and non-research sources of evidence (Kim et al., 2015). Because evidence is now accessible through multiple sources, it could be more challenging for practitioners to search for accurate information and interpret the findings (Speroni et al., 2020).

To help with evidence interpretation, EBP frameworks were developed to organize a person's thinking about the EBP process (Speroni et al., 2020; Stevens, 2013). These frameworks direct the focus and implementation of approaches intended to

strengthen a nurse's clinical decision making (Melnyk et al., 2004; Stevens, 2013). There are over 47 EBP frameworks available for use in any discipline (Stevens, 2013). A recent study revealed that the three most commonly used nursing EBP frameworks are the Iowa Model of Evidence-Based Practice, Johns Hopkins Nursing Evidence-Based Practice Model, and Advancing Research and Clinical Practice Through Close Collaboration Model (Speroni et al., 2020). All of the frameworks contain similar steps of questioning, searching, appraising, integrating and evaluating evidence, but the number of steps vary depending on the framework. It is recommended in all the frameworks that the process steps are followed consecutively for successful EBP implementation (Aveyard & Sharp, 2017; Beecroft et al., 2015; Canada, 2016; Melnyk & Fineout-Overholt, 2019; Stevens, 2013). A key difference of the EBP frameworks is the focus; meaning the approach is either designed for an individual practitioner or to incorporate EBP as an organizational strategy (Stevens, 2013; Wallen et al., 2010). This review is focusing on a frequently used organizational framework, the Advancing Research and Clinical Practice through Close Collaboration (ARCC). In addition, ARCC is the EBP framework being used within the healthcare organization that is a part of this study.

The ARCC model by Melnyk (1999) is a supporting EBP framework to develop EBP mentors and champions with the intent of establishing the EBP process as a system-wide initiative in healthcare organizations (Fineout-Overholt et al., 2005). Within its framework is the step by step EBP process. The framework has been revised over the

years and currently consists of a seven-step method to incorporate EBP as a process while engaging key individuals for successful implementation (Melnyk & Fineout-Overholt, 2019; Wallen et al., 2010). The EBP process steps include creating a culture of inquiry, questioning, evidence searching, critical appraisal, integration, evaluation and dissemination (Melnyk & Fineout-Overholt, 2019).

Before step one, there is a step zero. Step zero is the beginning step to cultivate a sense of inquiry among the staff and organization. This step is considered foundational to establish the success and sustainability of EBP within the organization (Melnyk & Fineout-Overholt, 2019). This is accomplished by encouraging collaboration among groups, encouraging the use of evidence and rewarding staff for using the EBP approach to care (Melnyk & Fineout-Overholt, 2019). A culture in which staff are encouraged and supported to query practices and make decisions strengthens the EBP process and encourages further development of the EBP culture (Melnyk, 2018; Melnyk & Fineout-Overholt, 2019; Wallen et al., 2010). The steps are sequential beginning with zero.

Step one in the EBP process within ARCC begins with formal questioning (Melnyk & Fineout-Overholt, 2019). Clinical questions are a day to day occurrence in healthcare practice. They are generated by the ever-changing clinical environment of individual patient needs, inexperience with incidents or just new clinical situations (Kim et al., 2015; Melnyk & Fineout-Overholt, 2019). To address clinical issues, staff need to formulate questions that are focused and answerable (Melnyk & Fineout-Overholt, 2019).

There are tools that are available to assist in formatting a question, including PICOT (Aveyard & Sharp, 2017; Beecroft et al., 2015; Melnyk & Fineout-Overholt, 2019). The PICOT tool is the most widely used in healthcare and encouraged in the ARCC framework, seven step EBP process (Beecroft et al., 2015; Melnyk & Fineout-Overholt, 2019). The mnemonic PICOT stands for Patient/Population; Intervention/Issue; Comparison/Context; and Outcome; Time. The intent of PICOT is to create a focused question that defines the clinical problem and provides search terms to use in the next step of the EBP process (Aveyard & Sharp, 2017; Beecroft et al., 2015; Melnyk & Fineout-Overholt, 2019). The next step in the EBP process is evidence searching.

The PICOT question leads into step two, evidence searching. The terms used to formulate the PICOT question are usually used as the search terms in examining the available scientific evidence (Melnyk & Fineout-Overholt, 2019). The topic or subject matter of the clinical question will also determine the evidence being sought (Melnyk & Fineout-Overholt, 2019). For example, if the PICOT question involves an intervention needed for wound care, then quantitative studies in the form of randomized control trials would be useful. If the clinical question is concerned with mindfulness exercises in palliative care, qualitative studies would be a benefit (Aveyard & Sharp, 2017; Beecroft et al., 2015; Melnyk & Fineout-Overholt, 2019).

Step three involves critically appraising the evidence. Critical appraisal identifies the evidence most reliable and valid to address the PICOT question (Melnyk & Fineout-

Overholt, 2019). Most scientific evidence falls within a ranking or hierarchical system. Most hierarchical systems provide a visual depiction of the types of research studies from least reliable at the base (expert opinion, anecdotal, editorial) to the most reliable at the apex (systematic review and meta-analysis)(Ingham-Broomfield, 2016; Melnyk & Fineout-Overholt, 2019; Sedig et al., 2015). It is this hierarchical structure that is said to determine an element of the quality of the evidence with the apex indicative of the highest quality (Ingham-Broomfield, 2016; Sedig et al., 2015). However, it is not without controversy by some in the research community. Sedig et al. (2015) stressed that some of the most life-saving treatments available today such as the Heimlich maneuver, external defibrillators and penicillin have never been validated by randomized controlled trials (Sedig et al., 2015). Randomized controlled trials are close to the apex of the hierarchical structure and are considered the gold standard of clinical evidence (Ingham-Broomfield, 2016; Sedig et al., 2015). Though penicillin, external defibrillators and the Heimlich are treatments that are highly regarded as best practice, they would not be supported as such on the evidence hierarchy (Sedig et al., 2015). Caution must be used when analyzing the evidence.

Step four in the EBP process is the integration. For Parrott & Rubinstein (2015), this is a key competence required in the EBP process (Parrott & Rubinstein, 2015). It is in this step that considerations of patient preferences or values and the clinician's expertise are taken into account as part of the compiled evidence (Melnyk & Fineout-Overholt, 2019). Integration is both the changes in knowledge and adoption of behaviors

to accommodate best practices in clinical care (Melnyk & Fineout-Overholt, 2019; Parrott & Rubinstein, 2015). Once the clinical question is answered based on the compiled evidence, it is then determined to either maintain current practice or make a practice change (Melnyk & Fineout-Overholt, 2019). Once the decision is implemented or the change made, evaluation takes place.

Evaluation is the step five in the EBP process. Whether a change is implemented, or current care standards are maintained, an evaluation should occur to verify if anticipated outcomes were met or if alternatives need to be considered (Melnyk & Fineout-Overholt, 2019). Evaluating the effectiveness of the evidence change is done through measuring outcomes or assessing new knowledge depending on what was implemented (Melnyk & Fineout-Overholt, 2019).

The final step, step six, is dissemination. Dissemination is the sharing of results with others, formally or informally. This can occur as presentations, publications or any procedure that shares the results of the EBP changes (Melnyk & Fineout-Overholt, 2019). It is considered an important step because it offers other clinicians insight into potential practice changes. It also builds on collaboration among various disciplines (Melnyk & Fineout-Overholt, 2019).

Identifying the steps in the EBP process illustrates the need for cognitive and metacognitive skills to translate scientific evidence into clinical practice (Kosior et al., 2019; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). It is

evident higher-order thinking skills such as analyzing and evaluating are required for successful application of the EBP process (Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015). To understand higher-order thinking skills and appreciate their development, a review of Bloom's taxonomy is discussed.

Bloom's Taxonomy and Thinking Skills

Bloom's taxonomy illustrates the complexity of skills needed for thinking processes (Lumpkin, 2020; Tee et al., 2010). The taxonomy is a structure to group and classify educational objectives and cognitive ability (Krathwohl, 2002). Bloom's taxonomy categorizes six types of thinking skills, from lower-order thinking skills to higher-order thinking skills (Krathwohl, 2002; Lumpkin, 2020; Tee et al., 2010). Lower-order thinking skills are the levels of knowledge, understanding and application, progressing to the higher-order thinking skills of analysis, synthesis and evaluation (Tee et al., 2010). Within each of the skill levels is key verbs or actions associated with that level (Krathwohl, 2002; Lumpkin, 2020). For example, the skill of remembering can involve the verbs/actions of recognizing, listing, describing, identifying, retrieving, naming, locating, finding (Krathwohl, 2002). The discussion of Bloom's taxonomy in this paper is to appreciate the complexity of thinking skills involved in higher-order or complex thinking like reflective thinking. Because there are numerous verbs and actions for each skill level, they have not been detailed in their entirety.

Anderson and Krathwohl (2002) revised the taxonomy to reflect how the categories intersect and reflect on different types of knowledge (Krathwohl, 2002). The revised Bloom's taxonomy identifies four types of knowledge: factual, conceptual, procedural and metacognitive. The knowledge dimension symbolizes the span of concrete (factual) to abstract (metacognitive) knowledge that develops as skills are acquired (Krathwohl, 2002; Lumpkin, 2020). Factual knowledge is as it states, knowledge of facts to problem solve or to understand. Conceptual knowledge refers to "interrelationships among the basic elements within a larger structure that enable them to function together" (Krathwohl, 2002, p. 5). Procedural knowledge is identifying how to perform and understanding how to use skills, algorithms, techniques, and methods (Krathwohl, 2002). Krathwohl (2002) shared that the addition of metacognitive knowledge was to address the awareness of cognition and a reflective knowledge about how to go about solving problems and cognitive tasks (Krathwohl, 2002). In both Bloom's taxonomy and Bloom's taxonomy (revised), the complexity of thinking skills increases as you increase on the hierarchy (Krathwohl, 2002; Lumpkin, 2020; Tee et al., 2010).

In reviewing Bloom's taxonomy revised version, the initial thinking skill level begins with remembering. While at the lowest level, it is considered a necessary step to begin improving upon thinking skills (Lumpkin, 2020). *Remembering*, is explained as recognizing or recalling knowledge from memory (Krathwohl, 2002; Lumpkin, 2020). It is the essential level needed to retrieve facts or recall knowledge by using skills of

recognizing, listing, describing, identifying, retrieving, and finding. *Understanding* is the second level which requires a comprehension of organizing information (Krathwohl, 2002; Lumpkin, 2020). In order for understanding to occur, it requires the use of a myriad of skills such as interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining (Krathwohl, 2002; Lumpkin, 2020). The third level, applying, establishes the ability to use what is learned. *Applying* refers to demonstrating acquired knowledge by incorporating it into presentations, written documents, simulations, interviews etc. Applying can be accomplished using verbs/actions of implementing, carrying out, using, and executing (Krathwohl, 2002; Lumpkin, 2020).

Analyzing, the fourth level, describes the dissection of concepts or parts to understand how they relate to each other. A few of the skills needed in the analyzing level include differentiating, comparing, organizing, and attributing and integrating (Krathwohl, 2002). Lumpkin (2020) described this level as the level needed to reach evidence-based conclusions, considering it one of the higher-order thinking skills (Lumpkin, 2020). The next level is evaluating. *Evaluating*, is formulating judgments based on standards through checking and critiquing (Krathwohl, 2002; Lumpkin, 2020). Verbs/actions skills associate with evaluating include checking, hypothesizing, critiquing, and monitoring. This level is considered necessary prior to creating as evaluating is usually done before creating can begin (Lumpkin, 2020). At the top of the taxonomy hierarchy is creating. *Creating*, involves the skills of putting together or reorganizing elements to form a whole. This is performed through the skills of generating, planning,

or producing. Creating requires consideration of pieces placed together in a new way, or synthesize pieces into something new, ultimately creating a different form (Krathwohl, 2002; Lumpkin, 2020). This level is considered the most mentally challenging by Krathwohl (2002).

Bloom's taxonomy is a continuum hierarchy categorizing six levels of thinking skills, from lower to higher-order thinking skills (Krathwohl, 2002; Lumpkin, 2020; Tee et al., 2010). There are clear parallels between Bloom's taxonomy's higher-order thinking skills levels and the EBP process steps of analyzing, synthesizing and integrating.

Rationale for Study

The EBP process of searching, analyzing, synthesizing and integrating evidence requires higher-order cognitive and metacognitive skills through critically and reflectively thinking, apparent by Bloom's taxonomy (Finn, 2011; Kosior et al., 2019; Kuiper & Pesut, 2004; Lumpkin, 2020; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). It is by applying these higher-order thinking skills to a problem that a nurse can effectively differentiate between acquired knowledge and gaps in knowledge. In addition, metacognitive thinking skills activate a regulatory tendency to ask internal questions guiding a person to search for new information (Coutinho, 2006; Finn, 2011; Kosior et al., 2019).

Higher-order thinking skills demonstrate a flexibility to use evidence to support ideas independently from cognitive biases with the aim of maximizing positive outcomes and minimizing errors when making decisions (Facione & Facione, 2008; Falco-Pegueroles et al., 2021; Gaudiano et al., 2011; West et al., 2008). The use of higher-order thinking skills in the EBP process benefits the goal of establishing nursing best practices and enhancing patient outcomes (Kosior et al., 2019). Using metacognitive skills in the EBP process, like regulating, analyzing and synthesizing assists healthcare professionals to identify gaps in their own knowledge, guide their searching efforts, interpret new evidence, and appropriately modify the solution to correspond to the situation (Belita et al., 2020; Canada, 2016; Kosior et al., 2019; Falco-Pegueroles et al., 2021; Finn, 2011; Saraff et al., 2020).

The EBP process may also benefit from those with critical thinking dispositions (Kim et al., 2015). Thinking dispositions are characterized by habits of mind or personal attributes associated with an internal motivation to engage in higher-order thinking, synonymous with complex thinking (Facione & Facione, 2008; Kim et al., 2015; Profetto-McGrath, 2005). Some of the critical thinking dispositions (CTD) important for the EBP process are inquisitiveness, truth seeking, open-mindedness and a desire for information (Canada, 2016; Finn, 2011; Kim et al., 2015). Complex thinkers use a combination of CTD and metacognitive strategies to operate the higher-order thinking skills of interpretation, analysis, evaluation, inference, explanation, and self-regulation, which are required to encourage individuals to effectively work through problems to

make good decisions (Canada, 2016; Dewey, 1910/1997; Facione & Facione, 2008; Falco-Pegueroles et al., 2020; Finn, 2011; Kim et al., 2015; Kosior et. Al., 2019; Saraff et al., 2020). Individuals who demonstrate strong dispositions towards reflective and critical thinking have been described as 'mindful' and 'metacognitive' (Facione & Facione, 2008). Nurses who have some of the characteristics of CTD are more likely to be determined to gather and use current evidence to further engage in EBP implementation (Kim et al., 2015).

Critical thinking dispositions are not the only factor that indicate an individual pursues the challenge of complex thinking. Those who enjoy complex or higher-order thinking are said to have a personality trait of need for cognition (NFC) (Cacioppo & Petty, 1982; Coutinho, 2006). NFC reflects an individual's desire to pursue complex thinking tasks (Coutinho, 2006). Curseu (2011) referred to NFC as a cognitive motivator (Curseu, 2011). Studies have revealed that individuals with higher NFC are more likely to actively spend time searching for information (Curseu, 2011; Grass et al., 2019; Rudolph et al., 2018), which is an essential activity when engaging in the EBP process (Parrott & Rubinstein, 2015). Those with a higher level of NFC enjoy complex cognitive effort, seeking out thinking challenges, while those with lower levels of NFC attempt to avoid situations that require complex thinking (Cacioppo & Petty, 1982; Curseu, 2011; Grass et al., 2019).

Complex thinking processes include reflective, along with critical thinking. Reflective thinking applies the metacognitive skills of awareness and regulation to self-

correct gaps and errors (Kosior et al., 2019; Parrott & Rubinstein, 2015). Reflective thinking is a way of metacognitive processing that relies on an analytical or logical approach to problem solving (Frederick, 2005; Soane et al., 2015). In considering that individuals who were higher in NFC tended to actively information seek (Curseu, 2011; Grass et al., 2019) and more likely to engage complex problem solving skills (Antonio, 2020; Maloney & Retanal, 2020; Rudolph et al., 2018), it makes it reasonable to consider NFC and reflective thinking in the EBP process.

Measuring reflective thinking can be achieved with Cognitive Reflection Test (CRT) (Frederick, 2005). The CRT is widely used to assess cognitive reflection (Frederick, 2005; Lins de Holanda Coelho et al., 2020; Toplak et al., 2014). The questions on the CRT bring to mind an intuitive but wrong answer that have to be ignored requiring reflective thought to answer correctly (Frederick, 2005). Because the EBP process is reliant on individuals seeking information, there is evidence that reflective thinkers have a strategy preference for searching and evaluating information (Soane et al., 2015). Therefore, the purpose of this study is to investigate how NFC and reflective thinking correlate with EBP beliefs and implementation practices. Understanding NFC and reflective thinking tendencies in regard to EBP beliefs among nurses could contribute to recognizing cognitive processes relevant to the successful EBP implementation process.

There is a significant amount of research linking critical thinking to the EBP process in nursing (Belita et al., 2020; Bovina et al., 2017; Canada, 2016; Chen et al.,

2020; Falco-Pegueroles et al., 2020; Finn, 2011; Futami et al., 2021; Profetto-McGrath et al., 2003; Profetto-McGrath, 2005; Rababa & Al-Rawashdeh, 2020; Rousseau & Gunia, 2016). There is also evidence supporting positive EBP beliefs benefitting EBP implementation practices (Abu-Baker et al., 2021; Easton et al., 2015; Gronvik et al., 2016; Melnyk et al., 2004). However, there is limited research on cognitive factors other than critical thinking affecting EBP implementation, warranting further research.

Purpose of Study

The purpose of this study is to investigate if NFC, reflective thinking and EBP beliefs have a relationship with nursing EBP implementation practices. Identifying cognitive factors that contribute to effective EBP implementation may diminish the research gap and offer insight into effective strategies for the EBP process (Gallagher-Ford et al., 2020; Kim et al., 2015; Melnyk, 2018). Melnyk (2018) and Canada (2016) identified that knowledge alone is insufficient for adopting EBP into clinical practice (Canada, 2016; Melnyk, 2018). There is evidence that factors like EBP beliefs and education may influence EBP adoption and implementation (Canada, 2016; Melnyk, 2018; Rousseau & Gunia, 2016). Formal education prepares healthcare professionals in becoming critical thinkers, possessing the needed skills of information seeking, analyzing, logical reasoning and transforming knowledge (Finn, 2011; Kosior et al., 2019). However, limiting attention to critical thinking without attention to reflective thinking in the EBP process may be creating inconsistencies in the process because it gives a single perspective on clinical problem-solving (Kuiper & Pesut, 2004).

Reflective thinking uses metacognitive skills of planning, monitoring and evaluating to oversee cognitive skills (Parrott & Rubinstein, 2015). These metacognitive skills play a vital role in the evidence analysis process of EBP (Parrott & Rubinstein, 2015). Metacognitive skills accomplish this by initially establishing knowledge awareness to identify gaps in knowledge, then by integrating knowledge to determine a plan to achieve a goal (Parrott & Rubinstein, 2015). It is both cognitive and metacognitive skills working together to acquire, retain and transfer the knowledge towards completing the goal (Ku & Ho, 2010; Parrott & Rubinstein, 2015). Therefore, engagement in the EBP process requires the use of both cognitive and metacognitive skills.

Significance of Study

Studies exploring cognitive contributors to EBP implementation practices are limited. Nurses come from a variety of backgrounds, educational levels and specialty experiences. These differences could influence a variation in higher-order thinking abilities and the capacity for EBP engagement (Melnyk, 2018; Kosior et al., 2019). A review of the literature reveals while critical thinking and EBP are a focus in nursing education and EBP is a goal for healthcare systems, EBP remains marginal in nurses' clinical practice and decision-making (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk et al., 2018; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). Therefore, additional studies are warranted and could contribute to understanding individual differences contributing to nursing EBP implementation practices. Moreover, there

remains a gap in the literature in understanding cognitive factors that contribute to nursing EBP implementation (Melnyk, 2018).

Hypothesis

A relationship is expected between high NFC, reflective thinking and high EBP beliefs to greater EBP implementation practices. That is, higher reflective thinking scores along with a high need for cognition scores and higher EBP beliefs are expected to be strong indicators of greater EBP implementation practices.

Research Question

The research question driving this study is aimed at investigating relationships between the NFC, reflective thinking and EBP beliefs with EBP implementation practices among a diverse group of nurses. The following research question will guide this study.

RQ #1: Is there a relationship between NFC, reflective thinking, EBP beliefs and EBP implementation among nurses?

Key Concepts Definitions

Metacognition – action of thinking about one's thinking, reasoning or decision-making using higher-order thinking skills

Cognition - broad and complex umbrella term that incorporates the collection of mental processes of attention, memory, thinking, reasoning, problem-solving and decision-making

Complex Thinking- thinking involving critical and reflective thinking. Also referred to as higher-order thinking

Reflective Thinking – taking rational, logical steps of defining and analyzing to solve problems while self-questioning and reflecting on processes to gain various perspectives

Intuitive Thinking - insight that arises without conscious reasoning

Critical Thinking - ability to transfer knowledge to other cognitive areas involving the acquisition and utilization of information, problem solving and decision-making

Need for Cognition (NFC) - personality trait supporting the desire to pursue complex thinking

Need for Cognition Scale (NCS) – scale intended to measure the desire to engage in and enjoy effortful cognitive tasks

Chapter Two

Literature Review

The purpose of this research is to examine cognitive factors that lead to understanding what contributes to successful EBP implementation. This literature review examines thinking processes and metacognition within the context of the EBP process in the nursing profession. This chapter provides a background of EBP and a review of studies that relate thinking processes associated with the EBP process in nursing. A background of EBP is provided.

Background of Evidence-Based Practice

Evidence-based practice (EBP) is defined as a disciplined, problem-solving approach in the delivery of healthcare by integrating the best scientific evidence with a clinician's expertise, and patient preferences to support excellence in care (Chien, 2019; Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk et al., 2018; Profetto-McGrath, 2005; Rousseau & Gunia, 2016). Historically, the timeline of EBP began with Florence Nightingale in the 1800s but began to receive recognition in physicians' practices in the 1970s. It was not until the 1990s that it started gaining momentum in the nursing profession (Mackey & Bassendowski, 2017; Rousseau & Gunia, 2016; Zimerman, 2013).

Florence Nightingale used evidence she established through experimentation and critical examination to make improvements in patient outcomes. By documenting recoveries in soldiers' conditions based upon different aspects of care she was providing,

her gathered evidence increased the likelihood of soldiers' survival (Mackey and Bassendowski, 2017). She has been described as "the pioneer of evidence-based practice within the discipline of nursing" (Mackey and Bassendowski, 2017, p. 52). She is also credited with utilizing statistics to understand and predict patient morbidity and mortality. While considered a nursing EBP pioneer, it has still taken decades for nursing to begin integrating EBP into clinical practice (Mackey & Bassendowski, 2017).

Generally, literature suggests the initiation of EBP began with evidence-based medicine movement in the 1970s (Mackey & Bassendowski, 2017). Evidence-based medicine began getting attention with Dr. Archie Cochrane, who emphasized the role of research, specifically randomized controlled studies, to provide scientific evidence on which to base healthcare decisions (Canada, 2016; Mackey & Bassendowski, 2017; Zimerman, 2013). Cochrane believed that randomized controlled trials were the most reliable form of scientific evidence and provided a foundation in which to base healthcare decision-making. He considered scientific evidence to aid their clinical decision-making gave clinicians a standard approach for consistency in clinical care (Canada, 2016; Mackey & Bassendowski, 2017; Zimerman, 2013). Even though using scientific evidence to influence clinical decision-making was embraced by some, others criticized the reliance on science without consideration of clinical expertise (Sackett et al., 1996; Zimerman, 2013). The growth of EBP slowly gained traction in medicine into the 1980's with the intent to foster a more systematic use of scientific evidence in clinical practice and physician education (Rousseau & Gunia, 2016; Zimerman, 2013). This growth was

the result of an awareness that physicians were making clinical decisions based on their personal experiences and prioritizing traditional practices which was creating variations in clinical care. These variations in clinical care were raising concerns with the quality of patient treatment (Sackett et al., 1996; Zimerman, 2013). Sackett et al. (1996) stated that evidence-based care "requires a bottom up approach that integrates the best external evidence with individual clinical expertise and patients' choice. It cannot result in a cookbook style approach to individual patient care" (Sackett et al., 1996, p. 72).

Evidence-based medicine was the official term used to define a physician's clinical decision-making from unsystematic, clinical experiences to scientific, clinically relevant research (Sackett et al., 1996; Zimerman, 2013). Later in 1990s, the process of evidence-based medicine was clarified in that evidence-based clinical decision-making was more about using a combination of research evidence, clinical expertise, and considerations of patient's preferences together versus just the use of scientific evidence to make clinical decisions, eventually becoming a general definition of EBP in medicine (Mackey & Bassendowski, 2017; Sackett et al., 1996; Zimerman, 2013). Regardless of the profession, the general definition of EBP remains utilizing "best research with clinical expertise and patient values for optimum care" (Institute of Medicine, pg. 45, 2003). This continues to be a focus when using current evidence in healthcare decision-making today (Mackey & Bassendowski, 2017).

Evidence-based practice is a priority in many healthcare institutions and among various professional disciplines (Melnyk et al., 2010; Parrott & Rubinstein, 2015; Ramis

et al., 2019; Rousseau & Gunia, 2016). Decades have past and there remains a struggle to implement EBP into healthcare. Despite EBP recommendations and endorsements from various professional organizations like the Institute of Medicine, The Joint Commission, the American Nurses Association, and the National League for Nursing, there is still confusion and hesitation surrounding implementation of EBP into clinical care (Canada, 2016; Melnyk et al., 2018; Stokke et al., 2014). The Institute of Medicine requested 90% of healthcare clinical decisions be supported by current evidence by 2020, yet this is occurring less than 25% of the time (Gallagher-Ford et al., 2020). Despite the fact that research increasingly suggests that EBP is essential to improving patient outcomes and diminishing the research to practice gap, the gap remains (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). Research needs to continue to investigate the causes of the continued EBP gap.

The use of EBP continues to be a discussion in trying to determine which factors influence its implementation (Melnyk et al, 2004). It is difficult to isolate specific reasons for the inconsistencies in the use of EBP among nurses (Kim et al., 2015). While several studies reveal strengths to EBP implementation like transformational leadership, willingness to engage in EBP, mentors that support EBP beliefs, and a positive organizational environment (Melnyk et al., 2010; Melnyk et al., 2014; Warren et al., 2016), there are challenges. Some challenges to EBP implementation suggested in the literature include lack of organizational support and resources (Foxcroft & Cole, 2003; Kim et al., 2015; Melnyk et al., 2010; Stokke et al., 2014), inconsistent leadership

support (Friesen et al., 2017; Foxcroft & Cole, 2003; Stokke et al., 2014) and individual doubts with EBP abilities and beliefs (Melnyk et al., 2004; Rousseau & Gunia, 2016; Sedig et al., 2015; Stokke et al., 2014). One of the ongoing challenges is to identify specific individual factors that affect EBP adoption (Friesen et al., 2017; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016; Sedig et al., 2015). While it is known that critical thinking is needed to process scientific evidence, what is not apparent is thinking processes that are needed to integrate evidence into clinical practice (Parrott & Rubinstein, 2015). Therefore, thinking processes relevant to evidence analysis are reviewed.

Cognitive and Metacognitive Skills and Evidence-Based Practice

The EBP process includes the steps of questioning, searching, appraising and synthesizing, integrating and evaluating to combine scientific evidence and professional experiences (Melnyk et al., 2014; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). While all the steps are essential, a significant aspect of the EBP process is the analysis and integration of scientific evidence, requiring higher-order thinking skills (Ku & Ho, 2010; Parrott & Rubinstein, 2015). Parrott & Rubinstein (2015), believe the key competence required in the EBP process is integration (Parrott & Rubinstein, 2015). They referred to integration as integrating the cognitive and metacognitive skills of questioning, identifying, analyzing, synthesizing and evaluating in applying the EBP process (Parrott & Rubinstein, 2015). Integrating these skills is achieved through the act of reflective and critical thinking (Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016).

Effective reflective and critical thinking requires using higher-order cognitive and metacognitive skills (Cameron & Jago, 2013; Chauhan & Singh, 2014; Kosior et al., 2019; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016).

Cognitive and metacognitive skills are used in reflective and critical thinking to solve clinical problems, including in the analysis, synthesis and integration of scientific evidence (Kosior et al., 2019; Kuiper & Pesut, 2004; Ku & Ho, 2010; Parrott & Rubinstein, 2004). Cameron & Jago (2013) describe cognitive skills as skills used to regulate information and thinking processes in order to complete a task or solve a problem (Cameron & Jago, 2013). Cognition in general, is the umbrella term used to describe mental processes of attention, memory, thinking, reasoning, problem-solving and decision-making (Cameron & Jago, 2013; Kuiper & Pesut, 2004). Those cognitive skills include the lower-order thinking skills of remembering, understanding and applying from Bloom's taxonomy (Lumpkin, 2020; Tee et al., 2010). But cognitive skills alone are not enough in processing scientific evidence. Metacognitive skills are needed, specifically to regulate cognitive skills towards the goal of integrating the evidence (Parrott & Rubinstein, 2015). Those higher-order thinking skills include analyzing, evaluating and creating (Lumpkin, 2020; Tee et al., 2010).

The metacognitive skills in reflective thinking also include metacognitive awareness of knowledge and regulation (Kosior et al., 2019). Metacognition is described as a concept of awareness of our knowledge about our cognitive processes and how to optimally use thinking strategies to achieve a goal (Abdolhosseini et al., 2011; Flavell,

1979; Ku & Ho, 2010). Cognition and metacognition differ in that cognitive skills are those required to perform a task while metacognitive skills help to understand the performance itself (Flavell, 1979). Flavell (1979) distinguished the two concepts with the following example: awareness of lack of knowledge from a required reading assignment would be considered metacognitive skill while reading the chapter to acquire the missing information would be the cognitive skill (Flavell, 1979).

Bloom's taxonomy provides a range of associated thinking skills as complexity increases into higher-order thinking, strengthening critical and reflective thinking (Facione & Facione, 2008; Krathwohl, 2002; Lumpkin, 2020). It is those higher-order skills of analyzing and evaluating that are used during reflective and critical thinking that benefit the EBP process steps of critical appraisal, integration, and evaluation (Melnyk & Fineout-Overholt, 2019; Parrott & Rubinstein, 2015). For this study, Bloom's taxonomy presents an overview of the cognitive and metacognitive skills used during reflective and critical thinking as presented in Chapter One.

Reflective and Critical Thinking

There are different thinking processes that occur to make decisions and solve problems in healthcare (Facione & Facione, 2008; Kosior et al., 2019). Those frequently discussed in the literature include critical, reflective, analytical and intuitive thinking.

Reflective and critical thinking are considered interconnected, so it is difficult to address one without discussing the other (Dewey, 1910/1997; Kosior et al., 2019; Ku & Ho, 2010). John Dewey (1910/1997) considered critical thinking a type of reflective

thought (Dewey, 1910/1997). While they have some similarities, they are two separate concepts. Critical thinking is conceptualized as a cognitive skill set that people can learn and apply in their professional or daily lives (Finn, 2011; Facione & Facione, 2008). In reference to Bloom's taxonomy, critical thinking skills begin at the lower portion of the hierarchy then progress to the top with inclusion of metacognitive skills, becoming integrated at the analyzing level (Krathwohl, 2002).

The American Philosophical Association convened an international panel of critical thinking experts to agree on a comprehensive definition of critical thinking, which led to the definition as:

> " a purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. " (Facione, pg. 3, 1990/1998).

Critical thinking is recognized as an outcome of education, being positively related to academic performance and appears to increase among educated individuals as they age, making it an important investment for personal and professional lives (Facione & Facione, 2008; Rousseau & Gunia, 2016). But critical thinking is not the only thinking process that has a relationship to academic success. Ghanizadeh (2017) confirmed that reflective thinking also makes a contribution to academic success. She conducted a survey study among 196 Iranian university students using three questionnaires, the

Reflective Thinking Questionnaire, Watson–Glaser Critical Thinking Appraisal and a self-regulation trait questionnaire (Ghanizadeh, 2017). She found reflective and critical thinking with self-monitoring resulted in positive academic achievement, with reflective thinking having the highest influence on academics. It was also revealed that reflective thinking and self-monitoring had significant impacts on critical thinking (Ghanizadeh, 2017). Her results support what others have speculated on the interconnectedness of reflective and critical thinking (Dewey, 1910/1997; Kosior et al., 2019; Ku & Ho, 2010). She defined self-monitoring as the extent one needs to self-check mechanisms to monitor goal achievement (Ghanizadeh, 2017). However, even though reflective thinking and self-check (regulating) are considered metacognitive skills, metacognition is not mentioned throughout her study.

In nursing, critical thinking skills are a prime focus in formal nursing educational programs with the goal of fostering effective clinical reasoning (Kuiper & Pesut, 2004; Mackey & Bassendowski, 2017; Profetto-McGrath, 2003). However, attention to just critical thinking without attention to reflective thinking undermines the complexity in applying thinking skills to clinical situations (Kuiper & Pesut, 2004). Together, critical and reflective thinking help to explain the dynamics of problem-solving and clinical reasoning in nursing (Kuiper & Pesut, 2004).

Critical and reflective thinking are key skill sets that characterize professional development (Kuiper & Pesut, 2004). A benefit of critical thinking skills is the ability to evaluate evidence separately from one's own prior beliefs and opinions (West et al.,

2008). In its application to EBP, critical thinking skills aid the EBP process by generating focused clinical questions and adapting relevant evidence to practice (Profetto-McGrath, 2005; Rousseau & Gunia, 2016).

In a similar approach, reflective thinking is taking rational, logical steps of defining and analyzing to solve problems but also involves self-questioning and reflecting on processes to gain various perspectives (Akturk & Sahin, 2011; Rousseau & Gunia, 2016). Analyzing, evaluating and creating are the metacognitive skills used in reflective thinking and listed towards the top of Bloom's taxonomy hierarchy indicating their level of advancing development (Krathwohl, 2002). While reflective and critical thinking have similarities in skills, reflective thinking involves a deeper analysis and formulation of judgements based on active, careful consideration (Antonio, 2020; Dewey, 1910/1997).

Reflective thinking is defined differently from critical thinking. John Dewey (1910/1997) is credited with defining reflective thinking as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p.6).

Reflective thinking relies on an analytical approach to problem-solving (Soane et al., 2015). The skills involved in reflective thinking can facilitate comprehension, support conceptual change, and promote critical evaluation and knowledge transfer (Antonio, 2020). These are essential skills for the EBP process.

John Dewey (1910/1997) distinguished the concept of reflective thinking. He considered reflective thinking the result of a state of doubt, uncertainty, or difficulty someone experiences in a situation, leading to a determination to resolve it (Dewey, 1910/1997). Dewey believed reflective thinking to be a complex, interactive process that involved connecting relationships with experiences, ideas and the environment to foster a deeper understanding, and therefore, learning (Dewey, 1910/1997; Rodgers, 2002). Dewey describes reflective thought to be a thought that "comes after something and out of something, and for the sake of something…thinking of every day practical life and of science is of this reflective type " (Dewey, 1910/1997, p. 6). He suggests that individuals are aware of and have control over gaining knowledge by participating in reflective thinking (Dewey, 1910/1997). Dewey (1910/1997) points out an important element is that reflective thinking involves the use of evidence to question knowledge and beliefs to actively pursue a conclusion (Dewey, 1910/1997; Rodgers, 2002). This element of using scientific evidence to question knowledge is at the core of the EBP step of questioning, thus indicating that reflective thinking could play an important role in the EBP process.

Dewey (1910/1997) also believed that reflective thinking demands attitudes that appeal to personal and intellectual growth; those of open-mindedness, whole-heartedness, and responsibility. These essential attitudes guide reflective thinking to be free from bias, open to various perspectives and considerate of the consequences (Dewey, 1910/1997; Ghanizadeh, 2017). Being open and free from bias is also essential in critical

thinking, demonstrating their similarities (Facione et al., 1995; Facione, 2011; Rousseau & Gunia, 2016).

Another interpretation of reflective thinking is given by Schon (1987). Schon described a reflective 'practicum' which is intended to assist learners to obtain competence in unfamiliar areas of practice (Schon, 1987). His belief is that professional development and learning is acquired through experiences and hands on application by either reflection-in-action or reflection-on-action (Schon, 1987). Reflection-in-action occurs when a person thinks about what they know and what they are doing and makes a decision on the next best step (Schon, 1987). In practice, this could be referred to as 'thinking on your feet' (Schon, 1987). Reflection-on-action would be consider after thoughts, considering alternatives to issues or problems after they occurred with the intent of potentially better outcomes. These types of reflective thinking provide an opportunity to consider changes, expand knowledge, or consider additional viewpoints (Schon, 1987).

Challenges that develop during times of uncertainty help to explain Mezirow's (2000) explanation of reflective thinking. He described reflective thinking as exploring a problem to get a better understanding (Mezirow, 2000). He explained it as the alteration of perspective that changes how a person learns and relates to the situation (Mezirow, 2000). An example often provided in EBP literature is situations in which staff perform tasks because it is how it is always done (Gallagher-Ford et al., 2020; Melnyk, 2018). For reflective thinkers, this would be an opportunity of questioning standard or habitual

practice, leading them to review anything new in the scientific evidence and to consider updating or changing practice (Kuiper & Pesut, 2004).

All these philosophers believed in the importance of reflective thinking even though their definitions slightly differed. The main similarity is that reflective thinking is a thoughtful cognition that takes time to reflect on knowledge and experiences with the goal of acquiring knowledge or changing behavior (Dewey, 1910/1997; Schon, 1987; Mezirow, 2000).

Reflective thinking is a process of metacognition. Kosior et al. (2019) believe health professionals who can successfully apply skills of metacognition have an increase in organized thoughts leading to effective problem-solving and clinical practice (Kosior et al., 2019). Reflective thinking is dependent on acquiring both cognitive and metacognitive skills illustrated on Bloom's taxonomy (Kuiper & Pesut, 2004; Lumpkins, 2020). Complex thinkers need to possess the reflective and critical skills of knowledge awareness, analyzing, understanding, applying, analyzing, evaluating and creating to competently applying the EBP process (Kuiper & Pesut, 2004, Parrott & Rubinstein, 2015).

Studies examining the ability of nurses to reflective thinking in clinical practice are limited. Of the few, both have a qualitative approach with one including a quantitative aspect. One by Teekman (2000) focused on reflective thinking in clinical nurses. Teekman (2000) explored reflective thinking among clinical nurses with the aim of uncovering whether nurses engaged in reflective thinking. She used the Sense-Making

approach to interview the nurses after they presented an unexpected clinical situation (Teekman, 2000). The Sense-Making method focuses on understanding the ongoing mental process in situations where people reached out for more information, used the information they obtained as a potential source and judged if it helped or did not help in the situation (Teekman, 2000). The Sense-Making method is not a dedicated reflective thinking measurement tool. It is a tool most often used in social work to identify or 'make sense' of a situation and the response by reflecting back and reviewing (Teekman, 2000).

Teekman's (2000) study sample consisted of 10 nurses who were interviewed in relation to 10 non-routine nursing situations. Non-routine situations were considered an encounter that the nurse did not routinely anticipate, i.e., sudden cardiac arrest or difficult encounters. The nurses were asked to recall the clinical situations they had experienced (Teekman, 2000). Their recalled situations were a sudden cardiopulmonary resuscitation on a patient, dealing with upset family, families with unfamiliar cultural needs, or dealing with a patient with mental health crisis. Based on the results of the interviews, Teekman (2000) revealed that reflective thinking was used to self-question but not for critical inquiry. These participants used reflective thinking primarily to create meaning to plan their nursing actions. Self-questioning itself, was identified as a significant activity within the reflective thinking process among this group (Teekman, 2000). The researcher concluded that reflective thinking was generated when these nurses experienced moments of doubt or confusion (Teekman, 2000). A limitation to this study is the lack of clarity

with reflective thinking ability of the participants. It raises questions on whether it was just assumed the participants instinctively knew how to reflectively think or did the researcher guide the reflective thinking process.

Asselin & Fain (2013) wanted to understand if clinical nurses who attended a reflective practice continuing education series would show improvements in their self-reflection, insight, and reflective thinking about clinical practice situations (Asselin & Fain, 2013). In a mixed method pilot study, 20 clinical nurses with more than one year nursing experience participated from two, small hospitals. The quantitative portion of the study included data collected using the Self-Reflection and Insight Scale (SRIS), which was administered before, after and six weeks after the program (Asselin & Fain, 2013). Qualitative data consisted of each participants sharing three reflective stories and a 6-week post program audiotaped in-depth interview. Results indicated self-reflection scores improved immediately post program (Time 2; $M = 30.84$; $SD = 3.99$) compared to pre-program (Time 1; $M = 27.32$; $SD = 6.01$) with the effect remaining into six weeks after the program (Asselin & Fain, 2013). While results indicated a significant change in engaging in self-reflection, there was no significant change in the participant's need to reflect and nor their insight (Asselin & Fain, 2013). Researchers suggested that using a structured reflection course increased the nurses' engagement in self-reflection and improved reflective thinking in practice. However, reflective thinking in practice was limited to the application in the participant's stories they provided. Asselin & Fain (2013) advocated that including a reflective practice education would benefit beginning

nurse orientation and preceptor training, while stressing more research is needed (Asselin & Fain, 2013).

Overall, it is known that reflective and critical thinking are used to solve clinical problems, including in the analysis, synthesis and integration of scientific evidence (Kosior et al., 2019; Kuiper & Pesut, 2004; Ku & Ho, 2010; Parrott & Rubinstein, 2004). Reflective thinking is the ability to explore the problem while being aware of personal knowledge gaps, a metacognitive skill, thus developing various perspectives based on acquiring new information (Ghanizadeh, 2017; Thompson et al., 2008). Critical thinking differs in that it is a process of applying knowledge to the problem-solving approach, a cognitive skill, to achieve an outcome (Finn, 2011; Rousseau & Gunia, 2016). It is evident there is a lack of literature focused on reflective thinking processes and clinical nursing. These studies reviewed provide a limited view of the potential under-development of reflective thinking skills among nurses. Being able to think competently, reflectively and critically is needed for successful analysis of evidence and in the process of EBP (Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016).

Intuitive and Analytical Thinking

It is also speculated in the literature that healthcare professionals use two modes of thinking processes to interpret information and problem solve (Clack, 2009; Gaudiano et al., 2011; Soane et al., 2015). When encountering a problem, the brain initially attempts to distinguish a previously encountered pattern (Richards et al., 2020). This is an extremely fast, usually unconscious process. Known as intuitive thinking, it is often

used to recognize family and friends, or managing clinical tasks that are redundantly familiar (Richards et al., 2020). Individuals who use intuitive thinking rely on instinctive experiences in judgement. The opposite mode is the analytical thinkers. Analytical thinkers tend to critically review their initial responses before deciding on a solution (Gaudiano et al., 2011; Richards et al., 2020). Analytical thinkers tend to use reflective thinking processes to approach a problem, reflect on acquired knowledge and pursue further evidence towards a logical conclusion (Gaudiano et al., 2011; Parrott & Rubinstein, 2015; Richards et al., 2020).

A number of scientists have considered human thinking as a dual process that takes place dependent upon an individual's mental effort. There have been many terms reinforcing this overall dual processing of cognition theory (Evans, 2008; Kahneman, 2011; Stanovich & West, 2000). Stanovich and West (2000) offered the distinctive terms of System 1 and System 2, Kahneman and Frederick (2002) with intuitive and reflective, while Evans (2008) used the terms Type 1 and Type 2 to support a dual processing theory (Evans, 2008; Stanovich & West, 2000). Evans (2008) further specified that Type1/Type 2 does not infer two separate systems but an intermingling of processes that maintain distinct characteristics (Evans, 2008). There have been attempts to connect the variations of the theories into one broad, dual process theory linking the dual attributes into intuitive and reflective processing (Evans & Stanovich, 2013). The consistent characteristics of dual processing relate that one process is quick and automatic, relying on a 'gut' feeling or intuitiveness; the other slower, effortful, and reflective, demonstrating a consciously

controlled thought process (Evans, 2008; Frederick, 2005; Kahneman, 2011). Regardless, scientists appear to agree with most of the characteristics of dual processes of thought (Evans, 2008; Evans & Stanovich, 2013; Kahneman, 2011).

A consideration is that dual processing effects information searching behaviors. Soane et al. (2015) conducted research to determine if intuitive or analytical thinking played a role in information searching among adults. Soane et al. (2015) surveyed 2069 adults, examining their information retrieval behaviors, to determine the extent of their motivation to seek further information and whether it correlated to intuitive or analytical thinking processes (Soane et al., 2015). The participants completed an online survey that asked questions about knowledge and behaviors regarding Salmonella bacteria food poisoning. Participants were presented with a scenario about chocolate mousse made with raw eggs but were given limited information. Participants were then questioned about food poisoning potential (Soane et al., 2015). Based on the responses, the researchers observed a direct effect of analytical thinking on the increased frequency of information searching behaviors while finding that intuitive thinking and heuristic preferences were associated with lower information searching behaviors (Soane et al., 2015).

Gaudiano et al. (2011) found some healthcare psychotherapists rely on intuitive thinking based on their clinical experiences rather than on evidence collected from research (Gaudiano et al., 2011). Out of 143 psychotherapists who participated in the survey, those who demonstrated an increase in negative attitudes towards research were

less likely to consider research-supported treatments. In addition, researchers discovered those who relied more on intuitive thinking had an increase in positive attitudes towards false therapy beliefs, supported false health beliefs and were more likely to recommend alternative therapies (Gaudiano et al., 2011). Gaudiano et al. (2011) findings are relevant because EBP supports strong evidence that is proven based on science and not deceptive therapies or health beliefs, suggesting reflective thinking could mitigate deceptive health beliefs.

It is also suggested that practitioners who rely on intuitive thinking may make more clinical errors. A case review among pediatric nurses found nurses used a combination of intuitive and analytical thinking tendencies when making decisions concerning a child's care (Clack, 2009). During an asthmatic child simulation, pediatric nurses more often relied on quick, intuitive thinking to formulate judgements instead of a logical analysis of the situation. Even though times of intuitive judgements may be lifesaving, there are other situations that require analytical thought for a more comprehensive consideration before concluding on treatment (Clack, 2009). In this case review using a simulation, the author concluded that if the pediatric nurses relied only on intuitive thinking, mistakes could be made in a child's care (Clack, 2009).

Rababa & Al-Rawashdeh (2021) recently conducted a correlational study examining nurses' critical thinking and decision-making skills related to pain management. They collected data using a pain-related scenario and questionnaires. The questionnaires included the Critical Thinking Self-Assessment Scale and the Nursing

Decision-Making Instrument to measure the nurses' critical thinking and intuitive versus analytical decision-making skills (Rababa & Al-Rawashdeh, 2021). Of the 115 critical care nurses who responded, they found a lower level of critical thinking for the group overall. The majority of the participating nurses were found to have poor critical thinking skills related to pain management with 67% relying on intuitive thinking skills related to pain management. The researchers also discovered higher educational level and greater nursing experience was associated with higher critical thinking skills and less with intuitive thinking, even though the group scored low on critical thinking (Rababa & Al-Rawashdeh, 2021).

While there are diverse thinking processes used in clinical decision-making and problem-solving in healthcare, the most frequently studied is critical thinking (Facione & Facione, 2008; Kosior et al., 2019; Rousseau & Gunia, 2015). Parrott & Rubinstein (2015) and Rousseau & Gunia (2016) believe that both reflective and critical thinking skills are needed for successful analysis of evidence within the EBP process (Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016).

Cognition in Nursing Evidence-Based Practice

While all the steps of the EBP process are important, it is the skills of integrating and evaluating the evidence that can pose the greatest challenge (Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015). Once the all the evidence is located, nurses must analyze and evaluate the information by applying critical thinking (Kuiper & Pesut, 2004). But that is not enough. Nurses must engage in reflective thinking to identify their own

knowledge gaps, gaps in their clinical practices, reflect on thinking skills being used and to consider changes to their practice (Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015). Nickerson and Thurkettle (2013) believe nurses must have a cognitive maturity reliant on critical and reflective thinking to incorporate EBP into clinical practice (Nickerson & Thurkettle, 2013). The steps involved in the EBP process include questioning, searching for evidence, appraising and synthesizing the evidence, integrating evidence with nursing expertise and patient preferences, and evaluating the effectiveness of the clinical Therefore, based on the steps involved in EBP process, performing the EBP process requires critical and reflective thinking (Nickerson & Thurkettle, 2013). Yet, reflective thinking and the nursing EBP process are limited.

A review of the literature revealed most studies on nursing EBP and thinking processes are associated with critical thinking and critical thinking dispositions. This is possibly because critical thinking skills are important for the EBP process but also because nursing education focuses on advancing critical thinking skills in students (Chien, 2019; Kim et al., 2915; Profetto-McGrath, 2005; Rababa & Al-Rawashdeh, 2020).

Profetto-McGrath (2005) reviewed critical thinking and nursing EBP and discovered the literature remains scarce on how to best evaluate the skills needed for critical thinking and nursing EBP in clinical practice (Profetto-McGrath, 2005). However, critical thinking and critical thinking dispositions (CTD) have received attention in the nursing literature (Chen et al., 2020; Futami et al., 2020; Kim et al.,

2015). It is suggested that CTD strongly influence how one responses to problems and situations (Facione, 2000). Critical thinking disposition implies a frame of mind or inclination to engage in critical thinking (Facione, 2000; Ku & Ho, 2010). Facione (2000) defined critical thinking dispositions as " ... a person's consistent internal motivation to act toward, or to respond to, persons, events, or circumstances in habitual, and yet potentially malleable, ways…" (Facione, 2000, p. 64). Ku and Ho (2010) consider a person's critical thinking disposition has an influence on the pattern of their cognitive activity (Ku & Ho, 2010). CTDs include a willingness to take a position and defend it, show creativity, flexibility, perseverance, reflection, and maturity in judgments, and being truth-seeking, systematic, and show maturity in judgments (Facione, 1995; Facione, 2011; Ku and Ho, 2010; Rousseau & Gunia, 2016).

Most recently, Futami et al. (2020) examined almost 1000 clinical nurses in Japan and found that nurses with more CTD's and higher critical thinking scores correlated with higher educational degrees, hospital experiences and stronger views of self and independence. The survey study measured critical thinking, CTD and hospital characteristics using the Japanese Critical Thinking Disposition Scale and questions created that related to hospital characteristics, and critical thinking (Futami et al., 2020). The intent of the study was to explore relationships between the hospital characteristics, personal characteristics, critical thinking and CTD among staff nurses (Futami et al., 2020). It is interesting to note they defined critical thinking as "a reasonable reflective thinking focused on deciding what to believe or do. The emphasis is on reasonableness,

reflection, and the process of making decisions" (Futami et al., 2020, p. 2). This definition appears to combine definitions critical and reflective thinking. But it does reinforce what previous authors and Dewey (1910/1997) inferred about critical and reflective thinking being interconnected (Dewey, 1910/1997; Kosior et al., 2019; Ku & Ho, 2010). Results of the Futami et al. (2020) study showed nurse's critical thinking was associated with personal characteristics; more years of nursing experience, maintaining a nursing specialty certification, and higher self-esteem, higher workloads, and continuing education. It did not find an association with hospital characteristics, like specialty area experience and size of hospital (Futami et al., 2020). Futami et al. (2020) concluded that personal characteristics and experiences added to an increase in critical thinking abilities (Futami et al., 2020). The study lacked clarity of what the critical thinking questions were, and it is unclear whether it used a reliable tool for measuring critical thinking, making it difficult to compare the results to other similar studies.

Another study compared critical thinking abilities between Iranian medical-surgical nurses and intensive care nurses. Gezer et al. (2017) used the California Critical Thinking Skills test along with collecting demographic data in their survey study. The intent of the study was to explore critical thinking abilities and whether demographic factors influenced critical thinking scores among the two groups of nurses (Gezer et al., 2017). The participants included 60 medical-surgical nurses and 60 intensive care nurses. The results indicated there was not a difference in critical thinking ability between the two groups. The researchers noted the overall critical thinking scores were low, stating

the nurses had “poor critical thinking skills and do not differ significantly with each other in terms of their skills” (Gezer et al., 2017, p. 4). Additionally, researchers did not find demographic variables predicted critical thinking ability in the intensive care nurses. However, they did find gender predicted critical thinking ability in medical-surgical nurses with male nurses scoring higher than female nurses (Gezer et al., 2017). While these studies did not focus on EBP, they do provide some data on critical thinking in clinical nursing, which is needed for the EBP process.

Studies that consider relationships between types of thinking and nursing research use or EBP process is limited. Chen et al. (2020) examined relationships between CTD and nursing research competence. They defined research competence as the ability to conduct research activities related to starting and using research. There were 156 Chinese clinical nurses who were surveyed using the CTD scale and Research Competence scale. Their findings indicated a moderate positive correlation between CTD and research competence (Chen et al., 2020). Higher educational level was also found to influence research competence (Chen et al., 2020). Kim et al. (2015) found similar results in their study among both student and clinical nurses (Kim et al., 2015).

Emphasizing the importance of critical thinking in both the educational and clinical setting, Kim et al. (2015) explored the relationship between perceived barriers to research, EBP and CTD among student nurses and clinical nurses (Kim et al., 2015). The total number of participants was 409. Using a survey design, they used a Korean version of the Evidence-Based Practice Questionnaire, a CTD scale and Barriers to Research

scale (Kim et al., 2015). The 24 item EBP questionnaire measures EBP practice, EBP attitudes and EBP knowledge and skills. They found that the relationship between barriers of research utilization and EBP was mediated by CTD, meaning high CTD scores demonstrated a positive relationship to lower barriers of research and EBP implementation practices (Kim et al., 2015). Kim et al. (2015) also found of the 351 participating clinical nurses, those who reported a higher level of EBP also reported higher overall CTD and lower perceived barriers to research and EBP implementation (Kim et al., 2015). Chen et al. (2020) and Kim et al. (2015) believe that CTDs may contribute to the EBP process, given that higher CTD composite scores reflect the nurses capability of interpreting studies and translating the results into practice (Chen et al., 2020; Kim et al., 2015).

While there is evidence showing that higher CTD demonstrates an advantage to the EBP process, the success of EBP from this study could be more related to critical thinking ability. Kim et al. (2015) did not measure critical thinking ability, just CTD and determine that CTD's contributed to the EBP success. Facione (2000) and Ku & Ho (2010) believe CTD implies a frame of mind or inclination to engage in critical thinking (Facione, 2000; Ku & Ho, 2010). So it could be that in Kim et al. (2015) the study participants scored higher in CTD had higher critical thinking ability which resulted in the EBP success.

The literature also reports evidence on nursing EBP beliefs and successful EBP implementation practices. It appears EBP beliefs have an influence in using evidence in practice (Gronvik et al., 2016; Melnyk et al., 2004).

Nursing Evidence-Based Practice Beliefs

A nurse's beliefs about the value and ability to implement EBP are associated with delivery of evidence-based care (Easton et al., 2015; Melnyk et al., 2014; Melnyk et al., 2004). Strong EBP beliefs are not only associated with a nurse's use of evidence, but it is also believed to influence changes in behaviors related to EBP (Gronvik et al., 2016). Given this association, it is understandable that a first step in evaluating a nurse's EBP implementation practices are assessing their EBP beliefs (Easton et al., 2015; Gronvik et al., 2016; Melnyk et al., 2014; Melnyk et al., 2004). If nurses' perceive the EBP approach as positive, there is likely to be a success in the adoption of EBP. If negative, there is a higher risk that EBP implementation will fail (Gronvik et al., 2016).

A descriptive survey was conducted by Melnyk et al. (2004) of a convenience sample of 160 nurses at an EBP conference. The researchers were exploring nurses' knowledge, beliefs, skills, and needs and whether these variables have a relationship, in addition to facilitators and barriers to the EBP process (Melnyk et al., 2004). The respondents indicated an overall 46% inclusion of EBP in their current practice. Their results revealed EBP beliefs, knowledge and skills all had a relationship (Melnyk et al., 2004). Results indicated a strong positive association with EBP beliefs and the benefits of EBP to patient care, $r = .32$, $p < .001$. There was also a positive correlation found

between an advanced practice nurse's experience and EBP knowledge at $r = .37$, $p < .001$(Melnyk et al., 2004). However, the clinical nurses' scores of knowledge of EBP and their EBP skills scores were lower compared to the advanced practice nurses (Melnyk et al., 2004). This would be expected given the level of education and experience of advanced practice nurses. It is important to note that this study was conducted at an EBP conference workshop, which participants chose to attend (Melnyk et al., 2004). Though speculative, it would indicate the attendees had an interest in EBP and desire to learn more resulting in higher EBP beliefs, knowledge and skills.

In 2010, Melnyk and colleagues examined EBP beliefs, EBP implementation, job satisfaction, and group cohesion among 58 health professionals. Most participants were nurses but there was also respiratory, physical and occupational therapists, a pharmacist and a dietician (Melnyk et al., 2010). The survey results indicated EBP beliefs were significantly related to EBP implementation ($r = .38$**), and group cohesion ($r = -.35$**), and job satisfaction ($r = -.34$*). Significance was indicated as a footnote to be of $p = < .05$* or $< .01$** (Melnyk et al., 2010). They found the stronger the individual's EBP beliefs regarding EBP importance, the higher the reported job satisfaction and group cohesion (Melnyk et al., 2010).

Bovino et al. (2017) found that EBP beliefs scores were positively correlated with implementation scores ($r = .35$, $p < .001$). In addition, they found educational level did have an impact, similar to Melnyk et al. (2004) findings. They discovered that nurses who had baccalaureate degrees or higher tended to have higher EBP beliefs and EBP

implementation practices, but those respondents were not directly involved in bedside care. Nurses who provided direct patient care tended to have associate degrees or nursing diplomas and scored lower on EBP beliefs and implementation (Bovino et al., 2017). They indicated that higher levels of education and leadership roles were associated with greater EBP beliefs and implementation, similar to Melnyk et al. (2004) findings (Bovino et al., 2017; Melnyk et al., 2004).

In considering EBP beliefs and EBP practice, a Norwegian study examined 356 specialty cancer nurses to determine if there was a correlation between EBP beliefs and practices. Researchers used a descriptive comparative study design by comparing respondents to non-respondents by collecting data on age and continuing education for the remaining nurses at the hospital (Stokke et al., 2014). Using the EBP beliefs and EBP Implementation scales, they found the respondents averaged a score of 42.0 (SD = 6.8) on EBP beliefs. Possible EBP beliefs scores can range from 16-80 total on the EBP Beliefs scale (Stokke et al., 2014). With EBP implementation, respondents average total score was 7.8 (SD = 7.9), out of a possible 0-72. These results indicate that respondents has higher EBP beliefs and lower EBP implementation practices (Stokke et al., 2014). However, there was a positive correlation between the EBP Beliefs Scale and the EBP Implementation Scale, $r = 0.59$, $p = 0.001$, which indicated that the stronger beliefs a nurse has in EBP the higher the nurse will report EBP implementation (Stokke et al., 2014). Overall, the evidence from Melnyk et al. (2004), Melnyk et al. (2010), Bovino et

al. (2017), and Stokke et al. (2014) indicate a person's EBP beliefs are related to the extent to which they practice evidence-based care.

Abu-Baker et al. (2021) and Warren et al. (2016) failed to find correlations between EBP belief scores and EBP implementation scores in their research. Abu-Baker et al. (2021) surveyed 241 nursing students and discovered after specialized EBP training; student nurses had an increase in their EBP beliefs but not in EBP implementation practices. The respondents mean EBP belief score was 54.32 out of 80 ($SD = 13.63$) and lower EBP implementation mean score of 25.34 out of 72 ($SD = 12.37$) (Abu-Baker et al., 2021). In examining for a correlation between EBP beliefs and EBP implementation, there was no significant relationship evident, ($r = 0.106$, $p = 0.101$). The researchers concluded that student nurses required further instruction on how to access knowledge, appraise evidence, and apply it correctly in order to successfully apply evidence based best practices (Abu-Baker et al., 2021). This would indicate that experience and education could be influential in the strength of EBP beliefs as Melnyk et al. (2004) and Bovino et al. (2017) reported.

A survey study conducted in among Korean nurses, Yoo et al. (2019) surveyed 521 clinical staff examining EBP beliefs, knowledge, and organizational readiness. EBP beliefs was positive, with a score mean of 51.7 (SD = 5.9) out of 80, and EBP implementation mean score was 15.0 (SD = 3.2) out of 72 (Yoo et al., 2019). Findings determined that while nurses reported positive EBP beliefs, their EBP knowledge and implementation were deficient. The researchers concluded that while organizational EBP

readiness was important, the work and psychological burden of adopting EBP can lead to implementation resistance among nurses (Yoo et al., 2019).

In a large national study, a cross-sectional survey was distributed to over 6,800 registered nurses. With a response rate of 24%, 1608 nurses indicated that while their EBP beliefs were positive, they described their ability to implement EBP as extremely low (Warren et al., 2016). The results were divided among respondent age groups but demonstrated a mean of 58.06 out of 80 on EBP beliefs scores and EBP implementation was a mean score of 14.92 out of 72 (Warren et al., 2016). It is evident from these studies that a nurse may have positive EBP beliefs, but it is not translating to EBP implementation. Even if a nurse reports higher EBP beliefs, evidence indicates it is not always translating into EBP implementation (Abu-Baker et al., 2021; Yoo et al., 2019; Warren et al., 2016). This lack of consistency demonstrates the need for further research into nursing EBP beliefs and EBP implementation.

Overall, nurses must be willing to embrace reflective and critical thinking to solve problems in clinical practice. The intensity an individual is willing to invest in cognitive processes has been linked to determination and accomplishment of goals (Akpur, 2017; Grass et al., 2019; Maloney & Retanal, 2020), thus supporting higher order thinking skills. Nurses with higher EBP beliefs may also tend to engage more in EBP implementation practices (Gronvik et al., 2017; Melnyk et al., 2004) but the evidence remains mixed. It is also important to understand why some individuals prefer complex thinking and others do not, especially since evidence analysis requires complex thinking.

Need for Cognition

Some level of motivation is essential in activating cognitive processes and maintaining the persistence to continue through complex problem-solving processes (Akpur, 2017; Facione, 2011; Rudolph et al., 2018; West et al., 2008). Even though critical thinking dispositions appear to link to motivation, they fail to identify exactly how they affect motivation and at what level; more of one, less of another (West et al., 2008).

Need for Cognition (NFC) has been studied as a tendency, or disposition, to engage in and enjoy thinking (Cacioppo & Petty, 1982; Coutinho, 2006; Curseu, 2011; Grass et al., 2019; Rudolph et al., 2018). Originally the concept was recognized in 1955 from Gestalt models of a person's tendency to structure their environments because of their frustrations from increasing mental tensions. It was suggested that the resulting mental tension would lead to efforts to actively search for understanding and structuring of situations (Cacioppo & Petty, 1982). Cacioppo and Petty (1982) considered that as "an important dispositional determinant of which route will be followed may be the extent to which recipients are motivated by their need for cognition to think about issues that they confront" (Cacioppo & Petty, pg. 130, 1982), resulting in the creation of a scale.

Their development of the Need for Cognition Scale (NCS) is intended to measure a desire to engage in and enjoy effortful cognitive tasks (Cacioppo & Petty, 1982; Curseu, 2011; Rudolph et al., 2018). The NCS examines an individual's satisfaction on thinking. Participants are asked to rate the extent to which they agree with

each of the 6 statements about the satisfaction they gain from thinking. Some of the questions on the NCS include "The notion of thinking abstractly is appealing to me," and "Thinking is not my idea of fun" (Cacioppo & Petty, 1982; Lins de Holanda Coelho et al., 2020). There is also evidence NFC can impact self-control. Researchers determined that NFC not only had a link with thinking processes, but it also reflected self-control abilities needed to approach effortful cognitive challenges. Their study concluded that NFC predicted levels of self-control (Grass et al., 2019). There are other advantages.

It has been found that individuals with higher measures of NFC prefer complex over simple tasks, need strong arguments in order to be persuaded, and are better at remembering complex information compared to their lower NFC peers (Cacioppo & Petty, 1982; Curseu, 2011). As a result of this preference towards effortful cognitive activity, those higher in NFC are expected to have higher positive attitudes toward situations that require complex problem solving. Individuals low in NFC tend to use other sources for ease and simplicity such as heuristics to make things understandable (Curseu, 2011; Grass et al., 2019; Lins de Holanda Coelho et al., 2020). Most importantly, NFC is believed to reflect a cognitive motivation rather than an individual's intellectual ability (Curseu, 2011; Maloney & Retanal, 2020; Rudolph et al., 2018). Some studies have shown positive results. West et al. (2008) studied the effect of the thinking dispositions of NFC and open-mindedness to predict belief bias. They found among university students that NFC and open-mindedness independently predicted the

ability to avoid bias after controlling for intellectual ability (West et al., 2008). Education may also have a role in NFC.

There were other studies that found positive relationships between need for cognition and academic achievement (Akpur, 2017; Curseu, 2011; Neigel et al., 2017; Rudolph et al., 2018). Recently, Rudolph et al. (2018) wanted to understand the correlation between NFC, complex problem solving, exploration time and reasoning ability among children. In a group of over 400 German middle-school children, they discovered that need for NFC was a positive correlate of a student's complex problem solving skills beyond their reasoning ability. The students who scored higher in NFC spend more time searching for information and problem solving than those who scored lower, demonstrating a motivational effect (Rudolph et al., 2018). These finding were similar among university students. Also finding positive correlations, Curseu (2011) and Neigel et al. (2017) studied groups of university students and found those who scored higher in NFC also spent more time actively seeking information and performed better on standardized testing than those who scored lower (Curseu, 2011; Neigel et al., 2017).

Akpur (2017) found that university students' academic performance directly correlated to positive NFC and metacognitive abilities. It was determined NFC and metacognition were significant predictors of academic performance (Akpur, 2017). Outside of academic environments, a study focused on the general adult population from the US and Canada. These 250 subjects answered questions on math anxiety, NCS and the Cognitive Reflection Test (CRT). The researchers found that people who reported

high math anxiety scored lower on need for cognition and were less likely to engage in reflective thinking (Maloney & Retanal, 2020).

There was one study that was unique as it reviewed NFC. It focused on monitoring the physical behaviors related to information searching and reading among 43 university students, specifically eye movement and NFC (Wu et al., 2018). The subjects eye movements were recorded with an eye tracking system while they read new information on topics of retirement. Those who scored higher in NFC recorded longer eye fixation duration, slower reading speed, and less eye movement compared to those who scored lower in NFC. While this offers a glimpse into physical behaviors of those who score higher in NFC, the researchers believe it also demonstrates a focused attention and concentration in those with higher NCS scores (Wu et al., 2018). While these studies do not specifically address EBP, they are generalizable.

Ku and Ho (2010) maintain that a person's disposition influences their pattern of cognitive activity and tendency to take on complex tasks. Those dispositions include an open attitude, enjoyment of thinking, a cautious approach and a mind-set for the truth (Ku & Ho, 2010). These listed dispositions are essential for a person to make sound clinical judgements, according to Ku and Ho (2010). Knowing the disposition 'enjoyment of thinking' may influence the tendency for complex thinking (Ku & Ho, 2010), it is important to investigate if need for cognition has a relationship to engaging in the EBP process.

Overall, NFC could help in exploring cognitive factors of the EBP process by offering insight as a motivational element. The implication being that those who score higher in NFC may have the motivation or persistence to complete the EBP process. Currently, there was no evidence of studies linking nurses to measurements of NFC.

Theoretical Framework

Reflective and critical thinking are cognitive processes that relate to metacognition (Kuiper & Pesut, 2004; Moshman, 2018; Parrott & Rubinstein, 2015). Metacognition is important for learning and deciphering information because it involves actively thinking about what is known, what is not known and how to improve upon and apply what is known (Kosior et al., 2019). Metacognitive theory associates the abilities a person uses to reflect on their own knowledge and control their own thinking (Moshman, 2018). Thus, metacognitive theory provides a framework in which to understand the evidence analysis process of EBP (Parrott & Rubinstein, 2015).

While thinking about thinking sounds elementary, it is actually a complex phenomenon (Moshman, 2018). The term metacognition is meant to explain one's knowledge and regulation of their cognition, by incorporating planning, monitoring, and evaluating cognitive processes, usually through reflective thinking (Kuiper & Pesut, 2004; Schraw et al., 2006; Moshman, 2018). Metacognition is frequently defined as thinking about one's thinking (Kandarakis & Poulos, 2008; Moshman, 2018), or the self-awareness and regulation of individuals' understanding of their cognition (Salovich &

Rapp, 2019). It is important to this research because metacognition helps to explain the cognitive processing a nurses uses to access her knowledge and experiences to develop a plan, accomplish goals, choose strategies, and regulate the outcomes that is critical to the EBP process (Kuiper & Pesut, 2004; Parrot & Rubinstein, 2015).

Moshman (2018) described metacognitive theory as a "systematic structure of knowledge that can be used to explain and predict a broad range of cognitive and metacognitive phenomena" (Moshman, pg. 600, 2018). In this digital age with access to a wide range of research studies and other information, it is important be able to select the correct information based on its usefulness and value and complex cognitive abilities can help (Saraff et al., 2020). Use of metacognitive abilities can be an advantage to the EBP process.

Flavell (1979) is credited with coining the term metacognition, as he described it as the awareness of one's knowledge regarding their own cognitive processes related to the processing of information (Flavell, 1979). He theorized that cognitive monitoring happens in four categories: metacognitive knowledge, metacognitive experiences, goals or tasks, and actions or strategies (Flavell, 1979). Moshman (2018) proposed that metacognition has two distinct components with their own focus, metacognitive knowledge and metacognitive regulation (Moshman, 2018).

Metacognitive Knowledge

Metacognitive knowledge is theorized as a collective of awareness of cognition, or what a person knows about their own cognition or cognition in general (Flavell, 1979;

Moshman, 2018). Flavell (1979) gave the example of a child's acquired belief she is better at math than spelling, unlike her friends (Flavell, 1979). Flavell (1979) believed metacognitive knowledge to be knowledge about how person, tasks and strategies interact to affect the progression and outcome of cognition (Flavell, 1979). Today, researchers term the variables of metacognitive knowledge as declarative (person), procedural (tasks) and conditional (strategies) to describe them as processes (Moshman, 2018; Saraff et al., 2020).

Declarative knowledge is knowing about things or what is being learned (Moshman, 2018; Saraff et al., 2020). It represents everything that you come to believe about yourself, your beliefs, and others as cognitive processors (Flavell, 1979; Moshman, 2018). Kuhn and Dean (2004) distinguish declarative knowledge mostly as epistemological understanding, or a person's understanding of thinking and knowing in general (Kuhn & Dean, 2004). Schraw et al. (2006) have described declarative knowledge as knowledge about oneself as a learner and what elements might impact one's performance (Schraw et al., 2006).

Procedural knowledge is the awareness of how to apply what we know. Flavell (1979) described it as a person's understanding of which "variations imply for how the cognitive enterprise should best be managed and how successful you are likely to be in achieving its goal" (Flavell, 1979, p. 907). Procedural knowledge focuses on the understanding of how to do things, like a perception of the differences on how a cognitive

task should be managed and the likelihood of how successful you will be in achieving its goal (Moshman, 2018; Saraff et al., 2020).

Finally, conditional knowledge implies being able to apply information using various acquired strategies. First described as conditional cognitive knowledge by Schraw et al. (2006), they specified the why and when to use a particular strategy in its application to information (Schraw et al., 2006). Most metacognitive knowledge functions as a combination of these variables, declarative, procedural or conditional, as they interact (Flavell, 1979; Saraff et al., 2020).

Overall, the awareness of metacognitive knowledge implies having an understanding of what, when, how, and where of strategies and information (Kosior et al., 2019; Moshman, 2018; Saraff et al., 2020). Flavell (1979) believed that metacognitive knowledge can fail. It can be inaccurate, it can fail to be activated and fail if not acted upon to influence outcomes (Flavell, 1979). However, the benefit of metacognitive knowledge is that it can guide the selection, evaluation and revision of cognitive strategies and goals, dependent of their relationships with each other and the persons' abilities, with respect to the goal at hand (Flavell, 1979; Schraw et al., 2006). While metacognition is not domain specific, it is a collective set of skills linking knowledge and cognitive regulation (Kosior et al., 2019).

Metacognitive Regulation

Metacognitive regulation refers to how a person thinks about their cognitive processes (Ku & Ho, 2010; Moshman, 2018; Schraw et al., 2006). The regulation refers

to the actual strategies applied to control cognitive processes, such as planning how to approach a task, monitoring comprehension and evaluating progress (Flavell, 1979; Ku & Ho, 2010). Because metacognitive regulation controls thinking process, it uses regulatory strategies of planning, managing and monitoring comprehension, and correcting and evaluating (Kosior et al., 2019; Moshman, 2018; Saraff et al., 2020; Schraw et al., 2006). Both metacognitive knowledge and metacognitive regulation enhance each other and are needed for optimal performance (Ku & Ho, 2010). Without optimal regulation, a person is unable to control knowledge or guide their thinking strategies in order to successfully accomplish their goals (Filippi et al., 2020).

Planning includes the selection of appropriate strategies and distribution of cognitive resources that affect performance such as deliberate problem solving techniques, direction of thoughts, determining time needed, and sharing of attention (Kosior et al., 2019; Saraff et al., 2020). During metacognitive regulation, a person uses a learned problem-solving strategy to retrieve and deploy that strategy to solve a new problem (Kosior et al., 2019). Regulation is also affected by developmental stages, meaning age impacts the level of awareness one has about their cognition and uses that knowledge and experience to regulate additional learning to perform a task (Schraw et al., 2006).

Monitoring and managing of comprehension refers to one's awareness of their ongoing cognitive performance, like performing self-checks of ability while learning and retaining or using only relevant information (Kosior et al., 2019). Monitoring helps a

person to review their chosen strategy and consider how they are accomplishing the task to determine if changes in strategy are needed (Schraw et al., 2006).

Evaluation is the final strategy and includes interpreting judgements or making decisions (Kosior et al., 2019; Parrott & Rubinstein, 2015; Schraw et al., 2006). Moshman (2018) considered the evaluation phase the overview appraisal of the end goal (Moshman, 2018). While Schraw et al. (2006) explained evaluation to be the action of examining goals and conclusions (Schraw et al., 2006).

The purpose of metacognitive regulation allows for proper organization of knowledge and is beneficial for memory retention and later recall (Saraff et al., 2020). This management of information provides quick access to mentally stored data, while correcting and evaluating are essential strategies for accuracy, permanence and improved problem-solving ability (Saraff et al., 2020; Schraw et al., 2006). Overall, metacognitive regulation allows an individual to continually update their metacognitive knowledge through the monitoring and evaluation of how declarative, procedural, and conditional types of knowledge influence the achievement of their goals.

Metacognition takes time and continues to develop through advancing educational instruction, aging, and experiences, assisting individuals to think about and monitor their cognition (Salovich & Rapp, 2019). Kuhn (2000) symbolized the development of metacognition as a very gradual process to acquire improved cognitive strategies to replace inefficient ones (Kuhn, 2000). This would suggest that as nurses age, gain

experience, or further their education, they have the potential for improving metacognitive skills.

Metacognition and Thinking Processes

Halpern (1998) and Facione (2000) consider metacognitive strategies as crucial during thinking processes (Halpern, 1998; Facione, 2000). Halpern (1998) believed that when a person engages in critical thinking, they use metacognitive skills to monitor their thinking process, check their progress towards the intended goal and assure accuracy (Halpern, 1998; Ku & Ho, 2010). Metacognition can also be viewed as reinforcing critical and reflective thinking to the level that examining one's thought processes will produce higher quality thinking (Demir, 2015; Ghanizadeh, 2017).

Understanding thinking processes in relation to metacognition can be explained through Bloom's taxonomy. Bloom's taxonomy is a hierarchy structure to group and classify educational objectives and cognitive ability and is sometimes how educational psychologist classify levels of cognitive strategies (Krathwohl, 2002). The taxonomy illustrates the complexity of skills needed for thinking processes by categorizing thinking skills, from lower-order thinking skills to higher-order thinking skills (Krathwohl, 2002; Lumpkin, 2020; Tee et al., 2010). Bloom's taxonomy was addressed in Chapter One.

Within the steps of the EBP process, questioning, evidence searching, critical appraisal, integration, and evaluation of evidence (Melnyk & Fineout-Overholt, 2019), is where metacognitive skills of question formulation, evidence identification, analysis, critical synthesis, and evaluation would be a benefit (Parrott & Rubinstein, 2015).

This is because metacognition supports one's ability to use prior knowledge to plan a strategy for approaching new information, taking the necessary steps to solving the problem, applying reflective thinking and evaluating the results, and adapting an approach or response accordingly (Chauhan & Singh, 2014; Parrott & Rubinstein, 2015). Metacognition helps an individual in deciding the behavior they will display based on deep reflection of their intentions and considerations (Albarracin et al., 2018). Some researchers emphasize the connection between metacognition and motivation because of beliefs and attitudes having a reciprocal relationship to the development and expression of metacognition (Martinez, 2006; Schraw et al., 2006; Tzohar-Rosen & Kramarski, 2014). Schraw et al. (2006) emphasize that from the perspective of metacognition, motivation is defined as "beliefs and attitudes that affect the use and development of cognitive and metacognitive skills" (Schraw et al., pg. 112, 2006). There are some researchers that believe that metacognitive skills can increase motivation and dedication to challenging tasks (Martinez, 2006; Tzohar-Rosen & Kramarski, 2014). Hong et al. (2020) found it was reversed, that motivation was the instigator to metacognitive skills. They discovered in undergraduates that motivation had a positive impact on engagement in learning and increased the use of metacognitive skills such as planning, monitoring of understanding, and evaluating performances (Hong et al., 2020).

Summary

EBP is a complex, problem-solving approach proven to improve healthcare quality and patient outcomes (Gallagher-Ford et al., 2020; Melnyk, 2018). EBP focuses

attention on implementing the latest scientific evidence with clinician expertise while considering patient values and preferences. Despite benefits of improving patient quality and outcomes, there remains a research to clinical practice gap (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk, 2018; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005).

Research is increasingly advocating that EBP is essential for the improvement of patient outcomes, but there continues to be a gap in the application of current evidence to clinical practice (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk, 2018; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). There are challenges inherent to the application of the EBP process and overcoming challenges is important for successful EBP implementation (Melnyk et al., 2018). While some challenges focus on organizational culture and readiness, resources, and tools (Mudderman et al., 2020; Yoo et al., 2019), others challenges are dedicated to intrinsic factors such as lack of knowledge and skills, knowledge translation, motivation, time, reliance on traditional standards, uncertainty with information seeking methods, and ability to critically appraise evidence (Finn, 2011; Fiset et al., 2017; Gaudiano et al., 2011; Melnyk et al., 2014; Melnyk et al., 2018; Profetto-McGrath, 2005; Schuessler et al., 2018; Stokke et al., 2014; Warren et al., 2016). Canada (2016) and Melnyk (2018) have suggested that cognitive factors play a significant role in the adoption and implementation of EBP (Canada, 2016; Melnyk, 2018). Regardless, for successful EBP implementation to occur, it is important to identify and understand the cognitive factors essential to the EBP process (Finn, 2011;

Melnyk et al., 2010; Nickerson & Thurkettle, 2013; Rousseau & Gunia, 2016). The EBP process is dependent on higher-order thinking skills to make decisions and determine actions (Profetto-McGrath, 2005; Rousseau & Gunia, 2016). However, additional cognitive factors need to be considered.

It has been suggested that beliefs influence EBP adoption and dissemination and that other cognitive factors could play a role (Melnyk, 2018). The literature confirms that while nurses EBP beliefs tend to trend high, their implementation practices are low (Abu-Baker et al., 2021; Stokke et al., 2014; Warren et al., 2016; Yoo et al., 2019). Cognitive factors such as cognitive and metacognitive skills used in reflective and critical thinking certainly offer a link in the processing of EBP. Specifically, the metacognitive skills of regulating, analyzing and synthesizing in reflective and critical thinking can assist healthcare professionals in identify missing information or gaps in their own knowledge, search and process for further information, interpret new evidence and have the ability to modify the solution to correspond to the situation (Kosior et al., 2019; Finn, 2011; Parrott & Rubinstein, 2015; Saraff et al., 2020). The advantage of using complex thinking skills like reflective thinking demonstrates a flexibility to analyze and use scientific evidence (Facione & Facione, 2008; Falco-Pegueroles et al., 2021; Finn, 2011; Gaudiano et al., 2011; West et al., 2008), which is essential for the EBP process. Significant research links critical thinking to the EBP process (Belita et al., 2020; Canada, 2016; Finn, 2011; Profetto-McGrath, 2005), yet there is limited understanding of reflective thinking and the EBP process warranting further studies.

Metacognition provides the theoretical framework for this study based on its relationships with higher-order thinking skills. Metacognitive theory is complex comprising of skills that involve thinking about thinking (Moshman, 2018). It contains two main components: metacognitive knowledge and metacognitive regulation. Metacognitive knowledge consists of knowledge about oneself and elements that might affect performance, knowledge about strategies and when and how to use those strategies by means of three knowledge types, declarative, procedural and conditional. Metacognitive regulation involves the monitoring of one's cognition and includes planning, monitoring and evaluation of strategies to reach a goal (Kuhn, 2000; Moshman, 2018; Salovich & Rapp, 2019).

Additionally, NFC has been studied as a tendency, or disposition, to engage in and enjoy complex thinking (Cacioppo & Petty, 1982). Studies support that NFC reflects a desire for complex thinking rather than a person's intellectual ability (Cacioppo & Petty, 1982; Coutinho, 2006; Curseu, 2011; Rudolph et al., 2018). Because some motivational factor is essential to activating complex thinking, investigating NFC's role in the EBP process is indicated.

Reflective thinking, higher NFC and strong EBP beliefs are expected to have a strong influence on EBP implementation practices. When considering that individuals who were higher in NFC tended to actively information seek (Curseu, 2011) and were more likely to engage complex problem solving skills (Rudolph et al., 2018), it supports

the NFC and reflective thinking relationship. Because metacognition has been linked to critical and reflective thinking, it supports further exploration with the EBP process.

It is hypothesized there will be a positive correlation among subjects with higher NFC, reflective thinking, and EBP beliefs with higher EBP implementation practices. Overall, exploring potential relationships between cognitive and metacognitive skills in regard to the EBP process could offer some knowledge into EBP implementation.

Chapter 3

Methodology

A key initiative to establishing high quality patient care, lowering healthcare costs and improving patient outcomes is EBP (Chien, 2019; Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Melnyk et al., 2018; Profetto-McGrath, 2005). Despite the evidence, there remains a gap in EBP implementation (Gallagher-Ford et al., 2020; Gaudiano et al., 2011; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). The purpose of this chapter is to present the research methodology for this study using metacognition to examine cognitive factors that may have a relationship to evidence-based practice (EBP) implementation. The specific aim is to investigate relationships between need for cognition, reflective thinking, and EBP beliefs with EBP implementation. This could offer insight into cognitive factors that affect EBP implementation as well as filling a gap in the literature.

Nurses have a direct impact on the quality of patient care; therefore, it is important to understand what effects their ability to implement EBP (Kim et al., 2015, Melnyk et al., 2018). The EBP process of searching, analyzing, synthesizing and integrating evidence requires the cognitive and metacognitive strategies (Finn, 2011; Kosior et al., 2019; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). Within the EBP process are the needed metacognitive strategies of critical and reflective thinking (Kosior et al., 2019; Kuiper & Pesut, 2004; Parrott & Rubinstein,

2015). It is by applying cognitive and metacognitive skills to a problem that a nurse can effectively differentiate between acquired knowledge and gaps in knowledge (Kuiper & Pesut, 2004). This study was conducted within a multi-hospital healthcare system in the Midwest. The value of conducting the study within this large setting is for the potential of a broad number of participants with varying backgrounds and levels of EBP implementation practices.

Research Design

This study followed a descriptive, correlational research design, which was used to determine if a statistically significant relationship existed between the variables of NFC, reflective thinking, EBP beliefs with EBP implementation practices of nurses. The research was conducted using a survey to collect the data on the relationship between cognitive factors and nursing EBP implementation. This methodology and design was chosen because EBP implementation practices offers opportunities to explain relationships between quantitative variables (Curtis et al., 2016). In this study, those variables included NFC, reflective thinking and EBP beliefs. This study was non-experimental, as there was no treatment applied to the subjects in the study.

Correlational research is concerned with determining if relationships exist between two or more variables in the same population or between the same variables in two populations (Curtis, 2016). Understanding relationships that exist among people, experiences and beliefs is relevant to all social sciences, including the disciplines in

healthcare and education (Curtis et al., 2016). However, correlational designs do not provide the best evidence regarding causation (Thompson et al., 2005). Nonetheless, there are benefits of correlational research. One is that the data are statistically based, and another is that it provides a logical explanation in a non-experimental design, in that it rules out any other reasonable alternatives (Thompson et al., 2005). Correlational designs do provide opportunities to examine variables to describe causal inferences and as a result, evidence-based practices (Curtis et al., 2016; Thompson et al., 2005)

Because not all questions can be answered with clinical trials, correlational research is valuable in healthcare EBP (Curtis et al., 2016; Thompson et al., 2005). Healthcare research develops from the need to measure the numbers of patients using a special service in a specific time period or measure the absence or presence of a particular characteristic in a patient population (Curtis et al., 2016). All correlational studies require a theoretical or conceptual framework, or a description of why the variables might be related to one another (Curtis et al., 2016). For measuring relationships, the Pearson correlation-coefficient is used to determine the strength and direction of the potential relationship of two variables. The correlation-coefficient range is from -1, which indicates a weak correlation of the variables, to 1, which indicates a strong correlation of the variables (Howell, 2011). In this study, reflective thinking, NFC, EBP beliefs and EBP implementation were examined to determine if there was a positive, negative, or no correlation present.

Research Question and Hypothesis

This study focused on investigating the following research question: Is there a relationship between NFC, reflective thinking, and EBP beliefs with EBP implementation practices among nurses? The EBP process of searching, analyzing, synthesizing and integrating evidence is a complex process requiring cognitive and metacognitive skills by critically and reflectively thinking (Finn, 2011; Kosior et al., 2019; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015; Rousseau & Gunia, 2016). While research indicates critical thinking is important in EBP, reflective thinking employs metacognitive skills to effectively analyze scientific evidence (Parrott & Rubinstein, 2015). However, there is a lack of literature investigating reflective thinking on EBP implementation practices among nurses.

Additionally, the literature indicated that while studies have considered CTD, critical thinking and research utilization and EBP in nursing (Chen et al., 2020; Futami et al., 2020; Kim et al., 2015; Profetto-McGrath et al., 2003), there was a lack of nursing studies examining NFC. Because some level of motivation is needed to engage thinking processes (Facione, 2011), NFC has been studied as a link to complex thinking. Need for cognition is a personality trait of engaging and enjoying complex thinking (Cacioppo & Petty, 1982; Curseu, 2011). Even though CTDs appear to link to critical thinking motivation, they fail to identify exactly how they affect motivation (West et al., 2008).

Therefore, reflective thinking and NFC were included as independent variables in this study.

The evidence also indicates EBP beliefs play a role in influencing EBP implementation practices (Melnyk et al., 2014; Melnyk et al., 2004). A nurse's beliefs about the value and ability to implement EBP are associated with delivery of evidence-based care (Easton et al., 2015; Melnyk et al., 2014; Melnyk et al., 2004). For that reason, EBP beliefs were included as an additional independent variable with the dependent variable being EBP implementation practices.

Ultimately, a relationship is expected between high NFC, reflective thinking and high EBP beliefs to greater EBP implementation. That is, higher reflective thinking scores along with a high need for cognition scores and higher EBP beliefs are expected to be strong indicators of greater EBP implementation practices among nurses.

Population

The study took place within a multi-hospital healthcare system within the midwestern US because of availability. The 11 hospitals ranged in size from a 19-bed critical-access, community hospital to a 794-bed metro hospital. The healthcare system employs approximately 5200 registered nurses within the acute care setting. Inclusion of a large number of potential participants is meant to generate statistical representative data that can allow the study findings to be generalized to the population of nursing (Curtis et al., 2016). All acute care registered nurses were eligible to participate. Though, it is

important to note that this survey study was conducted during an ongoing Covid-19 pandemic.

Participants

All of the approximately 5200 nurses were invited to participate through their work email. The email included an introduction explaining the rationale and purpose of the study, along with the survey link to SurveyMonkey®. Contact information for the principal investigator and co-investigator was included to answer any questions or offer assistance. See Appendix A. Demographic data were included and collected through the online survey. No personal identifiers were collected, and participation remained anonymous.

Ethical Concerns

Ethics are a priority for any study. The risks to human subjects associated with this study were minimal. Participant anonymity was secured by using the online survey. The data collected was stored on a secure server. Respondents were not asked for any personal or identifiable information. Confidentiality and anonymity was maintained. Permission was obtained from the senior nursing leadership of the healthcare organization. Permission for conducting this study was obtained through the ProMedica Institutional Review Board (IRB) in coordination with the University of Toledo IRB and moved forward after approval was received.

Data Collection

After IRB approval, self-reported data were collected via the SurveyMonkey® link. Demographic questions were created and consisted of 6 items. Demographic information was requested to describe the sample. No individual identifiers were collected. The demographic information collected included questions on age and sex. The professional background questions collected included educational level, the number of years as a registered nurse, their hospital of employment and whether they had participated in a formal EBP educational program.

The survey link was a compilation of four questionnaires including the Cognitive Reflection Test, Need for Cognition Scale, EBP Beliefs and EBP Implementation Scales (See Appendices B, C, D, and E) along with demographics questions. To be included in the study analysis, all surveys needed to be completed in its entirety.

Instrumentation

After a review of the nursing EBP literature, two psychometrically tested scales were selected to measure the variables of nurses' beliefs about and nurses' use of EBP, the EBP Beliefs Scale (see Appendix D) and EBP Implementation Scale (see Appendix E). Melnyk et al. (2008) defined EBP belief as "endorsement of the premise that EBP improves clinical outcomes and confidence in one's knowledge/skills" (Melnyk et al., 2008, p. 210). They defined EBP practice as "engaging in relevant behaviors" (Melnyk et al., 2008, p. 210).

EBP Beliefs (EBPB) scale was used to measure nurses' beliefs regarding the value of EBP and their ability to implement EBP into their nursing practice. The EBPB scale contains 16 items and investigates respondents' beliefs towards EBP. Each item is answered on a five-point Likert scale ranging from 1 (strongly disagree)–5 (strongly agree). The sum of the 16-item responses is calculated after inversing the scores for two items formulated negatively: "I believe EBP is difficult" and "I believe that EBP takes too much time." The resulting total scores could range between a minimum of 16 or maximum score of 80 (Melnyk et al., 2008). The scale was created by Melnyk et al. (2008). The higher the scores, the stronger the nurse's EBP beliefs.

Initially the two scales were combined, EBPB and EBPI, and originally developed as a 52-item scale that was introduced to a sample of 162 nurses attending EBP educational workshops (Melnyk et al., 2008). The survey included questions regarding demographics, EBP beliefs, implementation practices, knowledge, perceived barriers and supports to the use of nursing EBP (Melnyk et al., 2008). The survey went through several changes and updates that led to the EBP Beliefs scale and the EBP Implementation scale being used today (Melnyk et al., 2010).

Melnyk et al. (2008) assessed the construct validity of the EBPB scale and determined that a single concept was being measured based on the high factor loading >0.35 on the items asked, and the Cronbach alpha of 0.90 (Melnyk et al., 2008). The EBPB scale has well-established internal consistency reliabilities of > .85 as the authors

continue to test its validity and reliability (Melnyk et al, 2010). This scale is also used with the EBP implementation scale (EBPI). See Appendix D.

In association with the EBPB scale is the EBPI scale. The EBPI measures the extent to which a nurse implements EBP into clinical practice. The EBPI is an 18-item scale with a five-point frequency measure. The five-point frequency measure asks for how often the respondent performed an EBP activity within the past eight weeks. The scale ranged from zero (none) to four (greater than 8-times within the past eight weeks) (Melnyk, et al., 2008). The items addressed in the EBPI include statements like "I believe the care that I deliver is evidence-based," "I am sure that implementing EBP will improve the care that I deliver to my patients," and "I believe that I can overcome barriers in implementing EBP" See Appendix E. The total scores range from zero to 72 with higher scores indicating greater implementation of EBP. The EBPI has established internal reliabilities > .85 (Melnyk et al., 2010). Both EBPB and EBPI scales are the property of the Helene Fuld Health Trust National Institute for Evidence-based Practice in Nursing and Healthcare at the Ohio State University College of Nursing. Permission to use the scales was obtained from Dr. Melnyk and included in this study.

Two additional scales were included to measure NFC and reflective thinking. Need for cognition is a personal disposition describing a person's tendency to participate and enjoy effortful mental activities. This can be measured using the Need for Cognition Scale (NCS) (Cacioppo & Petty, 1982). The NCS is intended to measure a desire to

engage in and enjoy effortful cognitive tasks (Cacioppo & Petty, 1982; Curseu, 2011; Rudolph et al., 2018). The NCS examines an individual's satisfaction on thinking. Participants are asked to rate the extent to which they agree with each of the 6 statements about the satisfaction they gain from thinking on a Likert scale. Some of the questions on the NCS include "The notion of thinking abstractly is appealing to me," and "Thinking is not my idea of fun" (Cacioppo & Petty, 1982; Lins de Holanda Coelho et al., 2020). Individuals who score higher in the NFC tend to pursue and reflect on information to obtain a deeper understanding, where individuals low in the NFC tend to use heuristics to understand (Cacioppo & Petty, 1982, Curseu, 2011). Initially created as an 18-question scale with Likert-style responses ranging from one (strongly disagree) to five (strongly agree), a recent condensed version with the same Likert scoring has shown validity. Lins de Holanda Coelho et al. (2020) devised the short version from the original 18 questions to six questions to enhance its practicality (Lins de Holanda Coelho et al., 2020). Because of the length, the shorter version was used for this study. The Likert scores were then calculated into a sum resulting in a sum range of 6-30, with higher scores indicating higher NFC. See Appendix B.

Reflective thinking tendency was measured using the revised Cognitive Reflection Test **(**CFT). The CRT was created to measure the ability to override a quick, intuitive response that is incorrect and to engage in reflective thinking that leads to the correct response (Toplak et al., 2014). Because the original three-item test was becoming familiar to potential participants, a newer version was created (Toplak et al., 2014).

The CRT updated version consists of seven, short logic problems with four multiple choice answers (Sirota & Juanchich, 2018; Toplak et al., 2014). Each question consists of an 'obvious' intuitive response as well as an analytic correct answer that becomes evident after careful reflection. Computation of reflective scores range from zero (low cognitive reflection) to seven (high cognitive reflection) indicating the level of reflective thinking. The CRT seven-item version is a strong independent predictor of performance on rational thinking tasks with a reliability of .72 (Toplak et al., 2014). This version of the CRT with multiple choice answer options has been suggested as easier to complete without compromise to validity (Sirota & Juanchich, 2018). See Appendix C.

Procedure

The Chief Nursing Officer appointed each hospitals' senior nurse leader to distribute the survey information via professional email to all eligible acute care nurses within the organization. Senior nurse leaders were also encouraged to support their staff to participate throughout the study timeframe of two weeks. The email contained an informational section with an introduction to the study, along with details of survey instructions, study rational, consent and confidentiality details prior to linking to the survey. See Appendix A. Participants were informed that consent was implied when they chose to voluntarily link to the survey and complete the questions. The study was conducted from June 21 through July 9, 2021. Study timeframe was decided to be two-weeks in duration due to competing survey completion requests within the organization. Only surveys fully completed were included for final analysis.

Data Analysis

Descriptive statistics and correlational coefficients were used in this study to investigate bivariate associations using Statistical Package for the Social Sciences (SPSS) version 27. The significance level was set at p = .05. Pearson's *r* correlations were used to determine whether significant relationships existed between NFC, reflective thinking, and EBP beliefs with EBP implementation. Correlation coefficients vary from 0 to 1, no relationship to a direct linear relationship or -1, negative linear relationship (Curtis et al., 2016).

Limitations

A significant limitation to the study was the size of the sample. It is discussed in the literature that some limitations are inherent to survey research, with low response rate issues afflicting most (Safdar et al., 2017). In this study, with a response rate of approximately 2%, it unlikely to reflect the general nurse population. Though participation can be low in any survey study, it would be remiss not to consider the ongoing Covid-19 pandemic factoring in on participation rates. During this time, nurses who are constantly at the bedside have been especially hit hard with increases in stress, staffing shortages and just being overwhelmed (Temsah et al., 2021). This could account for a reason in the low participation rate of this study.

Another contributing factor is the length of the survey. Because of the validated tools used for the different measurements in this study, the compilation resulted in a 53-item survey. While surveys are one of the most frequently utilized study designs in

healthcare, long surveys tend to be problematic (Curtis et al., 2016; Safdar et al., 2017). The longer a research survey continues, the more likely respondents will tend to drop out or not fully answer all of the questions (Safdar et al., 2017). In this study, 38 respondents initiated the survey but did not complete the questions and had to be excluded. The length of the survey could have been problematic.

Additionally, the data received are based on self-reported responses. Even though survey studies are common in healthcare to measure a clinician's compliance, self-reported scales may overestimate actual behaviors, resulting in biased results which further complicates the data. (Curtis et al., 2016).

Finally, this study was restricted to a local healthcare organization. Even though three of the 11 hospitals within the organization were located within a neighboring state, it still restricted location making it difficult to generalize results to the entire nursing population.

Summary

The purpose of this descriptive correlational study was to investigate the relationship between NFC, reflective thinking, EBP beliefs and EBP implementation practices among acute care nurses. The study sample consisted of 75 acute care nurses from one healthcare organization comprised of 11 hospitals. A survey was compiled of the NCS, CRT, EBPB Scale and EBPI Scale with demographics questions resulting in a 52 item survey. SPSS 27 was used to calculate descriptive statistics and Pearson's correlation coefficients to investigate for bivariate associations between NFC, reflective

thinking, EBP beliefs and EBP implementation practices. Chapter IV presents the results.

Chapter IV

Results

The aim of this research was to investigate cognitive factors associated with nursing EBP implementation practices to address a gap in the literature. Acute care nurses from an 11 hospital healthcare organization provided the data for the study. The researcher posed the following research question: Is there a relationship between NFC, reflective thinking, and EBP beliefs with EBP implementation practices among nurses? This survey study included a compilation of four scales measuring the independent variables of NFC, reflective thinking and EBP beliefs and the dependent variable of EBP implementation practices. The scales included the NCS, CRT, EBP Beliefs and EBP Implementation scales. Descriptive statistics were used to analyze demographic information. Pearson's correlation coefficients investigated the bivariate association between NFC, CRT, EBP beliefs with EBP implementation. This chapter includes the results and analysis.

Descriptive Statistics

The population sample was obtained from a large group of acute care nurses employed at an 11 hospital healthcare organization. The hospitals within the organization ranged in size from a 19-bed, community hospital to a 794-bed, metro hospital. All acute care registered nurses employed by these hospitals were eligible to

participate. Distribution of the surveys were provided electronically through the nurses' work emails by each hospital's senior nurse leader.

Of the estimated 5200 acute care nurses within the healthcare organization, 113 nurses initiated the survey process. Thirty-eight respondents were excluded for incomplete survey questions. The remaining respondents (n = 75) completed the survey in its entirety and were included in the final analysis. Data were imported into Statistical Package for the Social Science (SPSS) version 27 for statistical analysis.

The majority of respondents worked in the larger, metro hospital at 56% (n = 42) with the remaining sparsely distributed among the other hospitals. Table 1. displays the number and percentage of survey respondents distributed by the hospital in which they were employed.

Table 1. Respondents Hospital of Employment.

Hospital Employed	**Frequency *n* (%)**
Toledo	42 (56%)
Defiance	10 (13%)
Coldwater	8 (11%)
Monroe	1 (1%)
Wildwood	0
Children's	1 (1%)
Flower	2 (3%0
Bay Park	0
Hickman	1 (1%)
Memorial	5 (7%)
Fostoria	1 (1%)
Other	3 (4%)

The majority of acute care nurses in this sample were female at 93% (*n* = 70) compared to 7% males (*n* = 5). The mean age of respondents was 41.19 years (SD = 12.149), ranging from 23 years to 69 years. Their years of nursing experience varied from one to 42 years with a mean of 15.17 years (SD = 11.19). The educational level of all who participated was at the college level. The majority of respondents were baccalaureate nurses at 53.3% (*n* = 40), followed by associate degree 29.3% (*n* = 22) and master's degree 17.3% (*n* = 13). See Table 2.

Data were collected on whether or not the participant had received formal education on the EBP process. The question asked if participants had a formal college level EBP course or had attended a formal EBP educational offering. The results indicated an almost equal division of respondents who had taken a formal EBP course at 47% (*n* = 35) compared to 53% (*n* = 40) without a formal EBP course. See Table 2.

Table 2. Demographics of Respondents.

Demographics	N	Mean	SD	Range	%
Age	75	41.19	12.149	23-69	
Experience (years)	75	15.19	11.175	1-42	
Sex					
Female	70				93%
Male	5				7%
Educational Level					
Associate	22				29.3%
Bachelor	40				53.3%
Master	13				17.3%
Formal EBP course					
Yes	35				47%
No	40				53%

A cross-tabulation further examined the nurses' ages with educational level and EBP course completion to gain insight into who are completed formal EBP courses. Based on the results in this small sample, registered nurses between the ages of 23-29 years had the highest percentage of bachelor's degree, 86% (n = 14), followed by the 30-39 years age group at 63% (n = 15). However, the 30-39 years age group completed the highest number of formal EBP courses at 71% (*n* = 17), with the next group, 23-29 years, distantly following at 43% (*n* = 6). See Table 3.

Table 3. Cross Tabulation of Age, Educational Degree and EBP course.

Age Range (Yrs)	N	Associate Degree	Bachelor's Degree	Master's Degree	Formal EBP	EBP Completed %
23-29	14	2	12	0	6	43%
30-39	24	6	15	3	17	71%
40-49	17	7	6	4	7	41%
50-59	15	5	5	5	3	20%
60-69	5	2	2	1	2	40%
Total	75	22	40	13	35	

Statistical Analysis

The survey included four scales complied into one link that began with six demographic questions followed by the 6-item NCS, 7-item CRT, 16-item EBP Beliefs and 18-item EBP Implementation scales. This resulted in a 53-item survey. Using descriptive statistics to calculate the means and standard deviations, the respondents' mean scores of each of the four scales can be seen in Table 4.

Need for Cognition

NFC reflects the tendency of individuals to engage in and enjoy effortful thinking. The NCS-6 scale was used to streamline the survey without comprise to validity based on previous studies (Lins de Holanda Coelho et al., 2020). Scores are tabulated into a sum based on Likert responses from one (extremely uncharacteristic of me) to five (extremely characteristic of me). Item # 3 (*Thinking is not my idea of fun.*) and item # 4 (*I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.*) were reversed scored with final sum scores ranging from six (lowest) to 30 (highest). The NCS scores in this survey ranged from one respondent scoring a 10 (lowest) to three respondents scoring 30 (highest). The mean of NCS was 22.48 (SD = 4.081). See Table 4. The respondents of this sample tended to score towards the mid to higher level of the NCS range.

Reflective Thinking

Next was the reflective thinking measurement. Reflective thinking relies on an analytical approach, a metacognitive skill, to problem-solving (Soane et al., 2015). Reflective thinking tendency was measured using the revised Cognitive Reflection Test **(**CFT-MCQ-4). The CRT included seven logic questions with four multiple choice answer option to test the ability to overcome intuitive tendency to answer an obvious but incorrect answer and reflectively think concluding on the correct answer. Results of the CRT in this sample group ranged from zero to seven, with a mean of 2.75 (SD = 1.677).

While the range of this sample was on the low side with five respondents scoring zero, two actually had perfect scores of seven. Interestingly, those two respondents differed in backgrounds. One was 25 years of age with three years nursing experience and held a bachelor's degree. The other was 48 years old, with 16 years nursing experience and held an associate degree. Overall, the respondents in this sample indicated a lower tendency toward reflective thinking.

Evidence-Based Practice Beliefs and Implementation

Individual beliefs in the value of EBP usually relate to their ability to implement evidence-based care (Melnyk et al., 2010). Both the EBPB and EBPI scales were used in this survey. EBPB scores have a potential range of 16-80. In this study, respondents' EBPB scores were in the higher range, from 42-70 with a mean of 59.07 (SD = 5.295). However, respondents' EBPI scores were lower at 0-71 with a mean of 14.59 (SD = 14.696), which was representative of the scales range of 0-72. This indicated that while EBP beliefs were higher, implementation practices were lower among this sample of nurses. See Table 4. There have been similar findings in a previous study indicating that while EBP beliefs were high, EBP implementation scores remained lower (Abu-Baker et al., 2021).

Table 4. Survey Tool Measurements.

Tool	N	Mean	SD	Minimum	Maximum	Possible Range
Need for Cognition (NCS)	75	22.48	4.081	10	30	6-30
CRT	75	2.75	1.677	0	7	0-7
EBP Beliefs	75	59.07	5.295	42	70	16-80
EBP Implementation	75	14.59	14.696	0	71	0-72

The study hypothesis was that higher NFC, reflective thinking tendency and EBP beliefs would be associated with higher EBP implementation. Data were analyzed by using a Pearson's correlation coefficient (*r*). The researcher examined for a relationship between the respondents' NFC, reflective thinking, and EBP beliefs with EBP implementation practices.

The scatterplot of NCS scores and EBPI scores demonstrates a significant scattering of points meaning that the points did not suggest a pattern (Figure 1). A Pearson correlation coefficient was calculated to examine the relationship between the respondents' NCS scores and EBP implementation scores. Findings indicated there was no correlation between NCS scores and EBP implementation scores, $r = .019$ ($p = .871$). See Table 5.

Figure 1. Scatter Plot of NCS scores and EBPI scores.

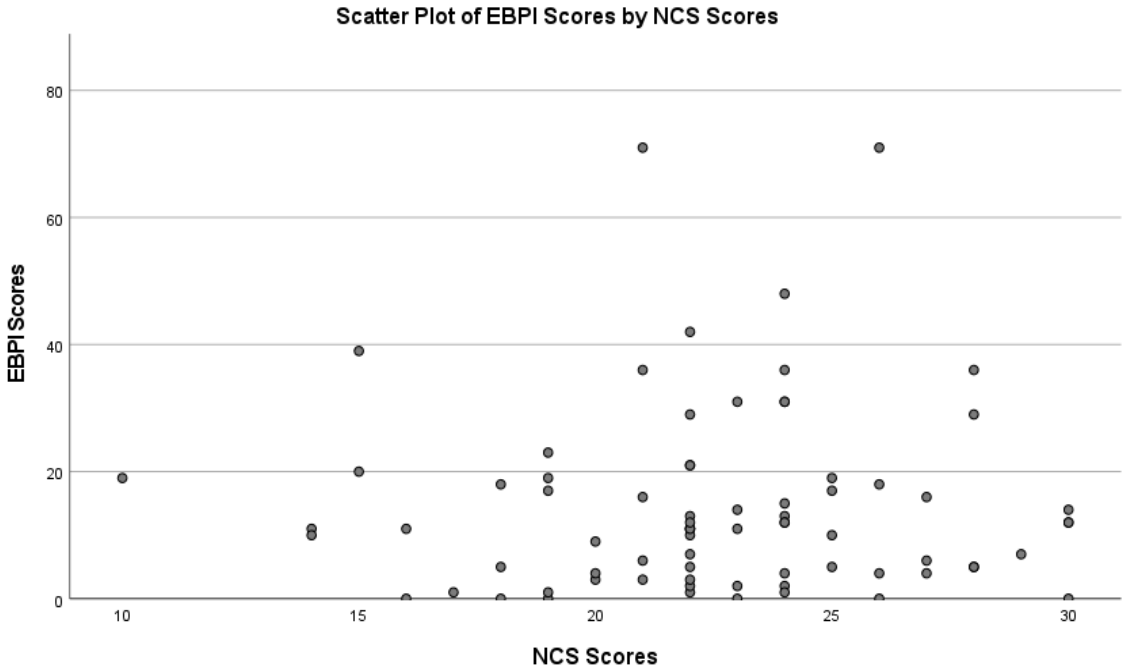

Table 5. Results of correlation between NCS scores and EBPI scores.

		EBPI Scores	NCS Scores
EBPI Scores	Pearson Correlation	1	.019
	Sig. (2-tailed)		.871
	N	75	75
NCS Scores	Pearson Correlation	.019	1
	Sig. (2-tailed)	.871	
	N	75	75

A scatterplot of CRT scores and EBPI scores revealed that a linear relationship did not exist between these two variables (Figure 2). Reflective thinking measured by the CRT scores showed no relationship with EBP implementation scores, $r = .071$ ($p = .546$). See Table 6.

Figure 2. Scatter Plot of EBPI by CRT.

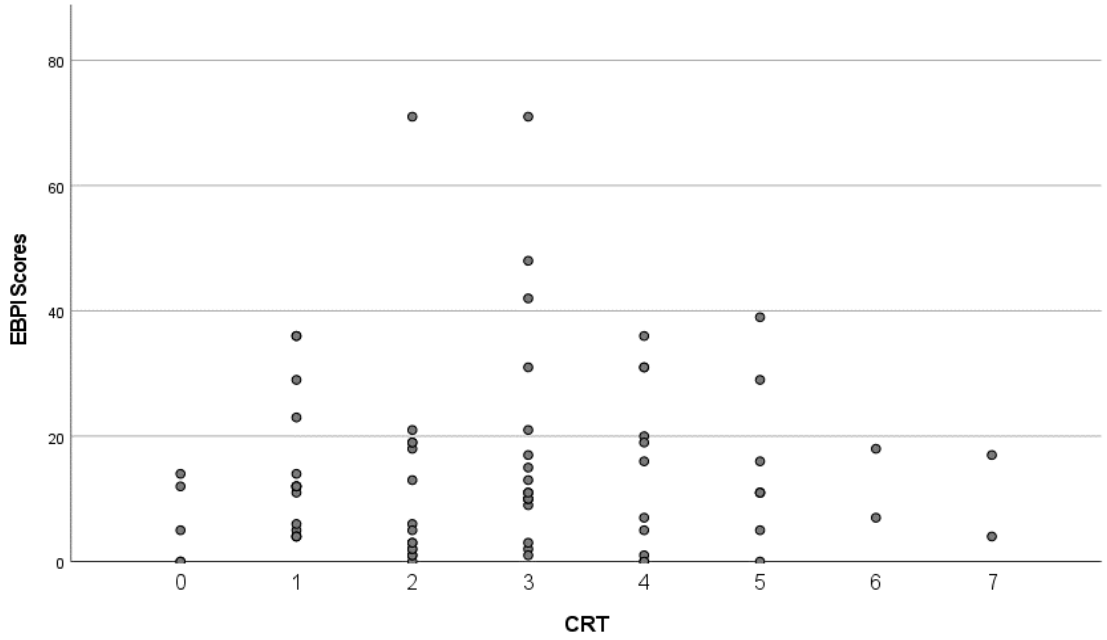

Table 6. Results of correlation between CRT scores and EBPI scores.

		EBPI Scores	CRT
EBPI Scores	Pearson Correlation	1	.071
	Sig. (2-tailed)		.546
	N	75	75
CRT	Pearson Correlation	.071	1
	Sig. (2-tailed)	.546	
	N	75	75

A scatterplot of EBPB scores and EBPI scores follow a slight linear pattern, but the data points are not close. The Pearson's correlation coefficient indicate a weak, positive correlation ($r = .286$, $p < .013$) between EBPB and EBPI practices, indicating a significant relationship. See Figure 3 and Table 7. Previous studies have examined the

relationship between EBP beliefs and EBP implementation and failed to find a correlation (Abu-Baker et al., 2021; Bovino et al., 2017; Warren et al., 2016). However, some of the researchers did report that while not finding a statistical significance, their respondents tended to rate their EBP belief scores higher and their implementation scores lower (Abu-Baker et al., 2021; Bovino et al., 2017). Most recently, a study among student nurses who had received formal EBP training revealed that after EBP training, the participants had an increase in their EBP beliefs but not their EBP implementation. Researchers concluded student nurses required further instruction on how to access knowledge, appraise evidence, and apply it correctly in order to be successful (Abu-Baker et al., 2021). The respondents in this study also had higher EBP beliefs with lower EBP implementation even though less than half attended a formal EBP course. However, this was a small sample and therefore would need to be replicated with a larger sample population to support its findings.

Figure 3. Scatter Plot of EBPI by EBP Beliefs.

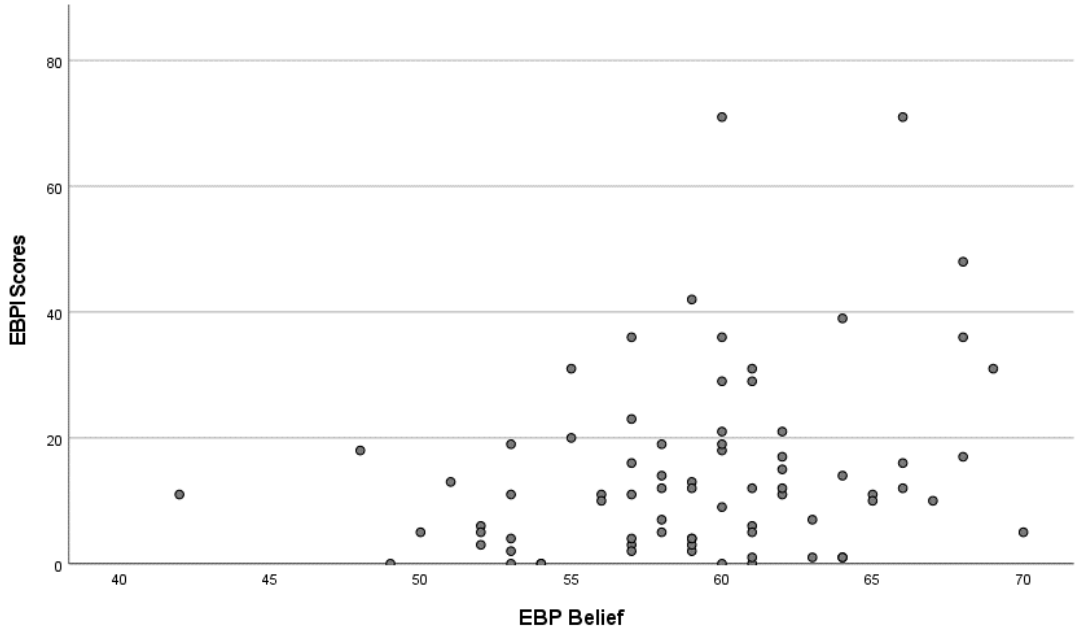

Table 7. Correlation between EBPI and EBP Beliefs.

		EBPI Scores	EBP Belief
EBPI Scores	Pearson Correlation	1	.286*
	Sig. (2-tailed)		.013
	N	75	75
EBP Belief	Pearson Correlation	.286*	1
	Sig. (2-tailed)	.013	
	N	75	75

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

Summary of Results

The intent of this study was to investigate cognitive factors associated with EBP implementation practices among nurses. The goal was to identify if there was a relationship between NFC, reflective thinking and EBP beliefs with EBP implementation.

The study was conducted among acute care nurses within an 11 hospital healthcare organization. There were approximately 5200 acute care nurses eligible to participate. One hundred and thirteen nurses responded, but did not complete the full survey, resulting in 75 nurses in the final analysis. The majority of respondents were female (93%, $n = 70$) with bachelor's degrees (53.3%, $n = 40$). Ages and years of nursing experience varied, with ages between 23 and 69 years (M = 41.19 years, SD = 12.149) and years of nursing experience between 1-42 years (M = 15.17, SD = 11.19). Additionally, less than half of the respondents, 47% ($n = 35$), had participated in a formal EBP course. There was a weak, positive correlation between EBP beliefs and EBP implementation ($r = .286$, $p < .013$).

This study was unable to identify a correlation between NFC and reflective thinking with EBP implementation practices among a sample of 75 nurses. Based on the small sample of respondents in this survey, the findings cannot be generalized to the nursing population.

Chapter 5

Even though EBP is proven to improve healthcare quality and patient outcomes, there continues to be a gap in clinical practice (Gallagher-Ford et al., 2020; Melnyk, 2018; Nickerson & Thurkettle, 2013; Profetto-McGrath, 2005). An examination of cognitive factors that contribute to EBP implementation is needed to determine successful EBP implementation into clinical practice (Melnyk, 2018). The purpose of this study was to investigate NFC, reflective thinking, and EBP beliefs with EBP implementation practices among nurses. This chapter will focus on the findings of this study and address the implications of the findings based on the data obtained.

Evidence-based practice is a problem-solving approach that requires the use of complex cognitive processing, like critical and reflective thinking, to synthesize and analyze scientific evidence in order to make important decisions regarding best implementation practices (Canada, 2016; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015; Profetto-McGrath, 2005; Rousseau & Gunia, 2016). EBP provides healthcare practitioners the ability to implement the latest scientific evidence to improve patient outcomes (Melnyk & Fineout-Overholt, 2019; Rousseau & Gunia, 2016). Metacognition was used as the theoretical framework for this study based on its relationships with constructs of complex thinking processes. Metacognitive theory is complex, comprised of skills that involve thinking about thinking as well as planning, monitoring, and evaluating (Ku & Ho, 2010; Moshman, 2018; Parrott & Rubinstein, 2015). Using

metacognitive skills in the EBP process allows an individual to interpret new evidence and use that new information to respond to the situation (Kosior et al., 2019; Finn, 2011; Parrott & Rubinstein, 2015; Saraff et al., 2020). Integrating these skills of analyzing and evaluating are a necessary cognitive component of scientific evidence analysis (Parrott & Rubinstein, 2015). The metacognitive skills of analyzing, evaluating, and creating by reflective thinking may assist healthcare professionals to identify gaps in their own knowledge, leading to searching, processing, and implementation of new information during implementation in the EBP process.

Summary of Findings

The nurses that participated in this study were employed at a large healthcare organization that consists of 11 hospitals. Those hospitals range in size from a 19-bed critical access hospital to a 794-bed metro hospital. The healthcare organization employs approximately 5200 acute care nurses. Of the approximately 5200 nurses, 75 completed the electronic survey in its entirety (response rate of approximately 2%). Generally, the respondents were mostly female (93%, $n = 70$) with bachelor's degrees (53.3%, $n = 40$). There was a large variation in ages from 23 years to 69 years, with a mean of 41.19 years, (SD = 12.149) which is below the national nurses' age average of 51 years (NCSBN, 2017). Nursing experience of the respondents was between a range of one year and 42 years (M = 15.17, SD = 11.19). Less than half of the respondents, 47% ($n = 35$), had taken a formal EBP course with a slightly greater number of non-EBP trained

respondents, 53% (n = 40). The variables of NFC (r = .019, p = .871) and reflective thinking (r = .071, p = .546) were found not to have a relationship with EBP implementation in this small population. Evidence-based practice beliefs was found to have a weak, positive correlation with EBP implementation, (r = .286, p < .013).

Discussion

Reflective thinking relies on an analytical approach to problem-solving (Soane et al., 2015). The metacognitive skills involved in reflective thinking of analyzing and evaluating, can facilitate comprehension, support conceptual change, and promote critical evaluation and knowledge transfer needed in the EBP process (Antonio, 2020; Ku & Ho, 2010; Parrott & Rubinstein, 2015). While much literature discusses critical thinking for EBP processing, reflective thinking must be considered. Kosior et al. (2019) believe health professionals who can successfully apply skills of metacognition, that includes reflective thinking, can have an increase in organized thoughts leading to effective problem-solving and clinical practice (Kosior et al., 2019). Nickerson and Thurkettle (2013) believe nurses should be reliant on both critical and reflective thinking to incorporate EBP into clinical practice (Nickerson & Thurkettle, 2013). Because the steps in the EBP process follow Bloom's taxonomy of cognitive and metacognitive skill complexity, it is reasonable to suggest reflective thinking is just as important as critical thinking in the processing of EBP.

The EBP process steps include questioning, searching for evidence, appraising and synthesizing the evidence, integrating evidence with nursing expertise and patient preferences, and evaluating the effectiveness of the clinical practice (Melnyk & Fineout-Overholt, 2019). Bloom's taxonomy lists the cognitive and metacognitive skills from lower-order of knowledge, understanding and application, to higher-order skills of analysis, synthesis and evaluation that are needed for critical and reflective thinking to be successful (Tee et al., 2010). This further supports that both critical and reflective thinking are to be considered when using the EBP process. But the literature is scarce on measuring reflective thinking in clinical nurses.

Therefore, one of the variables measured in this study was reflective thinking. Reflective thinking was measured using the CRT. The CRT has been widely used as a measurement of the tendency and willingness to think in an analytical manner, relying on reflective thinking and less on intuitive thinking (Bialek & Pennycook, 2018; Frederick, 2005; Maloney & Retanal, 2020). In this study, it was hypothesized that reflective thinking could have a relationship with EBP implementation. Because the EBP process is reliant on individuals continuing to question and seek information, there is support that reflective thinkers may be more inclined to engage in the EBP process (Soane et al., 2015).

Seventy-five acute care nurses participated in this study. The results of this study indicated lower reflective thinking scores at M = 2.75 (SD = 1.677) of the group. The

median score range for the CRT is 0-7. This indicated that the 75 nurse respondents demonstrated a lower reflective thinking ability. This study did not find a relationship between reflective thinking scores and EBPI scores $r = .071$, $p = .546$. But it is important to note the sample of respondents in this study was small so inferring an interpretation is inadequate.

However, some other factors need to be considered. The respondents' lower CRT scores could be influenced by time and length of the survey. First, reflective thinking and metacognition in general, can take time to fully develop. In fact, Dewey (1910/1997) reminds us that reflective thinking is a complex and demanding process that takes time to perform well (Dewey, 1910/1997). Even though a time measurement was not recorded for this survey, issues of time have been raised in regard to length of surveys. This study used four validated tools complied into one survey which resulted in a survey length of 53-items. While surveys are one of the most frequently utilized research designs in healthcare, longer surveys tend to be problematic due to time factors (Curtis et al., 2016; Safdar et al., 2017). The longer a research survey continues, the more likely respondents will tend to drop out or not fully answer all of the questions (Safdar et al., 2017). In this study, 38 respondents initiated the survey but did not complete the questions and had to be excluded. It is not unreasonable to consider the length of the survey may have not supported adequate time for reflective thinking.

Metacognitive skills continue to develop through ongoing educational opportunities, the aging process itself, and through expanding experiences (Salovich & Rapp, 2019). Kuhn (2000) symbolized the development of metacognition as a very gradual process to acquire improved cognitive strategies to replace inefficient ones (Kuhn, 2000). This would suggest that as nurses age, gain experience, and/or further their education, they have the potential for improving metacognitive skills and thus, reflective thinking ability. But this small sample revealed that the respondents who scored the highest in reflective thinking by obtaining a seven on the CRT, were under the age of 40 years and had less than 16 years of experience.

Overall, education and experience levels varied widely for the respondents in this study. The majority of study respondents were baccalaureate nurses at 53.3% (n = 40), with a few having a master's degree 17.3% (n = 13), indicating a higher educational level within this sample at 71% (n = 53). While the respondents scored low overall on reflective thinking, two actually had perfect scores of seven. Interestingly, those two respondents differed in backgrounds. One was 25 years of age with three years nursing experience and held a bachelor's degree. The other was 48 years old, with 16 years nursing experience and held an associate degree.

The years of nursing experience from this group of respondents indicated a wide range, from one to 42 years with a mean of 15.17 years (SD = 11.19). Because education and experience can influence differences in higher-order thinking abilities and EBP

engagement, they could have an effect on the outcomes in this study. Rababa & Al-Rawashdeh (2021) research into nurses' critical thinking ability revealed that higher educational level and greater nursing experience was associated with higher critical thinking skills and less with intuitive thinking, even though results of critical thinking abilities were low within their participants (Rababa & Al-Rawashdeh, 2021). Additionally, Futami et al. (2020) revealed that those nurses with higher critical thinking ability was associated with increases in years of nursing experience, having an advanced nursing certification, and continued education (Futami et al., 2020). While these study findings are not specifically focused on reflective thinking, it is because critical and reflective thinking have been connected in the literature that these results need to be considered. Kuiper & Pesut (2004) believed that not considering reflective thinking in conjunction with critical thinking undermines the complexity in applying thinking skills to clinical situations (Kuiper & Pesut, 2004). They considered together that critical and reflective thinking help to explain the dynamics of problem-solving and clinical reasoning in nursing (Kuiper & Pesut, 2004).

There is a significant amount of research linking critical thinking to the EBP process in nursing (Belita et al., 2020; Bovina et al., 2017; Canada, 2016; Chen et al., 2020; Falco-Pegueroles et al., 2020; Finn, 2011; Futami et al., 2021; Profetto-McGrath et al., 2003; Profetto-McGrath, 2005; Rababa & Al-Rawashdeh, 2020; Rousseau & Gunia, 2016). But there is very limited research into nursing and reflective thinking in clinical practice. It is evident more research is needed to examine reflective thinking and other

cognitive factors that may link to the EBP process. An additional cognitive factor that was investigated in this study was NFC.

It is suggested that those who enjoy complex or higher-order thinking are said to have a personality trait of NFC (Cacioppo & Petty, 1982; Coutinho, 2006). NFC reflects an individual's desire to pursue complex thinking tasks (Coutinho, 2006). There is literature that reveals individuals with higher NFC are more likely to actively spend time searching for information (Curseu, 2011; Grass et al., 2019; Rudolph et al., 2018). This is an essential activity when engaging in the EBP process (Parrott & Rubinstein, 2015). Studies indicate those with higher measures of NFC prefer complex over simple tasks, need strong arguments in order to be persuaded, and are better at remembering complex information compared to their lower NFC peers (Cacioppo & Petty, 1982; Curseu, 2011; Grass et al., 2019; Rudolph et al., 2018). As a result of this preference towards effortful cognitive activity, those higher in NFC are expected to have higher positive attitudes toward situations that require complex problem solving. Individuals low in NFC tend to use other sources for ease and simplicity such as heuristics to make things understandable (Curseu, 2011; Grass et al., 2019; Lins de Holanda Coelho et al., 2020). Individuals scoring higher on the Need for Cognition Scale (NCS) suggests that they readily engage in thinking about problems as they emerge, enjoy the thinking process, and are motivated to apply their thinking skills with little prompting. Such people are likely to be able to process and systematize information, sorting out the irrelevant from the important

(Cacioppo & Petty, 1982; Lins de Holanda Coelho et al., 2020), and a needed process in EBP implementation.

Need for Cognition Scale (NCS) was used to measure NFC by measuring the desire to engage in and enjoy effortful cognitive tasks by assessing an individual's satisfaction on thinking (Cacioppo & Petty, 1982; Curseu, 2011; Rudolph et al., 2018). The NCS scores in this survey ranged from one respondent scoring a 10 (lowest) to three respondents scoring 30 (highest). The mean of NCS was 22.48 (SD = 4.081) out of a possible range of 6-30, indicating this group tended to be towards the higher end of the NCS range. This would indicate that the respondent's had a tendency towards more complex thinking processes. Higher NFC is expected because the majority of respondents held higher educational degrees of baccalaureate or higher at 71% (n = 53). A desire to pursue higher education and NFC have been linked in the literature. Akpur (2017) and Maloney & Retanal (2020) found that cognitive performance directly correlated to higher NFC, with Akpur (2017) finding NFC was a significant predictor of academics (Akpur, 2017; Maloney & Retanal, 2020). But, in considering a relationship with EBP implementation, this study revealed NCS scores did not correlate with EBPI scores (r = .019, p = .871), suggesting that NFC does not influence EBP implementation practices among nurses.

Bovino et al. (2017) and Melnyk et al. (2004) reported from their research that higher educational levels were associated with greater EBP beliefs and EBP

implementation (Bovino et al., 2017; Melnyk et al., 2004). Bovino et al. (2017) reported that nurses with baccalaureate degrees or higher tended to have higher EBP beliefs and EBP implementation practices compared to associate degrees or nursing diplomas, who tended to score lower on EBP beliefs and implementation (Bovino et al., 2017).

The majority of this study sample had higher educational degrees at 71% (n = 53). Their collective EBPB scores were in the higher range at 59.07 (SD = 5.295). However, respondents' EBPI scores were lower at 14.59 (SD = 14.696), indicating that while EBP beliefs were higher, implementation practices were lower among this sample of nurses. These results indicate that experience and education could be influential in the strength of EBP beliefs as Melnyk et al. (2004) and Bovino et al. (2017) reported but not in EBP implementation. Further analysis of the data from this study found that there was a weak, positive correlation with EBP beliefs and EBP implementation (r = .286, p < .013), indicating a slight, but significant association with EBP beliefs and EBP implementation practices.

The literature reported similar studies finding higher EBPB scores, but low EBPI scores (Abu-Baker et al., 2021; Bovino et al., 2017; Stokke et al., 2014; Warren et al., 2016). Using the same EBP beliefs and EBP Implementation scales, Stokke et al. (2014) found their respondents averaged a score of 42.0 (SD = 6.8) on EBP beliefs. With EBP implementation, their respondents average total score was 7.8 (SD = 7.9), which is quite low. Stokke et al. (2014) found however, a stronger, positive correlation between the

EBPB scores and the EBPI scores, $r = 0.59$, $p = 0.001$, indicating that the greater beliefs a nurse has in EBP the higher the nurse will report EBP implementation (Stokke et al., 2014) similar to the results of this study, $r = .286$, $p < .013$. Interestingly, Yoo et al. (2019) had similar results. Their study found EBPB scores of 51.7 (SD = 5.9) with EBPI scores of 15.0 (SD = 3.2) (Yoo et al., 2019). They determined that while nurses reported higher EBP beliefs, their EBP implementation practices were deficient, though they did not investigate for an association between the two scales. Yoo et al. (2019) concluded that the cognitive burden of adopting EBP can lead to implementation resistance among nurses (Yoo et al., 2019). A more recent study of student nurses who had formal EBP training had an increase in their EBP beliefs but not their EBP implementation. Abu-Baker et al. (2021) concluded that newer nurses require further instruction on how to access knowledge, appraise evidence, and apply it correctly in order to be successful with the EBP process (Abu-Baker et al., 2021).

All these studies report similar findings combined with findings from this study with EBP beliefs and EBP implementation. Still, it is important to note this current study had a small response rate and would need to be replicated with a larger sample population to further support its findings. Because slightly higher than half of the respondents did not attend a formal EBP course (53%), it raises questions whether those individuals understand the complexity of analyzing evidence in the EBP process. The sample of respondents in this study also had higher EBP beliefs with slightly lower EBP

implementation even though 53% never attended a formal EBP course. However, a weak, positive correlation was found between EBP beliefs and EBP implementation.

Limitations and Implications for Future Research

Based on the results of this study, further research into reflective thinking and exploring other cognitive factors in the implementation of EBP would be useful. It is vital to understand the specific cognitive processes that lend to EBP implementation, which remains an issue in healthcare today. This research focused on investigating a relationship with reflective thinking, NFC and EBP beliefs with EBP implementation among nurses, and had a low response rate. Replication of this study with changes to the length of the survey by considering alternative EBP tools may be a benefit, but more research is needed to identify metacognitive skills that contribute to EBP implementation.

Reflective thinking scores were found to be low among the respondents in this study. But the literature reveals reflective thinking to be a key component in the analysis and evaluation aspects of the EBP process (Kosior et al. 2019; Ku & Ho, 2010; Kuiper & Pesut, 2004; Parrott & Rubinstein, 2015). However, studies among nurses are very limited. It would be valuable to know if an association between reflective thinking and the EBP process is evident in a much larger study population.

This research was limited in the small number of respondents within one healthcare organization. It was also limited to three cognitive factors, reflective thinking, NFC and EBP beliefs. It would be interesting to replicate this research and explore other

cognitive factors that may contribute to EBP implementation among the clinical nursing population.

The sample size in this study was a significant limitation. Though low response rates appear to be inherent to survey research (Safdar et al., 2017), replicating this study at another time may result in increased participation. The ongoing Covid-19 pandemic also needs to be considered a detriment to study participation. Clinical nurses are experiencing high stress, staffing shortages and anxiety (Temsah et al., 2021). This could account for the low participation rate in this study.

Time could be a limiting factor in this study. Extending the timeframe of the data collection and offering the study after the Covid-19 pandemic has ended may increase participation in the study, resulting in a better understanding of the influence of reflective thinking, NFC, and EBP beliefs have with EBP implementation practices in nursing. Further studies remain essential to identifying cognitive processes that foster EBP implementation to optimize patient outcomes.

Another contributing factor is the length of the survey. Because of the validated tools used for the different measurements in this study, the compilation resulted in a 53-item survey. While surveys are one of the most frequently utilized study designs in healthcare, long surveys tend to be problematic (Curtis et al., 2016; Safdar et al., 2017). The longer a research survey continues, the more likely respondents will tend to drop out or not fully answer all of the questions (Safdar et al., 2017). In this study, 38

respondents initiated the survey but did not complete the questions and had to be excluded. The length of the survey could have been problematic.

Additionally, the data received are based on self-reported responses. Even though survey studies are common in healthcare to measure a clinician's compliance, self-reported scales may overestimate actual behaviors, resulting in biased results which further complicates the data. (Curtis et al., 2016).

Finally, this study was restricted to a local healthcare organization. Even though three of the 11 hospitals within the organization were located within a neighboring state, it still restricted location making it difficult to generalize results to the entire nursing population.

The results of this study indicate low cumulative scores in reflective thinking among the small number of nurse respondents. Though this study did not indicate relationships between need for cognition and reflective thinking with evidence-based practice implementation, the literature indicates the necessary inclusion of metacognitive skills needed for complex thinking when using the EBP process. Metacognitive skills of analysis, synthesis and evaluation are necessary for EBP decision-making. In addition, the ability to think with complexity using metacognition is critical in transitioning from student to independent practitioner in a highly complex clinical setting. As Kuiper and Pesut (2004) noted, there needs to be altering perspectives between cognitive and

metacognitive thinking skills in clinical reasoning among healthcare professionals (Kuiper & Pesut, 2004).

The instruction of gaining effective metacognitive skills begins in formal education. Even though attention is primarily on the acquisition of content knowledge in nursing education, nursing education needs to strengthen the student's ability to think in complex care environments, and to improve upon the student's capacity to reflectively and critical think. A focus on metacognition in nursing education can build and strengthen cognitive and metacognitive skills in nursing students. Some metacognitive strategies to consider include concept mapping, reflection journals, thinking aloud opportunities, and questioning with immediate feedback to encourage the learner to become more reflective in their thought processes. Instructor led metacognitive prompts can also result in a student's increase in their knowledge and problem solving abilities. These are a few suggestions to enhance metacognitive abilities in nursing students that can prepare them for the transition into effective evidence-based practice.

Conclusion

Evidence-based practice is vital in supporting healthcare excellence. EBP is a complex process with multiple steps to analyze scientific evidence and integrate findings into clinical care. While EBP is advocated by many professional healthcare organization, there continues to be a gap in practice. It is important to understand why this gap continues. Because the EBP process steps involve questioning, searching,

analyzing, integrating, and evaluating, it is essential to understand cognitive factors involved with the EBP process. The aim of this study was to investigate the variables of reflective thinking, need for cognition and EBP beliefs with EBP implementation practices among nurses. While this study found a weak, positive correlation between nurses' EBP beliefs and EBP implementation, there was no relationship identified between NFC and reflective thinking with EBP implementation. However, the response to the survey was extremely low. In beginning to understand the cognitive processes associated with EBP implementation, more research is needed to determine the importance of specific cognitive factors that influences the success of the EBP process. It is important to understand the metacognitive strategies that will lead us towards an evidence-based nursing culture. Emphasizing educational strategies that highlight metacognitive knowledge and regulation of cognition may be a benefit to healthcare educators in teaching future nurses how to decipher complex clinical issues and effectively utilize the EBP process.

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Appendix A. Cognition and EBP Study Introduction.

There is evidence that supports evidence-based practice (EBP) improves patient outcomes, decreases costs, and fosters safety. Unfortunately, there continues to be a gap in clinical implementation. Understanding individual cognitive processes may reveal more about how to address the gap.

You are being invited to participate in a nursing research study being conducted at ProMedica to determine if there is a relationship between cognitive factors and EBP implementation practices. The specific aim of this study is to investigate need for cognition, reflective thinking tendency, and EBP beliefs with EBP implementation among registered nurses.

Your participation is voluntary and no personal identifying information is being collected, nor is your email linked to your responses in order to maintain your confidentiality. The survey will take approximately 20-30 minutes to complete. ProMedica IRB has approved this study. Please click on the link below to begin if you wish to participate.

If you have any questions or concerns, please contact Dr. Vicki Dagostino-Kalniz at (419) 530-4306 or Jennifer Micham at (567) 395-0701.

Thank you for contributing your information so research can understand the link between cognition and EBP.

Appendix B. Need for Cognition (NCS)

Likert scale
1 *(extremely uncharacteristic of me)* to 5 *(Extremely characteristic of me)*

1. I would prefer complex to simple problems.

1…….2…….3…….4…….5

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

1…….2…….3…….4…….5

3. Thinking is not my idea of fun. (R)

1…….2…….3…….4…….5

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities. (R)

1…….2…….3…….4…….5

5. I really enjoy a task that involves coming up with new solutions to problems.

1…….2…….3…….4…….5

6. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

1…….2…….3…….4…….5

Appendix C. Cognitive Reflection Test

1. If Jason can drink one barrel of water in 6 days, and Ashley can drink one barrel of water in 12 days, how long would it take them to drink one barrel of water together?
    - 4 days
    - 24 days
    - 12 days
    - 36 days

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
    - 5 minutes
    - 100 minutes
    - 20 minutes
    - 500 minutes

3. A bat and ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?
    - 5 cents
    - 10 cents
    - 9 cents
    - 1 cent

4. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?
    - 47 days
    - 24 days
    - 12 days
    - 36 days

5. Jenny received both the 15^{th} highest, and the 15^{th} lowest make in the class. How many students are in the class?
    - 29 students
    - 30 students
    - 1 student
    - 15 students

6. A man buys a piglet for $60, sells it for $70, buys it back for $80 and sells it finally for $90. How much has he made?
    - 20 dollars
    - 10 dollars
    - 0 dollars
    - 30 dollars

7. Simon decided to invest $8000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. At this point, Simon:
    - has lost money.
    - is ahead of where he began.
    - has broken even in the stock market.
    - it cannot be determined.

Appendix D. Evidence-based Practice Beliefs Scale

Below are 16 statements about evidence-based practice (EBP). Please circle the number that best describes your agreement or disagreement with each statement. There are no right or wrong answers.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I believe that EBP results in the best clinical care for patients.	1	2	3	4	5
2. I am clear about the steps of EBP.	1	2	3	4	5
3. I am sure that I can implement EBP.	1	2	3	4	5
4. I believe that critically appraising evidence is an important step in the EBP process.	1	2	3	4	5
5. I am sure that evidence-based guidelines can improve clinical care.	1	2	3	4	5
6. I believe that I can search for the best evidence to answer clinical questions in a time efficient way.	1	2	3	4	5
7. I believe that I can overcome barriers in implementing EBP.	1	2	3	4	5
8. I am sure that I can implement EBP in a time efficient way.	1	2	3	4	5
9. I am sure that implementing EBP will improve the care that I deliver to my patients.	1	2	3	4	5
10. I am sure about how to measure the outcomes of clinical care.	1	2	3	4	5
11. I believe that EBP takes too much time.	1	2	3	4	5
12. I am sure that I can access the best resources in order to implement EBP.	1	2	3	4	5
13. I believe EBP is difficult.	1	2	3	4	5
14. I know how to implement EBP sufficiently enough to make practice changes.	1	2	3	4	5
15. I am confident about my ability to implement EBP where I work.	1	2	3	4	5
16. I believe the care that I deliver is evidence-based.	1	2	3	4	5

Appendix E. Evidence-based Practice Implementation Scale

Below are 18 questions about evidence-based practice (EBP). Some healthcare providers do some of these things more often than other healthcare providers. There is no certain frequency in which you should be performing these tasks. Please answer each question by indicating the number that best describes how often each item has applied to you in the past 8 weeks.

In the past 8 weeks, I have:

	0 times	1-3 times	4-5 times	6-8 times	>8 times
1. Used evidence to change my practice.	0	1	2	3	4
2. Critically appraised evidence from a research study.	0	1	2	3	4
3. Generated a PICO question about my practice.	0	1	2	3	4
4. Informally discussed evidence from a research study with a colleague.	0	1	2	3	4
5. Collected data on a clinical issue.	0	1	2	3	4
6. Shared evidence from a study or studies in the form of a report or presentation to more than 2 colleagues.	0	1	2	3	4
7. Evaluated the outcomes of practice change...	0	1	2	3	4
8. Shared an evidence-based guideline with a colleague.	0	1	2	3	4
9. Shared evidence from a research study with a patient/family member.	0	1	2	3	4

10. Shared evidence from a research study with a multi-disciplinary team member.	0	1	2	3	4
11. Read and critically appraised a clinical research study.	0	1	2	3	4
12. Accessed the Cochrane database of systematic reviews.	0	1	2	3	4
13. Accessed an evidence-based guideline.	0	1	2	3	4
14. Used an evidence-based guideline or systematic review to change clinical practice where I work.	0	1	2	3	4
15. Evaluated a care initiative by collecting patient outcome data.	0	1	2	3	4
16 Shared the outcome data collected with colleagues.	0	1	2	3	4
17. Changed practice based on patient outcome data.	0	1	2	3	4
18. Promoted the use of EBP to my colleagues.	0	1	2	3	4