Spring 5-2019

Dispositional Mindfulness in Senior-Level Nursing Students: Examining the Relationship to Situation Awareness and Clinical Outcomes

Deborah L. Struth

DISPOSITIONAL MINDFULNESS IN SENIOR-LEVEL NURSING STUDENTS: EXAMINING THE RELATIONSHIP TO SITUATION AWARENESS AND CLINICAL OUTCOMES

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Philosophy

Deborah L. Struth

Indiana University of Pennsylvania

May 2019

Indiana University of Pennsylvania
School of Graduate Studies and Research
Department of Nursing and Allied Health Professions

We hereby approve the dissertation of

Deborah L. Struth

Candidate for the degree of Doctor of Philosophy

_____ _____
Lora K. Hromadik, Ph.D., RN
Associate Professor of Nursing and Allied Health Professions, Advisor

_____ _____
Riah L. Hoffman, Ph.D., RN
Assistant Professor of Nursing and Allied Health Professions

_____ _____
Jan K. Wachter, Ph.D.
Professor of Safety Sciences

ACCEPTED

_____ _____
Randy L. Martin, Ph.D.
Dean
School of Graduate Studies and Research

Title: Dispositional Mindfulness in Senior-Level Nursing Students: Examining the Relationship to Situation Awareness and Clinical Outcomes

Author: Deborah L. Struth

Dissertation Chair: Dr. Lora K. Hromadik

Dissertation Committee Members: Dr. Riah L. Hoffman
Dr. Jan K. Wachter

Experts in the study of ergonomics and human performance factors have described the 'collective mindfulness' of nurses as a critical element to the attainment of highly reliable safety within patient care delivery. Little research exists related to the construct of mindfulness and its impact on safe nursing practice and situation awareness by the nurse.

A mixed method, descriptive correlational study of 102 senior-level nursing students at two baccalaureate nursing programs was used to examine the relationship between dispositional mindfulness, situation awareness (SA) and the clinical competence of senior-level nursing students engaged in a simulated patient care experience. Results of this study indicate that human cognitive factors negatively impacted the participants' ability to focus attention, switch attention, and achieve SA necessary for quality and safe nursing care.

Quantitative analysis of study data revealed that self-reported dispositional levels of mindfulness did not correlate to the latent variable of clinical competence (r =0.099, n = 102, p = .320, 2-tailed) or SA (r = 0.091, n = 102, p = 0.363, 2-tailed); however, a weak correlation between the mindfulness facet of observing and the clinical competency of communication (r = .0.193, p = 0.053) was identified. Analysis of the relationship between SA and clinical competency revealed that overall higher levels of assessed SA were found to have a moderately strong, positive relationship with overall clinical competency scores (n =102, r = .301, p = .002, 2-tailed). The level of overall situation awareness demonstrated a positive correlation to three of

the four competency related sub-scales: assessment ($r = 0.212$, $p = 0.032$), communication ($r = 0.340$, $p = 0.000$), and clinical judgment ($r = 0.388$, $p = 0.000$). The qualitative findings identified two areas in which nursing students described lacking mindfulness in their clinical practice: focused attention (acting with awareness, observing) and effective communication skills (describing).

These findings provide implications to nurse educators regarding the impact of mindfulness and situation awareness on the clinical outcomes of students. The findings further suggest the inclusion of teaching/learning strategies within the curriculum to develop both mindfulness and situation awareness as non-technical skills needed for safe practice.

ACKNOWLEDGEMENTS

I am deeply appreciative of the time and effort that my dissertation committee members have made on my behalf. I want to recognize the guidance provided to me by my committee chairperson, Dr. Lora Hromadik. Her ability to listen carefully and help translate ideas into strategy moved my study forward. Dr. Hromadik also acted as a mentor for my professoriate practicum and her deep understanding of quality and safety concepts in nursing gave me the confidence to move forward with the development of this study. I thank Dr. Riah Hoffman and Dr. Jan Wachter for providing thoughtful and detailed feedback on the various drafts of my proposal and dissertation. Dr. Wachter challenged me to expand my understanding of safety and health care quality. Sharing his expertise in safety science added great value to the quality of this work and to my professional development. Dr. Hoffman's attention to detail was an outstanding asset to me as she pointed out numerous opportunities for me to clarify concepts and add rigor to this work. I am very thankful for the guidance and respectful feedback provided by this committee.

I must also express my gratitude to Dr. Suzan Kardong-Edgren, director of the RISE Simulation Center at Robert Morris University, and Dr. Johanna Boothby, coordinator of simulation education within the Department of Nursing and Allied Health at Indiana University of Pennsylvania. Both provided the support I needed to collect data from student participants assigned simulated care experiences in their laboratories. This support included the privilege of working beside outstanding simulation educators, including, Molly Schleicher and Dana Bargerstock at Robert Morris University and Lauren Succheralli at Indiana University of

Pennsylvania. Most importantly, I thank the 126 senior nursing students at both universities who graciously agreed to participate in this study. I will always remember their professionalism and enthusiasm for learning.

I want to recognize and thank the members of my dissertation cohort as our discussions and comradery during the course work in the program were an invaluable part of my experience at IUP. I also send special thanks to Dr. Donna McDermott and Mrs. Brenda Smith for providing me with expert consultation related to simulation education. Both reviewed my ideas for this study and provided feedback. Donna provided me an overview of the PEARLS debriefing method which was a key element of my study. My thanks to both of you!

Finally, I would like to thank my family for their unwavering support of me as I completed this endeavor. To my husband David and my children, Kelly, Daniel and Jennifer, I thank you for waiting patiently for me to finish and forgiving me for all the times I needed to say "no" to family or school activities in order to complete my dissertation. Your support helped me attain my goal. I love you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABC	Antecedent, Behavior and Consequence Model of Behavior Change
ACM	Accident Causation Model
AFI	Attentional Function Index
AT	Attentional Training
C-CEI	Creighton Competence Evaluation Instrument
CHF	Cognitive Human Factors
CME/CE	Continuing Medical Education/Continuing Education
CRCI	Cancer-related Cognitive Impairment
FFMQ	Five Facets of Mindfulness Questionnaire
HFE	Human Factors and Ergonomics
HRO	High Reliability Organization
IEA	International Ergonomics Association
INACSL	International Nursing Association of Clinical Simulation & Learning
IOM	Institute of Medicine
ISMP	Institute for Safe Medication Practices
LLI	Lucian Leape Institute of the National Patient Safety Foundation
MBCBT	Mindfulness-based Cognitive Behavioral Therapy
MBSR	Mindfulness-based Stress Reduction
MM	Mindfulness Meditation
MT	Mindfulness Training
NAM	National Academy of Medicine
PEARLS	Promoting Evaluation and Reflective Learning in Simulations

QD	Qualitative Descriptive
RCT	Randomized Control Trial
SAGAT	Situation Awareness Global Assessment Technique
SBAR	Situation Background Assessment Recommendation
SEM	Structural Equation Model
SOBP	Standard of Best Practice

CHAPTER I

INTRODUCTION

Medical errors have risen to the third leading cause of death in the United States behind heart disease and cancer (Makay & Daniel, 2016). An analysis of all published data on deaths from medical errors since 1999 suggests a mean annual death rate from errors of 251,454 (Makay & Daniel, 2016). This estimate far exceeds the original estimates of 44,000 – 98,000 deaths related to medical error published in the 1999 Institute of Medicine Report, *To Err is Human: Building a Safer Health System* (Institute of Medicine [IOM], 2000). Experts attribute this increase to better tools to measure and report medical errors even in the face of vast improvements in the understanding of clinical systems and patient safety (Berwick, 2015).

Unfortunately, methods of educating health professions students lag far behind what is needed to advance safe practice. A top recommendation of the National Academy of Medicine (NAM) in 2015 included increased funding for educational research aimed at identifying more effective methods of health professions education and continuing professional education related to human factors, safety science, and methods to incorporate the best available evidence into practice (NAM, 2015). The Lucian Leape Institute (LLI) within the National Patient Safety Foundation specifically identifies the need to reform quality and safety education in medical education to include, from "day one," curricula that "conceptualize and treat patient safety as a science that encompasses knowledge of error causation and mitigation, human factors concepts, safety improvement science, systems theory and analysis, systems design and redesign, teaming, and error disclosure and apology" (LLI of the National Patient Safety Foundation, 2016, p.27). Human factors, or ergonomics, is the scientific discipline concerned with the study of the interactions between humans and systems, and the application of theory, tools, and methods

designed to optimize human well-being and overall system performance (International Ergonomics Association [IEA], 2017).

Educating nursing students to the individual and system level factors leading to medical error falls to nursing faculty who may feel inadequately prepared to effectively educate nursing students to these constructs (Ebright, Patterson, Chalko, & Render, 2003; Henneman & Gawlinski, 2004; Pape et al., 2005; Roth, Wieck, Fountain, & Haas, 2015). Faculty in schools of nursing have begun to examine methods of incorporating content related to the science of human factors and ergonomics (HFE) into pre-licensure curriculum. Carayon (2010) describes three domains of HFE: 1. physical ergonomics, 2. cognitive ergonomics and 3. organizational ergonomics. However, the focus on human performance factors in curricula to date has targeted organizational HFE, such as teamwork and communication (Carayon, 2010) and physical HFE in which the physical characteristics of the work (nursing) are studied and designed to correct mismatched task requirements, such as patient lifting procedures necessary for back safety and injury prevention in the care team (Carayon, Xie, & Kianfar, 2013). There is limited nursing research to guide curricular development regarding teaching students about cognitive human factors and their impact on human attention, situation awareness and practice errors on the part of the nurse (Sitterding, Broome, Evertt, & Ebright, 2012; Xie & Carayon, 2015). This gap in the literature furthers challenges nurse educators in determining best teaching/learning activities to address human factors related to attention and awareness during patient care.

The literature reports that 80% of health care errors that reach the patient and result in harm may be attributed to cognitive human factors (CHF) (Pape et al., 2005; Sitterding et al., 2012) such as distracted practice (D'Esmond, 2016). Faculty need access to pedagogical tools that develop the non-technical skills of safe practice that may serve to mitigate the impact of

cognitive human factors, such as distracted practice (Carayon, 2010; D'Esmond, 2015; Henneman & Gawlinski, 2004) and cognitive overload (Sitterding et al., 2012; Spadaro & Hunker, 2016). One such practice may be the incorporation of mindfulness development techniques within nursing curriculum.

Mindfulness meditation, also known as mindfulness-based stress reduction (MBSR), mindfulness training (MT) and attentional training (AT), may represent curricular innovation necessary to develop the key safety skills of focused attention and awareness (Carayon, 2010; Ebright et al., 2003; Endsley, 2015; Roth et al., 2015). These skills are needed to combat the impact of cognitive human factors such as interruptions and distractions in practice. Distractions and interruptions are associated with medication errors and sub-optimal clinical decision making (Beaman, Hanczakowski, & Jones, 2014; Carayon et al., 2013; Currie et al., 2007; D'Esmond, 2016; Henneman et al., 2010; Jennings, Sandelowski, & Marks, 2011; Westbrook, Woods, Rob, Dunsmuir, & Day, 2010).

Mindfulness, a construct well-studied in the psychology discipline, represents the human ability of focused attention and present moment awareness of internal and external stimuli, in a non-reactive and non-judging manner (Bishop et al., 2004; Brown & Ryan, 2003; Kabat-Zinn, 1994). Specific attributes or 'facets' of mindfulness described in the literature include behaviors of observing, describing, acting with awareness, non-judging, and non-reaction. While humans are born with a level of inherent or dispositional mindfulness, decades of research in clinical and education psychology have demonstrated that not only can mindfulness be learned and enhanced with training (Beddoe & Murphy, 2004; Cohen-Katz, Wiley, Capuano, Baker, & Shapiro, 2005; Kabat-Zinn, 1994), it can be empirically measured (Baer et al., 2008; Brown & Ryan, 2003). With repeated practice of mindfulness meditation (MM), even individuals reporting high levels

of dispositional mindfulness demonstrate improvements in mindful attention and awareness (Baer et al., 2008) along with lower stress levels, less anxiety, improved sense of well-being (Brown & Cordon, 2010; Grossman, Niemann, Schmidt, & Walach, 2004) and improvement in cognition (Baer et al., 2008; Moore & Malinowski, 2009; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010).

This evidence suggests that skills training and education regarding mindfulness integrated throughout a baccalaureate nursing curriculum would not only provide nursing students a vehicle to deal with the stress and emotional reactivity associated with the work of the healthcare professional (Beddoe & Murphy, 2004; Cohen-Katz, Wiley, Capuano, Baker, & Shapiro, 2005; Horner, Piercy, Eure, & Woodard, 2014; Kabat-Zinn, 1994; Pipe et al., 2009; Shapiro, Schwartz, & Bonner, 1998; Spadaro & Hunker, 2016; Tusaie & Edds, 2009; White, 2013), it may also improve the nurse's ability to sustain focused attention and awareness (Anderson, Lau, Segal, & Bishop, 2007; Brown & Cordon, 2010; Drew, Vo, & Wolfe, 2013; Langer & Moldoveanu, 2000), improve working memory (Anderson, Lau, Segal, & Bishop, 2007), improve cognition, promote metacognition development (Chiesa, Calati, & Serretti, 2010; Johns et al., 2015; Spadaro & Hunker, 2016; Zeidan et al., 2010) and enhance psychological well-being (Brown & Ryan, 2003; Grecucci, Pappaianni, Suigzdaite, Theuninck, & Job, 2015; Horner et al., 2014; Tusaie & Edds, 2009). Wachter (2016) reported that one aim of educational strategies utilizing human performance tools would be reductions in error through development of heightened levels of situation awareness by workers. These are non-technical skills identified as necessary to mitigate cognitive human factors and thus enhance the safety of nursing practice and clinical decision making (Beaman et al., 2014; Carayon et al., 2013; Ebright et al., 2003; Feil, 2013; Killam, Luhanga, & Bakker, 2011; Roth et al., 2015).

Background

Mindfulness is an ancient construct traced back to the teachings of the Buddhist tradition (Beddoe & Murphy, 2004; Ludwig & Kabat-Zinn, 2008; Bishop et al, 2004; Cohen-Katz et al.2004). In attempt to help man ease the burdens of life in ancient times and develop empathic, caring behaviors within their culture, practitioners of mindful meditation practiced focused attention in a non-judgmental manner (Lugwig & Kabat-Zinn, 2008; Jha, Krompinger & Baime, 2007). Non-judgmentally accepting one's self and acknowledging one's thoughts without letting negative self-talk distract or overwhelm the lived experience were key goals of the practice (Kabat-Zinn, 1994). In fact, mindfulness meditation developed from a contemplative tradition referred to as vipassana, which means to see clearly (Cohen-Katz, 2004; Baer, 2003). Unlike other forms of meditation, mindfulness meditation does not promote relaxation but alertness and focused attention (Beddoe & Murphy, 2004; Kabat-Zinn, 1994; Bishop, 2002) often described as an attempt to fall awake (Kabat-Zinn, 2018). This permits the individual to direct attention to novel situations (Langer & Moldeveanu, 2000) and review streams of conscious thought along with internal and external stimuli as they occur (Baer, 2008). The mindful individual deliberately acknowledges psychic events and refocuses attention to the present moment without judgment or emotional interference from these thoughts (Ortner, Kilner, & Zelazo, 2007; Jha, Krompinger & Baime, 2007, Kabat-Zinn, 1994). Additional attributes of mindfulness include "dispassionate, nonevaluative and sustained moment to moment awareness of perceptible mental states and processes" (Grossman, Niemann, Schmidt, & Walach, 2004, p.36).

Contemporary exploration of the construct of mindfulness needs to include a description of the antithesis of mindfulness – mindlessness. Psychologists describe rote, repetitive behaviors, or "autopilot" in which automaticity of action and thought is experienced (Kabat-Zinn, 1994).

The term mindset is also used to describe patterns of mindless behaviors (Langer & Moldoveanu, 2000). These classic descriptions of mindlessness parallel descriptions of human factors associated with lapses in decision making, critical thinking and error.

Humans engaged in mindless behavior often fail to attend to additional information or novel situations in the context of completing a task (Langer & Moldoveanu, 2000). Langer & Moldoveanu (2000) describe mindlessness from the focus of educational psychology and learning, describing education as replete with mindless activities for students. Ergonomic scientists also describe similar issues through the lens of safety science. Mindlessness increases the likelihood that pertinent information about a situation is lost or normalized (Weick & Sutcliffe, 2007). Normalization is the over-simplification of issues or problems in one's personal or work life (Langer & Moldeveanu, 2000; Weick & Sutcliffe, 2007; Weick, Sutcliffe & Obstfeld, 1999). The science of human factors also describes a phenomenon called normalized deviation or drift as a form of mindless behavior which leads to error (Carayon, 2007).

A clinical example of normalized deviation or drift that a nursing student might observe is the acceptance of a physiologic value – such as tachycardia – as "normal" for a certain patient. The risk to the tachycardic patient is increased as normalization of resting tachycardia might limit the further evaluation and intervention related to this abnormal finding by the nurse. The risk to safe, future practice by this nurse is that this normalization is generalized and becomes a mindset such that the significance of resting tachycardia becomes simplified and dismissed as acceptable for all patients.

In its most basic form, mindlessness is failed attention, with resultant loss of situation awareness to the changing nuances presented in changing or evolving situations (Endsley, 1995; Langer & Moldeveanu, 2000; Weick & Sutcliffe, 2007). Failed attention and loss of situation

awareness resulting in loss of focus (Roth et al., 2015) and disruption of critical thinking (D'Esmond, 2016) and nursing process (Potter et al., 2005) as described by nurses in practice who had experienced human factors contributing to nursing error in the acute care setting.

Nursing educators need greater understanding of cognitive human factors, their contribution to nursing error (Carayon, 2010; Roth et al., 2015), and evidence-informed teaching practices to fully influence student understanding of safety science and the nurse's role in identification and mitigation of medical error (Henneman & Gawlinski, 2004). Nursing research reports the lack of data available for faculty to use for curriculum development to teach nursing students the skills of patient surveillance, identified as pre-requisite for nursing practice for error prevention and recovery (Henneman et al., 2010; Sitterding et al., 2012). Specifically, research is needed to more fully understand the relationship between the psychological construct of mindfulness, the HFE theory of situation awareness, competent entry-level nursing practice and clinical outcomes to support the proposition for implementation of mindfulness training as an HFE innovation throughout the undergraduate nursing program of study.

This chapter will examine: (1) the issues of cognitive human factors related to distracted practice, cognitive workload, and psychological well-being and the impact on safe practice, and (2) the incorporation of mindfulness training as a non-technical skill and an antecedent to mindful behavior (or the state of mindfulness) with a consequence of reduction of errors on the part of the nurse. This chapter will also discuss James Reason's (1995) Accident Causation Model (ACM) and Swiss-Cheese Model of Organizational Errors as a framework for this study.

Statement of the Problem

Kalisch (2015) reports that nursing care "routinely fails to deliver its potential benefits" related to behaviors including lack of surveillance, missed nursing care (errors of omission), incivility directed at peers, failing to listen to patients and families, and lack of goal directed care planning (p.7). At the same time, there is little empirical data regarding the types of errors and near miss events that nursing students commit while involved in the clinical practicum experience (Disch & Barnsteiner, 2014) and no literature addressing the consequences of errors committed by nursing students. Safety science experts note the lack of evidence regarding "the positive impact of HFE interventions on the quality and safety of patient care" (Carayon, 2010, p.600), even while evidence identifies cognitive human factors as accounting for as much as 80% of the factors leading to medical error (Carayon, 2010; D'Esmond, 2016; Westbrook et al., 2010). Such research data could be beneficial in guiding curriculum development and the selection of instructional activities to achieve crucial programmatic outcomes related to mindful nursing practice. Teaching/learning activities regarding HFE and safety science represent crucial content for undergraduate nursing students (Disch & Barnsteiner, 2014).

Novel educational interventions addressing human responses to distractions, interruptions, cognitive workload and failed attention are necessary to advance safety science in cognitive human factors and inform nursing education (Cooper et al., 2010; Henneman et al., 2010) and practice (D'Esmond, 2016; Westbrook, 2013). Such interventions may facilitate the development of mindful nursing practice as a non-technical skill to support competent nursing practice.

Purpose

The purpose of this mixed method, descriptive, correlational study was to examine the relationship among dispositional mindfulness, situation awareness and the clinical outcomes of senior-level, baccalaureate nursing students. Key to defining the relationship between these variables was to determine if mindfulness is an antecedent to the desired behavior of situation awareness on the part of the nursing student. The resultant consequence is safe care delivery on the part of the nursing student. If this relationship were validated it would support the assumption that mindfulness training is an antecedent to situation awareness (behaviors) that is reinforced by the consequence of competent clinical practice on the part of the student. This evidence would provide support for the use of the ABC (Antecedent, Behavior, and Consequence) Model of Behavior change in the development of a pedagogical practice in which nurse educators work to reinforce mindfulness in practice (desired behavior) by providing mindfulness training as an antecedent, and, in which debriefing and reflective exercises highlight the consequences of mindfulness with review of clinical outcomes of care on the part of nursing students.

Significance

HFE is increasingly viewed as innovation to address the complex issues of patient safety in health care organizations (Carayon, 2010); however, the impact of incorporation of HFE tools, methods and theories into patient safety programs has not been rigorously evaluated (Carayon, 2010). The goal of HFE science is to improve system performance and optimize human wellbeing (Carayon, 2010). Based on the goals of HFE, Carayon (2010; 2016) proposes that the aim of HFE innovation would be that of improving task performance through mitigation of organizational, cognitive and physical human factors. The development of novel educational interventions to improve the task performance of undergraduate nursing students during clinical

experiences may then meet the criteria as HFE innovation also. Based on extensive research, mindfulness is a tangible behavior from which the human ability for focused attention and awareness are developed. Mindful behaviors on the part of the nurse may potentially improve the skill of patient surveillance and levels of situation awareness, needed for safe practice (Sitterding et al., 2012; Stubbings, Chaboyer, & McMurray, 2012).

A recent study of the concept of distracted practice proposed a model to explain the cognitive impact of distractions on health care professionals (D'Esmond, 2016). D'Esmond (2016) defined distracted practice as the "diversion of a portion of available cognitive resources that may be needed to effectively perform or carry out the current activity" (p.66). Cognitive resources include working memory and knowledge retrieval capabilities during cognitive work (D'Esmond, 2015) (figure 1). Distractions may originate within the environment or within the internal thought streams on the part of the student. Mindfulness involves the ability to monitor internal and external stimuli and objectively consider whether to refocus attention on the task at hand or shift attention to a new focus, presumably with situation awareness of salience within the event (Tusaie & Edds, 2009).

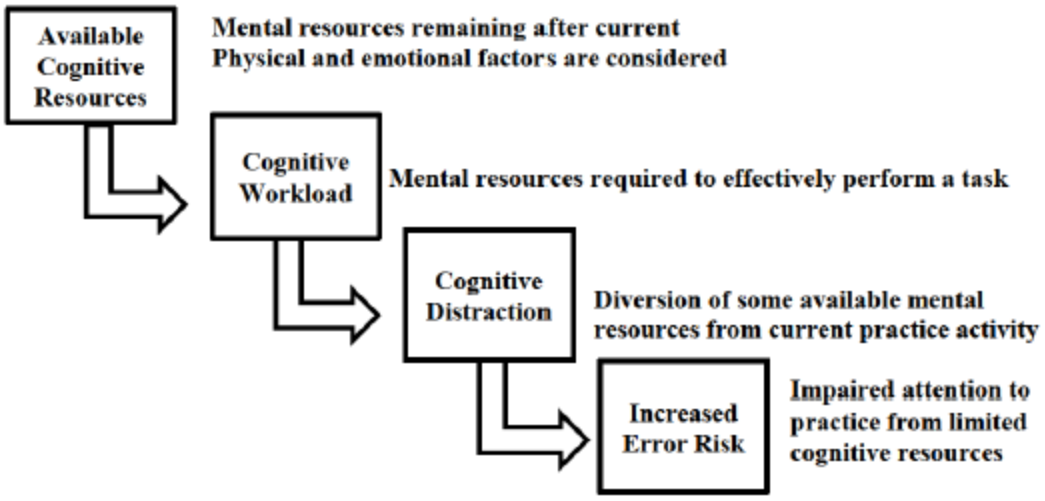


Figure 1. Distracted practice in healthcare model. Used with permission from "Distracted practice: A concept analysis," by L. D'Esmond, 2015, November 25, *Nursing Forum,* p.4 (Appendix K).

Anxiety and stress are described as contributing to decreased cognitive resources (D'Esmond, 2016). Healthcare workers, who agreed to participate in a qualitative, descriptive study of distracted practice in an academic teaching hospital, reported that distractions interrupted their critical thinking and when this occurred errors of omission were common (D'Esmond, 2016). D'Esmond describes the experience of distracted practice in this manner: "In the moment of distracted practice, the healthcare team member shifts away from thinking critically, being able to complete tasks without error, to NOT thinking critically and working in automatic mode. This is when study participants described errors occurring." (D'Esmond, 2016, p.58). This observation is consistent with findings from the study of medication errors by nursing students. The most frequent causes of medication errors by students were not system errors, but human performance deficits (human errors) (Valdez, Guzman, & Escolar-Chua, 2012; Wolf, Hicks, & Farley Serembus, 2006) with both errors of execution (slips and lapses) (Cooper et al.,

2010; Wolf et al., 2006) problem-solving and planning (mistakes) (Henneman et al., 2010; Valdez et al., 2012).

Conceptual Framework: Accident Causation Model

The Accident Causation Model (ACM) describes the development of an organizational accident or error (Reason, 2995). The model describes both organizational and human factors that contribute to an error. Reason (1995) defines an error as the failure of planned actions to achieve desired goals. Within the context of human error, there are specific psychological antecedents underpinning error (Reason, 1995). Human errors are described in terms of either the presumed cause (causal) or outcome (consequential) with the later most typically used to describe accidents in healthcare (Reason, 1995). The examples of consequential labeling of healthcare errors given by Reason (1995) include description of the "proximal actions" contributing to the error such as wrong medication administered or the transection of a coronary artery during percutaneous intervention (82). However, when examining unsafe acts on the part of humans and the related contribution to organizational accidents, the ACM identifies causal agents (slips, lapses and mistakes, errors and violations) as critical to understanding the origins of human error. It is important to note that these causal agents each have a different psychological antecedent and countermeasure (Reason, 1995, Wachter & Yorio, 2013).

Whatever the causal agent of human error, Reason's ACM (1995) describes that "human behavior – for good or ill – clearly dominates the risks to modern technological systems – medical or otherwise", and human error is the most difficult to address as policies and procedures (p.80). In addition, the literature reports that training and education are not effective in preventing these causal agents of psychological origin (D'Esmond, 2016; Henneman et al., 2010; Reason, 2000; Sitterding et al., 2012).

This study examined the relationship between a nursing student's dispositional mindfulness measured across the five attributes or facets of dispositional mindfulness (observing, describing, acting with awareness, non-judgmental, and non-reaction) (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) and level of situation awareness (perception, comprehension, and prediction) (Endsley, 2000) during a patient care experience, and competency of clinical outcomes as demonstrated by skills of patient assessment, clinical judgment, patient safety, and communication (Hayden, Keegan, Kardong-Edgren, & Smiley, 2014). Exploration of the nursing students' perceptions of slips, lapses, and mistakes provided qualitative data regarding student awareness of preconditions to and the experience of error or near-miss during clinical practicum experiences.

Specific Aims and Related Research Question(s) (RQ)

The specific aims of this study were to:

1. Describe the relationship between dispositional mindfulness and level of situation awareness demonstrated by senior level nursing students in a simulated patient care scenario that meets the International Nursing Association for Clinical Simulation and Learning (INACSL) Standards of Best Practice: Simulation^{SM} (2016) within the curriculum to answer the research questions:

    RQ1: What is the relationship between dispositional mindfulness (as measured on the Five-Facets of Mindfulness Questionnaire) and level of situation awareness (as evaluated using the Situation Awareness Global Assessment Tool) during simulated patient care delivery?

    RQ2: Is situation awareness a mediator between mindfulness and clinical competency?

2. Explore the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students in a simulated care scenario that meets the INACSL Standards of Best Practice: Simulation^{SM} (2016) within the curriculum and answer the following research question:

RQ3: What is the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students during simulated patient care delivery?

3. Determine which of the five facets (attributes) of dispositional mindfulness (observing, describing, acting with awareness, non-judging, non-reacting) are most predictive of safe/competent clinical practice in a simulated care scenario that meets the INACSL Standards of Best Practice: Simulation^{SM} (2016) within the curriculum as measured by the Creighton Competency Evaluation Tool (C-CEI) and answer the following research question:

RQ4: Which of the five facets (attributes) of dispositional mindfulness are most predictive of competent clinical practice in the areas of assessment, safety, communication and clinical judgment?

4. Provide a descriptive summary of themes identified by nursing students as they self-assess their clinical performance and outcomes and provide insights into the experience of errors (slips, lapses, and mistakes) during simulated practice and answer the following research questions:

RQ 5: What themes are identified by nursing students describing perceptions of their clinical outcomes and insights into errors using a metacognitive/reflective approach within the PEARLS Model of Debriefing?

5. Evaluate a recursive Structural Equation Model (SEM) in which situation awareness is a mediator between mindfulness and clinical competency on the part of the nursing student.

Overview of Methodology

A cross-sectional, mixed-method descriptive study was utilized for this study of the phenomenon of mindfulness. A mixed-method design was selected to enhance the validity of this study by using multiple and complementary data types (Polit & Beck, 2012). Mindfulness is both a cognitive process and human experience framing consciousness. The examination of a complex phenomenon for which there is little scientific evidence from the perspective of nursing practice and nursing education pedagogy is best accomplished with a practical approach to selecting whichever study approaches best answer the research questions (Polit & Beck, 2012).

This study utilized the Five-Facets of Mindfulness Questionnaire (FFMQ) developed by Baer in 2004, the Situation Assessment Global Assessment Technique (SAGAT) developed by Endsley in 2000, and the Creighton Competency Evaluation Instrument (C-CEI) developed by Hayden and colleagues (2014) and utilized in the National Council of State Boards of Nursing (NCSBN) National Simulation Study. Qualitative descriptive data was collected during debriefing with nursing students utilizing a scripted set of questions within the PEARLS Model for Debriefing (Eppich & Cheng, 2015). A convenience sample of 102 full-time, senior level nursing students from two baccalaureate nursing programs in Pennsylvania participated in this study.

Operational Definitions

This section provides a definition of terms that were pertinent to this research study. Those definitions include:

Error: Failure of a plan to reach its intended goal either through execution failure or planning failure (Reason, 1995) or using the wrong plan to achieve an aim (Henneman et al., 2010).

Simulated care environment: A patient care environment authentically recreated in a laboratory setting in which health professions students may engage in high fidelity re-creation of actual patient care situations (Henneman et al., 2010).

Slips: Are actions guided by a correct plan or intention but failed to produce the expected outcome (Wachter & Yorio, 2013).

Skills-based error: Skills-based errors result from misapplied competencies in which the actor is distracted or inattentive while operating in an automatized (autopilot) mode of behavior (Wachter & Yorio, 2013).

Rule-based error: Failures of expertise, such as not applying rules or policies correctly or using substandard rules to guide behavior (Wachter & Yorio, 2013).

Knowledge-based error: Errors of failed knowledge in which the actor does not have knowledge to make sound decisions in dynamic or changing situations (Wachter & Yorio, 2013).

Lapses: Lapses are missed actions or omissions often associated with a memory failure or inattention (Wachter & Yorio, 2013) or failure to recognize the significance of a finding or change (Reason, 1995).

Mistakes: Actions planned based on a goal or objective that execute perfectly but were not adequate to achieve the goal in the first place. Mistakes represent high level cognitive processing failures including planning, formulating interventions, problem solving and

decision making. Mistakes fall into three sub-categories: skill based, rule based, and knowledge based (Henneman et al., 2010; Rasmussen & Vicente, 1989; Reason, 1995).

Near Miss – "An event, situation, or error that took place but was captured before reaching the patient" (ISMP, 2005)

Mindfulness – The deliberate, self-regulation of attention with present moment awareness and non-judgmental mindset. Mindful individuals are able to examine internal and external stimuli without emotional reaction thus decreasing the experience of stress and anxiety related to the stimuli (Bishop et al., 2004; Brown & Ryan, 2003; Kabat-Zinn et al., 1992)

Dispositional Mindfulness – The baseline or innate level or degree to which an individual demonstrates mindfulness or the tendency to act in a mindful way (Baer et al., 2004).

Distraction – "A diversion of cognitive resources that draws some attention away from the current activity (primary focus), making it difficult to think clearly, focus or pay attention" (D'Esmond, 2015, p.4).

Practice – "The acceptable performance (according to standards and competency) of the duties and responsibilities associated with the position [student nurse role] one is to perform" (D'Esmond, 2015, p.5).

Mindful [Nursing] Practice – A practice state in which the nurse has developed skills of focused attention through mindfulness training to enhance situation awareness and improve clinical decision making and outcomes of care.

Situation Awareness (SA) – "The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" (Endsley, 2000, p.36). This model presents a 3-level hierarchy of SA that is widely accepted: Perception, Comprehension and Prediction (Endsley, 2000; Sitterding et al., 2012).

Human Factors and Ergonomics (HFE): "Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of the system and the profession that applies theories, principles, data and methods to design in order to optimize human wellbeing and overall system performance" (International Ergonomics Association [IEA], 2017).

Cognitive Human Factors (CHF): One of the three domains of ergonomics "concerned with mental processes, such as perception, memory, reasoning, and motor response as they affect interacts among humans and other elements of a system. Relevant to this construct are mental workload, decision making, skilled performance, human-computer interaction, human reliability, work stress, and training as they may relate to human-system design" (IEA, 2017).

Assumptions

The following beliefs regarding the phenomenon of mindfulness were assumed for the purposes of this study:

1. Mindfulness, as a disposition of one's personality, can be measured by valid and reliable tools;
2. Mindfulness promotes (is antecedent to) situation awareness and SA mediates clinical outcomes/competency through enhanced surveillance abilities to overcome the attention and recognition factors associated with slips and lapses;

3. The consequence of mindfulness is the reduction of human precursors of errors with resultant reduction in cognitive error and mistakes;

4. Mindfulness is a metacognitive process and as such enhanced mindfulness increases awareness of the internal and external environment in the present moment; thus, as the literature suggests, mindfulness is a construct represented by the phenomenological school (Brown & Cordon, 2010); and,

5. Safe clinical practice of nursing students can be evaluated and measured using valid and reliable instruments in a simulated care environment.

Summary

This study examined the relationship between the dispositional mindfulness of senior level nursing students, the student's level of situation awareness and overall clinical competence demonstrated by the student in the areas of patient assessment, communication skills, patient safety, and clinical judgment. The Accident Causation Model was used as a theoretical framework to support the study. This chapter included the background, problem statement, significance, theoretical framework, research questions, definition of terms, and assumptions for the study.

The following chapter provides a review of the literature regarding current understanding of the constructs of mindfulness and findings from research across disciplines studying the construct. This literature review also examines SA and its influence on safe nursing practice, provides an operational definition of SA for nursing and studies of SA in nursing students. A review of the science of HFE in health care and the Accident Causation Model (ACM) care is

also examined. The literature describing the development and psychometric testing of the instruments used to measure the constructs in this study are described. These include the FFMQ, SAGAT, C-CEI, and PEARLS Debriefing Model.

CHAPTER II

LITERATURE REVIEW

This chapter begins with an examination of the role of error precursors in the causation of accidents and near-miss events in the clinical environment. The Accident Causation Model (ACM) that was used as a theoretical framework for this study will be reviewed. The literature describing studies of errors and near-miss events in nursing practice and in the practice of nursing students are presented to illustrate the relevancy of the ACM to nursing errors, particularly medication errors, the most common medical error committed by a nurse or nursing student (Dilles et al., 2010; Wolf et al., 2006).The second area of this review is the phenomenon of mindfulness from its earliest identification in contemporary literature as an educational construct (Langer & Moldoveanu, 2000) through the extensive examination of mindfulness in the disciplines of psychology and medicine. An appraisal of studies in which mindfulness training is utilized as a clinical intervention and means to enhance attention, decrease stress and enhance performance in medical students, nursing students, and health professionals in practice is presented. Finally, the literature pertaining to the scientific development of methods for quantitative measurement of mindfulness, situation awareness and clinical competence along with the use of qualitative descriptive methods are reviewed. This review of the literature highlights the gaps in nursing's knowledge of human errors and near-miss events and nursing pedagogical practices specifically related to mindfulness, unsafe acts and competent nursing practice.

Conceptual Framework: The Accident Causation Model

Every system, clinical or otherwise, has safeguards designed into operations to protect those operations and the people with whom the system interacts (Reason, 2000). In health care, systems can be redundant, with the same aim, but some of these redundancies are technology based while others rely on human operators. Reason (2000) likens each layer of defense as a piece of Swiss cheese, in which the holes in the cheese open and close depending on the status of the defensive layers of the system. The holes in the cheese open for only two reasons in this model – an active failure (human performance related) or a latent condition (inadequate decisions on the part of top management) that inform the system design and lie dormant until they combine with some unanticipated trigger with damaging consequences (Reason, 1995).

Active failures are typically immediately impactful on the clinical outcome in medicine. Latent conditions may lie dormant within the system for long periods of time and emerge in some provoking situation such as performing an accident investigation. Reason (2000) reports that latent conditions can be identified and corrected prior to an adverse effect; however, if left to evolve into incident, a latent condition often has two consequences: 1. the latent condition will translate into a practice error within the clinical environment (Swiss cheese holes represent failures in defenses) and 2. they may have long lasting effects on the system (holes in the cheese stay open a long time and weaken safeguards in place). A nuance of the ACM with significance to healthcare environments is the issue of trust – as workers within the system begin to view defenses as untrustworthy these feelings tend to spread, potentially affecting teamwork, morale and the organizational culture of safety (Reason, 2000). Reason (2000) notes that corrective action of active failures through human intervention has been largely ineffective and the ACM supports a system-wide approach to workplace safety that addresses causes of latent failures.

More contemporary examination of safety theory suggests that all organizational errors represent latent failures and require a systematic approach to management, including employee engagement in safety (Wachter & Yorio, 2013).

Execution and Planning or Problem-Solving Failure

To better understand the causality of human error, the ACM describes the failure of planned actions to achieve their desired goal. Some errors represent plans that are adequately designed by the human actor but fail to work as intended. These errors are failures of execution and are referred to as slips and lapses (Reason, 1995). Specifically described by Reason (1) slips that relate to observable actions and are associated with attentional failures; (2) lapses that are internal events and often related to memory failure (p.81). Slips and lapses are associated with times when an individual is engaged in a task in "auto-pilot" mode or mindlessly engaged. Reason (1995) suggests that "Slips and lapses…are almost invariably associated with some form of attentional capture, either a distraction from the immediate surroundings or preoccupation with something in the mind" (p.91). Thus, the model of distracted practice (Figure 1) described by D'Esmond (2015) would represent a pre-requisite experience prior to slip or lapse. Figure 2 provides a graphic of the ACM related to the psychological components of human error or cognitive human factors.

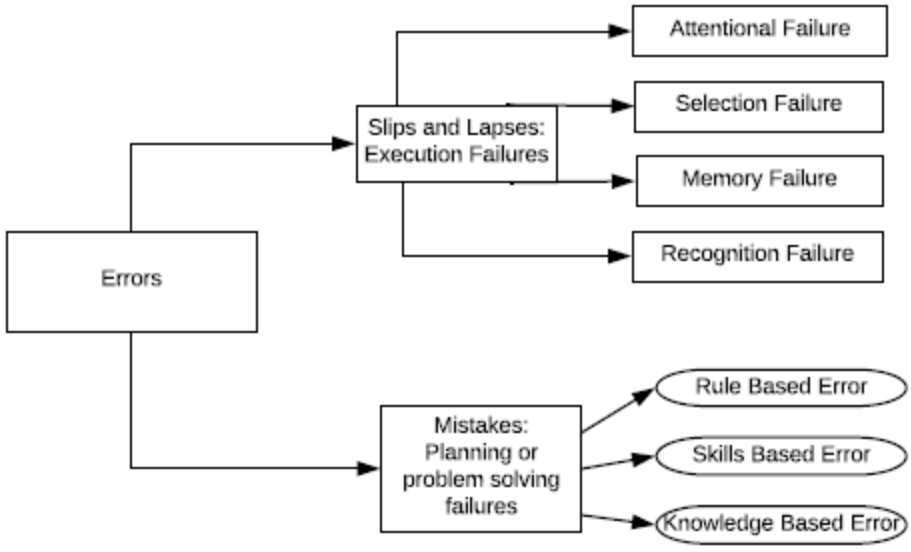


Figure 2. Accident causation model. The model outlines the psychologic elements of human error including failures of execution and failures of planning or problem solving. Adapted from "Understanding adverse events: Human factors," by J. Reason, 1995, *Quality in Health Care, 4,* p. 83.

Mistakes are those plans that execute exactly as designed by the human actor, but the plan was never adequate to achieve the intended goal or outcome (Reason, 1995). Mistakes are further sub-categorized as skills-based, rule-based and knowledge-based (Table 1). The foundation of an undergraduate nursing curricula is built on providing the technical skills and competencies needed to develop safe practice in which the potential for these categories of mistakes are minimized. Non-technical skills, such as MT, are the part of the curricula used for development of quality and safety competency in nursing students that serve as facilitators of competent nursing practice (Cronenwett et al., 2007). Mindfulness may serve to mitigate the impact of distracted practice on cognitive errors through increased ability for focused attention, situation awareness, attention shifting and cognitive flexibility. The mindful behaviors of emotional regulation and diminished reactivity to internal and external stimuli would be

considered as beneficial in optimizing available cognitive resources (Figure 1) by reducing common error precursors.

Table 1

Sub-Categories of Mistakes

Category	Description	Clinical Example
Skills-Based Mistake (Error)	An error that occurs during a routinize task that typically does requires little or no attention to the task (automatized) (Henneman et al., 2010). Optimized motor skills in which speed-accuracy trade-offs define acceptable performance (Rasmussen & Vicente, 1989)	Unlikely level of error for a nursing student as skills are so new, focused attention and sequential processing are necessary (Henneman et al., 2010) for the nursing student. An expert nurse skilled in venipuncture skills unexpectedly experiences a blood exposure when the inner cannula of a new needle system does not disengage as expected as part of the automated schema under which the nurse operates.
Rule-Based Mistake	Errors of inadequate habits (Reason, 2000), including failure to follow a systematic verification process. These errors fall into four categories: 1. coordination 2. verification 3. monitoring 4. intervention	Failure of a nursing student to follow the systematic verification process of patient identification and/or allergies prior to medication administration to a patient (Henneman et al., 2010)
Knowledge-Based Mistakes	Occur when one encounters a novel situation for which the search for solutions "may lead to acts which are judged as errors after the fact" (Rasmussen & Vicente, 1989)	Knowledge deficits prevail the transition to practice for students and novice nurses (Henneman et al., 2010). Thus, application of this level of cognitive control may be applied inappropriately. However, a knowledge-based mistake would occur when clinical knowledge is not possessed by the nurse or the knowledge was applied incorrectly due to incomplete mental models (Henneman et al., 2010; Rasmussen & Vicente, 1989; Reason, 1995))

Note. A mistake often executes exactly as planned. The failure that occurs with a mistake is a higher-level cognitive event involving planning, formulating goals, clinical judgment and problem solving

One small study examining the senior-level nursing student's ability to identify and recover errors deliberately incorporated into a simulated care environment reported that 100% of the sample (n=50) committed at least one rule-based error (Henneman et al., 2010). Medication administration wad one area where the complex cognitive work of the nurse is vulnerable to error (Jennings et al., 2011). Early education of nursing students to the mindful behaviors in nursing practice may result in fewer errors in practice; however, this area has not been well addressed (Jennings et al., 2011). Efforts to decrease errors and improve medication safety and safety of other complex cognitive tasks of nursing practice have focused on streamlining processes and making medication administration an "interruption free zone" for the nurse (Hallman, O'Connor, Hasenau, & Brady, 2014; Pape et al., 2005).

A large observational study at two academic teaching hospitals involved recording of interruptions as 4,271 medications were administered to 720 patients. Clinical error rates (wrong medication) and procedural failures (patient identification) were recorded. Even without interruptions, the rate of procedural failures was 69.6% and clinical error rate was 25.3% (Westbrook et al., 2010). Years of experience was NOT associated with lower clinical error rates and WAS associated with higher procedural failures. Approaches to stop interruptions did not necessarily impact distractions and emotional reactivity and thus have been only modestly effective in improving the safety of nursing care (D'Esmond, 2016; George, Henneman, & Tasota, 2010; Westbrook et al., 2010). Novel educational interventions addressing human responses to distractions, interruptions, cognitive workload and failed attention are necessary to advance safety science in cognitive human factors and inform nursing education (Cooper et al., 2010; Henneman et al., 2010) and practice (D'Esmond, 2016; Westbrook, 2013). Such

interventions may facilitate the development of mindful nursing practice as a non-technical skill to support competent nursing practice.

Precursors to Error

The chain of events leading to an error or near miss event on the part of a nursing student may include any of the common error precursors (Table 2).

Table 2

Common Error Precursors

Worker Characteristics	Timing and Work Characteristics	Procedure-, Instruction- or Communicated-Related
Time Pressure/Being Behind Schedule	End-of-Shift Work	Vague work guidance or instructions; vague misleading or poor communication
Mental Pressure	Returning to work after being off 4 days	Procedure users must make decisions without appropriate levels of guidance for decision making.
High Workload Pressure	Non-normal conditions	Procedure users have multiple options for choosing course of actions.
Fatigue	Non-routine work	Procedure users have options for choosing next course of action contingent on conditions, which requires decisions as to whether these conditions are present.
New/Unfamiliar to a Task	Distractions present	Procedures have multiple actions included in the same step.
Multitasking	Difficult task	Procedures have embedded actions which could be easily missed
Distracted		
Overconfidence		

Note. Adapted from "Current practices related to use of human performance improvement & worker engagement tools," by J.K. Wachter and P.L. Yorio, 2013, *Journal of Safety, Health & Environmental Research, 8,* p. 74.

Human precursors, such as distraction or fatigue, are the most difficult factor within a developing accident to control and will often continue to influence the events of error or near miss well into the evolving situation (Rasmussen & Vicente, 1989; Reason, 1995; Reason, 2000). Reason (1995) suggests that when these preconditions exist, they increase the likelihood that an error will cause patient harm. Between 2013 and 2016, a sample of 10,688 registered

nurses and nursing students completed the American Nurses Association Health Risk Assessment (2017), which included several items evaluating occupational safety through the filter of workplace wellness and included questions regarding the 'health' of the RN work environment. While 90% of these nurses reported that they were aware of the organizations workplace safety programs and 80% felt that their employers valued their dignity and respect, respondents perceived that the stress of the clinical environment was a significant risk to the nurses' safety and well-being. Eighty-two percent of these nurses reported that they were "at significant [health] risk" related to workplace stress. As a precursor to error this occupational risk then extends to patients cared for by those nurses.

The Phenomenon of Mindfulness

Merriam-Webster dictionary (2017) defines mindful as "bearing in mind; are inclined to be aware" and mindfulness as "the quality or state of being mindful and/or the practice of maintaining a nonjudgmental state of heightened or complete awareness of one's thoughts, emotions, or experiences on a moment to moment basis; such a state of awareness." An inclination to be aware does frame an attribute of mindfulness; however, through the eyes of a psychologist, mindfulness is tangible. Mindfulness is a means of describing a cognitive process with a steadily expanding body of evidence to support its physiologic significance through neurobiological study and imaging (Brown & Cordon, 2010; Jra, Krompinger, & Baime, 2007; Grecucci et al., 2015; Moore & Malinowski, 2009; Ortner, Kilner, & Zelazo, 2007; Zeidan et al., 2010).

Mindfulness is described as "the process of drawing novel distinctions" (Langer & Moldoveanu, 2000, p.1), "responding skillfully to mental processes that contribute to emotional distress and maladaptive behaviors" (Bishop et al., 2004, p.230) and "paying attention in a

particular way, on purpose, in the present moment and non-judgmentally" (Kabat-Zinn, 1994, p.4).

In 2003, an operational definition of mindfulness was proposed at an international meeting of psychologists (Bishop et al., 2004). These experts proposed a two-component model of mindfulness: the first component addressed the self-regulation of attention and the second component involved the orientation of one's experience in the present moment.

Attentional focus as experienced by humans is sustained for about 10 seconds (Tusaie & Edds, 2009). Mindfulness involves training intended to help participants regulate their focus of attention and sustain that attention (Bishop et al., 2004). This notion of sustained attention refers to the ability to "maintain a state of vigilance over prolonged periods of time" and the ability to intentionally switch attention back and forth between "thought, feeling and sensation" (Bishop et al., 2004, p.232), all of which can be objectively measured and have been validated as an outcome of mindfulness training (Bishop et al., 2004; Brown & Cordon, 2010; Grecucci et al., 2015; Moore & Malinowski, 2009).

This operational definition of mindfulness identifies the phenomenon as a metacognitive skill (Bishop et al., 2004). Within the context of self-regulation of attention (sustaining attention, attention switching, and the inhibition of elaborate thought processing), "mindfulness can be considered a metacognitive skill…. since its evocation would require both control of cognitive processes and monitoring the stream of consciousness" (Bishop et al., 2004, p.233).

A Phenomenology of Mindfulness

Brown & Cordon (2010) argue that the nature of mindfulness as a basic human capacity described in Eastern thought over 2,000 years ago has significant parallels to the western philosophic school of phenomenology. Mindfulness has been defined as both an experiential and

metacognitive human event. A major teaching of Husserlian phenomenology is that in a natural state, sustained human attention is fleeting at best, perhaps so quickly switching focus that the human may be unaware that an element entered the field of consciousness; yet even this fleeting attention may evoke both cognitive and emotional reaction (Brown & Cordon, 2010). This phenomenological aspect of the construct informs the qualitative descriptive design within this study.

The experience of fleeting attention in a non-mindful manner (mindlessness), is very often the trigger for immediate, and often inaccurate, evaluation of the situation at hand (Brown & Cordon, 2010). A label, often good, bad, or neutral, is applied to this event of fleeting attention with a typical reference to self – and often defines the "lived experience" inherent in this school of philosophy. This evaluative stance may instantaneously affect human decision making (Beaman et al., 2014; Chiesa et al., 2010; Endsley, 1995; Drew et al., 2013) and the perceived confidence in the quality of the decision by the individual involved (Beaman et al., 2014). These fleeting moments of attention as part of the lived experience are associated with sensory stimuli and memory for which the individual may be unaware (Brown & Cordon, 2010); however, this may trigger memory links that further engage existing cognitive schema (Brown & Cordon, 2010) and prior knowledge resulting in automatized decision making and potentially errors in decision making.

Husserl's theory suggests that human attention takes on a "naturalistic attitude" as the default mode of conscious processing for which humans accept events as they appear (Brown & Cordon, 2010). For humans to really experience consciousness, the individual would engage in intentionally removing oneself from the stream of habitual (automatic or mindless) processing to intentional consciousness or the "phenomenological attitude" (Brown & Cordon, 2010). Most

importantly, the scientific study of mindfulness (Anderson et al., 2007; Baer et al., 2008; Brown & Ryan, 2003; Chiesa et al., 2010; Kabat-Zinn et al., 1992), the Eastern Buddhist philosophy, and the Western phenomenological attitude all agree that mindfulness can be "cultivated" through suspension of automatized or habitual thought processing in favor of "open attentiveness" (Brown & Cordon, 2010) with the eventual attainment of the ability to bring attention to the most salient features of the present moment experience (Brown & Cordon, 2010). It is worth noting that salience is also a key attribute of high-level situation awareness (Endsley, 1995) and has been described as an attribute of expert nursing practice (Benner, 1984; Sitterding et al., 2012) thus linking the concept of situation awareness to the attention and awareness that frame human mindfulness.

Mindfulness: The State of the Science

Contemporary exploration of the construct of mindfulness falls across three broad disciplines: health care, business and education (Langer & Moldoveanu, 2000). Within the field of health care, most research regarding mindfulness has been in the discipline of psychology, particularly within the sub-specialties of social, cognitive, educational and development psychology (Bishop et al., 2004; Chiesa et al., 2010; Grecucci et al., 2015; Jra et al., 2007; Ortner et al., 2007). Clinical applications of mindfulness have been and continues to be explored in medicine (Johns et al., 2015; Kabat-Zinn et al., 1992).

The business literature describes mindfulness or mindful engagement as a defining characteristic of high-reliability organizations (HROs) (Weick & Sutcliffe, 2007). HROs have internalized a systems approach for dealing with human performance error and accidents and thus HROs operate with exemplary safety records in high risk industries (Weick & Sutcliffe, 2007). This application of mindfulness in business, specifically HROs, is very applicable for

review in this study as the foundation for this business model in individual mindfulness with the important distinction that operational mindfulness is not an intrapsychic process but an attribute that develops, or does not develop, based on the practices and structures put in play by top leadership of the organization (Vogus & Sutcliffe, 2012). There is no evidence that a collection of individuals with high levels of dispositional mindfulness enhance the collective mindfulness of organizations. The most recent descriptions of this construct state summarily that organization mindfulness is "strategic, top-down, and enduring" (Vogus & Sutcliffe, 2012a, p.722).

MBSR and Psychiatry/Psychology. Mindfulness-based stress reduction training was developed by Jon Kabat-Zinn at the University of Massachusetts and is frequently associated with wellness or stress reduction programs. Indeed, the earliest explorations of MBSR was as a clinical intervention for patients with anxiety disorders (Kabat-Zinn et al., 1992). Twenty-two patients with significant anxiety, panic attacks and depression identified via valid and reliable measures were followed for three years after attended MBSR training. At the end of the MBSR training, researchers reported that the cohort demonstrated both clinically and statistically significant improvements in reported anxiety level, depression and number of panic attacks. Repeated measures of anxiety, depression and panic attacks using the same instruments demonstrated that after three years, the effects of the training had maintained the improvements in anxiety and depression as measured on the Hamilton ([F2.32] =13.22, $p<.0001$) and Beck ([F2,32] = 9.83, $p<.0001$) (Miller, Fletcher, & Kabat-Zinn, 1995) instruments.

In addition to stress reduction and decreased anxiety, the literature discusses additional clinical interventions for which MM is effective including mindfulness-based dialectical behavioral therapy (DBT), acceptance and commitment therapy, and relapse intervention or mindfulness-based cognitive behavioral therapy (CBT) (Baer, 2003). Mindfulness-based

cognitive behavioral therapy is a widely-prescribed intervention in which the MM was effective with symptom control in people with mood disorders (Baer, 2003; Sipe & Eisendrath, 2012). As MM enhances human well-being and provides tools to enhance non-judging, non-reactive attention and awareness to thoughts for individuals without psychopathology, the real strength of the training is demonstrated in studies of individuals suffering from mood disorders.

Randomized control trials (RCT) find Mindfulness-based Cognitive Behavioral Therapy (MBCBT) effective intervention for preventing relapse of depression (Teasdale, Pope, Moore, Hayhurst, & Segal, 2002) and is recommended for implementation into practice for clinicians treating people with depression (Sipe & Eisendrath, 2012; Teasdale, 1999). The primary mechanism of action frequently suggested as the basis for the efficacy of the MBCBT lies in changing the relationship the patient has with thoughts. Depression is characterized by rumination and brooding over thought, often replaying those streams of thoughts daily.
The traditional CBT approach focused the patient on learning new ways of viewing painful thoughts and the related emotional reaction. Additionally, the therapist would attempt to help the patient distinguish "dysfunctional and negative thought from healthy thought" (Sipe & Eisendrath, 2012). Consistent with MBSR or MM for lifestyle purposes, MBCBT promotes ways of non-judgmentally "being" with thoughts to address the mood disorder. The patient with a mood disorder learns through training to recognize thoughts as just thoughts and not fact or defining of the person (Sipe & Eisendrath, 2012).

MBCBT is currently being studied for the treatment of persons with active depression, bipolar disorder and suicidal gestures. A series of small, pilot RCTs demonstrate the promise of MBCBT as treatment modality (Grecucci et al., 2015; Sipe & Eisendrath, 2012). To summarize these studies, for persons with bipolar disorder, small trials have demonstrated short-term

improvements in depressive symptoms with no increases in manic behaviors; however, these studies were not longitudinal and did not provide data regarding the impact of the intervention of mood cycling or dosing frequency of medication needs during treatment (Sipe & Eisendrath, 2012).

Depression with suicidal risk poses one of the greatest challenges in the treatment of mood disorders as poor problem-solving skills, high levels of emotional reactivity and depressive rumination with brooding frame the experience of the disorder (Sipe & Eisendrath, 2012). Anecdotal accounts of using MBCBT for treatment in patients with suicidal risk are challenging and these patients consistently have high dropout rates, thus complicating the evaluation of this intervention. While there seems to be great promise in the use of mindfulness meditation-based therapies for the treatment of mood disorders, the evidence available is limited to small, pilot studies with the need for large RCT in which the intervention is compared to the effectiveness of medications in the treatment of these disorders (Sipe & Eisendrath, 2012).

Small RCTs have also demonstrated alterations in brain and immune function in response to MM (Davidson et al., 2003) and another single RCT demonstrated heart rate control as an effect of training (Delizonna, Williams, & Langer, 2009). These studies were conducted to examine the underlying biological changes that may take place with MM.

Given the well-established effectiveness of mindfulness on emotional regulation in the context of stress reduction and emotional reactivity with improved affect in meditators, scientists examining the functional neuroanatomical substrates of emotion hypothesized that subjects practicing meditation would demonstrate increased activation of the left-side of the frontal lobe regions of the brain (Davidson et al., 2003). Neuroscientists have hypothesized that left-sided anterior activation within the brain was associated with enhanced immune function. Davidson

and colleagues (2003) designed a small RCT to test this hypothesis given evidence that MM was associated with function in this area of the brain. The brain activity and immune function of a wait list control group of 16 subjects and a study cohort of 25 subjects who completed the 8-week MM course were tested and the results compared between groups (Davidson et al., 2003).

Brain activity was measured using electro-encephalograph (EEG), directly before (baseline), directly after MBSR training (T1) and 4 months after the MM training (T2). At the end of the MM training both groups received the influenza vaccine to evaluate immune response among meditators compared to non-meditators. Influenza vaccine antibody titers were drawn at 4 and 8 weeks after the immunization was given. Finally, self-reported measures of affect and anxiety were obtained before and after MM training for both the study and control groups (Davidson et al., 2003).

Meditators experienced significantly greater rises in antibody titers from week 4 to week 8 when compared to the controls ($t\ (33) = 2.05$, $p < .05$). The Spielberger State-Trait Anxiety index demonstrated significant reduction in anxiety over time in the MM group [$F\ (1,31) = 5.45$, $p < .05$). While the Positive/Negative Affect scale did not reveal any changes in positive or negative affect over time, the MM group reported statistically significant decreases in negative affect between T2 and T3 compared to their affect at T1 and T2 [$t\ (20) = 2.27$ and $t\ (21) = 2.45$, respectively and $p < .05$ for both time points) (Davidson et al., 2003).

A systematic review of RCTs involving MM and the immune system was published in 2016 with 20 RCTs conducted between 1966 and 2015 meeting inclusion criteria (Black & Slavich, 2016). The total sample size included 1602 subjects with females representing 60% of the subjects. The MBSR training methodology was documented as highly similar across all remaining intervention protocols (Black & Slavich, 2016). The researchers reported specific

analysis of five outcomes: 1. circulating and stimulated inflammatory proteins, 2. cellular transcription factors and gene expression, 3. immune cell count, 4. immune cell aging and 5. antibody response. The conclusions from this study indicate replicated (yet tentative) evidence of changes to select immune system processes associated with MM. These specifically include processes of inflammation, cell-mediated immunity (specifically increased T cell count and activity) and biologic aging (increased telomerase activity) (Black & Slavich, 2016). Immune system process changes were noted in age-related conditions including type-2 diabetes, cardiovascular disease, frailty, arthritis, osteoporosis and certain types of cancer (Black & Slavich, 2016). These studies would need to be replicated across larger sample sizes to further define the effects of MM on this important area of immune system processing.

The intent of reviewing the state of the science of mindfulness in medicine and psychiatry/psychology was to provide evidence-based discussion of the efficacy and effectiveness of MM in mood and anxiety disorders, common among the general population, including undergraduate students, and the role that neurology and psychology are having in the concrete mapping brain activities specifically identified as mindfulness.

Mindfulness and high-reliability organizations. Ergonomic engineers and organizational psychologists have studied HROs for whom the attribute of mindfulness is described as a key element of this distinction for quality and safety in the face of considerable risks related to operations (Weick & Sutcliffe, 2007a). Weick, Sutcliffe, & Obstfeld (1999) refer to HROs as "harbingers of adaptive organizational forms for an increasingly complex environment" (p.81). "Stated summarily, HROs warrant closer attention because they embody processes of mindfulness that suppress tendencies towards inertia" (Weick, Sutcliffe, & Obstfeld, 1999, p.81) and thus error. Mindful organizations are complex adaptive systems that maintain a

pre-occupation with failure, which result in highly predictable, yet unprecedented quality and safety outcomes (Weick, Sutcliffe & Obstfeld, 1999, Weick and Sutcliffe, 2007). Commercial and military aviation represent examples of HROs, along with nuclear energy plants around the world. There is increasing interest on the part of large integrated health care systems to apply lessons from HRO to health care delivery to improve the safety of care processes and the quality of care outcomes (Vogus & Sutcliffe, 2007a; Tamuz & Harrison, 2006; Cannon & Edmondson, 2001).

As psychology defines mindfulness by describing mindless behavior on the part of humans, organizational theorists describe the mindfulness of HROs by first describing mindlessness in organizations. Mindless organizations lack a cognitive infrastructure that "enables the adaptive learning and reliable performance" (Weick, Sutcliffe, & Obstfeld, 1999) that HROs demonstrate. The literature suggests that non-HROs focus on successes and efficiency rather than failure and reliability thus preventing the development of a cognitive infrastructure from which mindfulness emerges (Weick, Sutcliffe & Obstfeld, 1999).

Weick and Sutcliffe (2007a) describe five characteristics of mindful infrastructure that have been identified in HROs in industry and business providing the basis for an operational definition of mindfulness from the human factors perspective. These five behaviors define mindful organizations: tracking of small failures, resisting the tendency to oversimplify, remaining sensitive to operations, maintaining capabilities for resilience and shared knowledge of the location of individuals with operational expertise across organizational processes (Weick & Sutcliffe, 2007a). The research leading to the identification of these characteristics repeatedly utilizes the terms "attention" and "noticing" as descriptive of mindfulness (Vogus & Sutcliffe, 2007; Cannon & Edmondson, 2001; Weick & Sutcliffe, 2007).

"Mindfulness is as much about the quality of attention as it is about the conservation of attention. It is as much about what people do with what they notice as it is about the activity of noticing itself" (Weick, Sutcliffe, & Obstfeld,1999, p.37.) Figure 3 illustrates the mindful infrastructure for HROs.

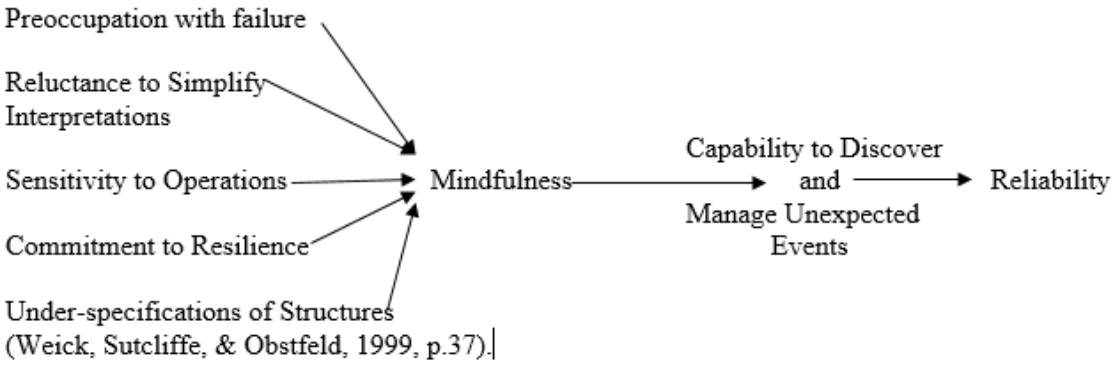


Figure 3. Processes/attributes of safety organizing by high-reliability organizations.

Cannon & Edmondson (2001) utilized a mixed method design to study one of the characteristics of a mindful organization: preoccupation with failure. The researchers hypothesized that (1) "people hold tacit beliefs about appropriate responses to mistakes, problems and conflict, and that these are shared within and vary between organizational work groups, (2) effective coaching, clear direction and a supportive work context influence belief related to failure, and (3) beliefs about failure influence group performance" (Cannon & Edmondson, 2001, p.161). As part of the study, nursing units were ranked based on quality outcomes and strength of leadership, from strongest to weakest performers. An evaluation of medication error rates and rates of reported adverse medication effects by unit was conducted. Initial expectation of analysis was that the units rated as less effective performers would have more reported medication related events. In fact, researchers discovered that these units had the fewest reported events and the units with strongest leadership and best patient outcomes had the highest reported rates of adverse medication events (Cannon & Edmondson, 2001).

High performance work teams on nursing units monitored the environment for "weak signals" of potential failure (Weick & Sutcliffe, 2007a). They worked as a team to validate and mitigate risk and, with support of leadership, relentlessly reported failures, near misses and team learning regarding these errors through the chains of command thus the elevated reporting rates in these units (Cannon & Edmondson, 2007). "Safety culture is seen coming to life in HROs through behavioral processes of 'collective mindfulness' enacted by front-line employees" (Vogus & Sutcliffe, 2007, p.2) (Table 3). Vogus and Sutcliffe (2007b) studied the safety organizing behaviors of registered nurses that positively impact patient safety with the aim of establishing validity and reliability of the Safety Organizing Scale (SOS). The Safety Organizing Scale was completed by 1,685 registered nurses from 125 nursing units in 13 hospitals in California, Iowa, Indiana, Maryland, Michigan, and Ohio, and six months after administration of the measure Vogus and Sutcliffe completed a cross-sectional analysis of medication errors and patient falls.

Findings indicated that the SOS provided meaningful insight into safety orienting behaviors consistent with a safety culture, and that "the measure was shown to discriminate between related concepts like organizational commitment and trust…and was negatively associated with reported medication errors and patient falls" (Vogus and Sutcliffe, 2007b, p.1). These researchers maintain that the selection of registered nurses (RNs) was critical in this study as RNs "are the surveillance system for early detection of emerging errors and complication in care and are well-positioned to take action to minimize negative outcomes" (Vogus & Sutcliffe, 2007b, p.2).

Table 3

Description of Mindful Processes of HROs

Process	Description
Preoccupation with Failure	Failure is viewed as precondition for learning. Management is reluctant to put rules in place that are not sensitive to the possibility of analytical error. HROs worry about failure and a byproduct of this is increases attention to all failures.
Reluctant to Simplify Interpretations	Redundancy "takes the form of skepticism and…cross checks and doubts that precautions are sufficient and wariness about claimed levels of competency" describe this process.
Sensitivity to Operations	Situation awareness (SA) or "having the bubble". SA refers to the big picture. Having the bubble refers to "an effortful achievement of a high level of SA" (p.43). State of cognitive integration and collective mind.
Commitment to Resilience	Performance in the face of unexpected events. "capacity to cope with unexpected events…. learning to bounce back" (p.46). Coping with surprise moment to moment.
Under-specification of Structures	Effective management of the paradox that "adoption of orderly procedures to reduce error often spreads errors around" (p.48). As leadership resists dictating structure constraints of performance, solutions are linked to the issue at hand, not arbitrary organizational "rules", opens up choices to decision makers in the moment.

Note. Adapted from "Managing the unexpected: Resilient performance in an age of uncertainty", K.E. Weick and K.M. Sutcliffe, 2007

Nursing research has not explored the construct of mindfulness in nursing practice at an individual or team level, despite the research completed regarding health care safety. The study of nursing error by human factors scientists specifically identify the collective mindfulness of RN's as the linchpin needed to keep patient safe (Vogus & Sutcliffe, 2007a).

One editorial by Dr. Karlene Kerfoot (2005) chief nurse executive at Clarian Health, Indianapolis and associate dean at the Indiana University School of Nursing, put out a call to

action challenging nurse leaders to take up the cause of developing cultures capable of "attending to weak signals" and fostering the collective mindfulness of nurses.

Dr. Kerfoot (2005) noted that mindfulness is the most salient element of the Weick & Sutcliffe theory of HROs as mindfulness permits the nurse to apply strong intervention to weak signals. The caveat is that cognitive human factors may prevent the nurse from attending to these weak signals. Development of the individual mindfulness of nurses to enhance the well-being and optimize performance of nursing practice through the mitigation of cognitive and environmental human factors may be a structure or strategic activity toward organizational mindfulness. The proposition suggested provides strong argument that nursing research is needed to determine strategies to educate nursing students and the existing nursing workforce regarding mindfulness. Further, nursing leaders need strategies for cultivating mindfulness and the related health benefits to individuals. Leadership can also cultivate the organizational mindfulness through structure and processes that facilitate attention to weak signals and preoccupation with the possibility of error.

Mindfulness and nursing education. A search of the Cumulative Index of Nursing and Allied Health Literature (CINAHL), utilizing mindfulness-based stress reduction, mindfulness meditation, mindfulness training and nursing education, yielded a total of 240 selections when delimited to the geographic area of USA and the years 2012-2017. This search yielded only three small studies meeting inclusion criteria of nursing students as subjects of the study. Expanding the search from 2000-2017 with the same search and inclusion criteria added 2 additional studies for review. A new search of CINAHL using MBSR and Nurse, limited to the years 2000-2017, resulted in the identification of 5 additional studies, totaling 9 studies over the past 17 years in

which MBSR and nursing students were studied. A manual search of references of the included studies on mindfulness and nursing was conducted to supplement the electronic searches.

Similarly, a search of the MEDLINE database using keywords MBSR and nurse for the past 17 years yielded a total of 9 studies, three of which were unrelated to nursing. Substitution of 'nurse' with 'student nurse' and 'nursing student' yielded one study. All nine studies identified in the CINAHL search were reviewed for this examination of mindfulness and nursing education. Two studies of mindfulness and medical students were also included as findings from these interventional studies supported the findings from studies of outcomes from MBSR as intervention with nursing students.

Mindfulness as an attribute of nursing practice or as pedagogical practice was not examined in any of these studies. MBSR was studied as an intervention for stress and anxiety related to the clinical environment and anxiety. Beddoe & Murphy (2004) studied the effect of an 8-week MBSR training class on stress levels and empathy development in 16 nursing students who voluntarily enrolled in the course. The pre-test, post-test design included measurement of emotional reactivity on the Interpersonal Reactivity Index (IRI) and the Derogatis Stress Profile (DSP), however, no measure of mindfulness was included in this study.

The course included guided meditation weekly for 2 hours, completion of home journaling and meditation practice with audio tapes. At the completion of the course, there were no reported differences between stress and empathy as measured on the IRI scales using repeated measures *t*-tests (Beddoe & Murphy, 2004). The intervention significantly reduced students' anxiety level between baseline and conclusion of training ($p > .05$) and was associated with positive trends in several additional stress measures, including attitude, time pressure and total stress (Beddoe & Murphy, 2004).

A descriptive, qualitative study design involving a 7-week MT and stress-reduction course with follow up focus group was utilized to explore the efficacy of this course as a means of learning support and stress reduction of undergraduate and new nurse midwifery students at one large regional university in Australia (Van der Riet et al., 2015). Only 10 students completed the study. Researchers utilized thematic analysis and identified three themes from focus group data: attending to self, attending to others and attending to program related changes. Additional findings included reports of improvements in sleep and concentration by participants. Also reported was decreased occurrence of negative cognition (Van der Riet et al., 2015).

The final study of MM as intervention in nursing students involved the use of an online, asynchronous MM program. This descriptive study examined the effect of training on mood, stress and cognition in 26 non-traditional, post-RN licensure undergraduate and graduate students (Spadaro & Hunker, 2016). The eight-week online MM intervention was provided via the university learning management system. A 16-week follow up period was included. Measures utilized in the study included the Perceived Stress Scale (PSS), the Hospital Anxiety and Depression Scale (HADS) and the Attention Network Scale (ANTS).

These researchers utilized the Intentional Attention and Attitude (IAA) model as a conceptual framework for the study (Spadaro & Hunker, 2016). This framework was described as an evolving theory of self-regulation using human feedback mechanisms to achieve goals in the face of stress. These researchers hypothesized that nursing student stress, as applied to the model, “consciously (intention) brings awareness (attention) to the present moment with acceptance and openness (attitude)” (Spadaro & Hunker, 2016, p.165).

Nursing student stress was found to have decreased significantly and the effect endured through all 24 weeks of the study ($F(2,24) = 4.163$, $p = .019$). A moderate effect size of .32 was

reported for stress reduction related to the intervention, indicating a moderate effect of MM for this effect (Spadaro & Hunker, 2016). No statistically significant decrease in anxiety or depression were reported using the HADS; however, decreasing levels of anxiety during the study period was described as evidence of increasing mood during the study. The measures of cognition using the Attention Network Test (ANT) instrument segmented cognitive function into alerting, orienting, and executive control. The researchers reported that alerting function did not change (effect size = -.02); however, orienting (attention shifting) and executive control (attention selection and concentration) demonstrated non-significant improvement during the study (Spadaro & Hunker, 2016). This study presents a novel pedagogical approach in the teaching of the skill of MM, demonstrating effectiveness of a less intrusive and less labor-intensive training method.

MBSR was utilized as an intervention to address stress and burnout in nurses (Cohen-Katz et al., 2005) and nurse leaders (Pipe et al., 2009). Quasi-experimental design for both studies involved random assignment of participants into either wait-list control or invention group of 8-week MBSR training (n=25) (Cohen-Katz et al., 2005) or nurse leaders (n=33) into either leadership training course or modified brief MM training course (4 weeks) (Pipe et al., 2009). Both mindfulness training approaches demonstrated improvements in outcomes within the MT intervention groups.

Cohen-Katz and colleagues (2004) measured outcomes on the Mindful Attention and Awareness scale (MAAS), the Maslach Burnout Inventory (MBI) and the Brief Symptom Inventory (BSI). Pipe and colleagues (2009) utilized the Symptom Checklist 90 (revised version) to measure stress as an outcome of the modified MT course for nurse leaders. Between-group analysis utilizing independent *t* tests identified a significant difference in emotional exhaustion

between the groups post intervention (p=.050) (Cohen-Katz et al., 2005, p30). Additionally, the treatment group reported a significantly different description of personal accomplishment than the wait list control group (p=.014).

Within treatment group analysis demonstrated significant decreases in emotional exhaustion, immediately post intervention (T2) (*P*=.001) and 3 months' post intervention (T3) (*P*=.01). MBSR participants also reported "positive changes include living in the present and enjoying what is positive in my life, better listening skills, better communication skills; taking better care of myself; more focused; utilizing body scan and meditation and placing greater value on my needs" (Cohen-Katz et al., 2005, p.32). Findings also demonstrated significant differences in mindfulness (*P*=.001) as measured on the MAAS from pre-intervention to post-invention in the MBSR participants (p.29).

Similarly, results of the effect of modified MT course for nurse leaders indicated statistically significant improvements utilizing repeated measures t-tests within group in 10 (depression, anxiety, positive symptom totals and caring efficacy scales) of 14 measures within the SCL-90-R from baseline to completion as compared to the leadership training control group that showed statistically significant improvements in only one (caring efficacy) of 14 measures within the SCL-90-R post treatment (Pipe et al., 2009). Between group, paired t-tests indicated statistically significant improvements for the MT group over leadership group in 6 of 14 scales (obsessive-compulsive (p = .0194), anxiety (p = .0409), phobic anxiety (p = .0146), psychoticism total (p = .0059), psychoticism global severity index (p = .0188), positive symptom distress (p = .0096)).

A small, unit-based intervention in a child and adolescent psychiatric unit in which staff were trained in MBSR demonstrated a positive trend towards reports of decreased stress for the

staff and decreased utilization of restraints and utilization of 1:1 staffing episode on the unit. The authors suggest that MBSR training had a 'positive impact' on unit safety and patient centered care (Hallman et al., 2014). Likewise, an analysis of the concept of mindfulness in psychiatric nursing proposes that the process of mindfulness in nursing practice for this specialty has the promise of changing the nurse-patient relationship positively (Tusaie & Edds, 2009). Specifically, the outcome of mindfulness in this concept analysis is "emotional and logical balance {that} facilitates making better choices and having a greater capacity for empathy and self-awareness" (Tusaie & Edds, 2009, p.361) with the potential for 'long-lasting change for clients' as nurses improve their potential for 'empathetic presence' through the practice of mindfulness meditation (Tusaie & Edds, 2009, p.362). Interestingly, Beddoe & Murphy (2004) commented on a positive trend toward increased empathy in meditating nursing students and propose a theory consistent with Tusaie & Edds. As meditation decreases personal distress and diminishes fantasy and rumination, a nurse may be more able to experience self-empathy and thus better able to engage in "prosocial and altruistic" behaviors (Beddoe & Murphy, 2004, p.360).

A concept analysis of mindfulness in nursing, using Rodgers evolutionary method of concept analysis, was completed based on a literature review of all theoretical and research-based articles in the CINAHL index between 1981 and 2012 (White, 2013). A sample of 59 articles met inclusion criteria and were used in this analysis.

White (2013) calls for integration of 'mindfulness' into nursing education programs and practice to "enhance therapeutic nursing qualities and support a shift from a purely theoretical way of knowing to one that is more embodied and holistic" (p.283). Concluding that mindfulness is a transformative process, four inter-connected attributes of mindfulness are developed as part

of the transformation to a mindful state including the 1. experience being present, with 2. acceptance, 3. awareness and 4. attention (White, 2013). White (2013) also encourages qualitative research as a means of exploring mindfulness in nursing, pointing out that while several quantitative measures of mindfulness are available, none are specific to the experience of mindfulness in nursing.

Attentional Control and Awareness

One argument for the pursuit of mindful nursing practice is the promise of improved attentional control and enhanced surveillance of the clinical environment through focused attention and situation awareness on the part of the nurse. As previously discussed, distracted practice represents a cognitive human factor related to cognitive processing of internal and external stimuli that negatively impact available cognitive resources and interrupt the critical thinking of the health care professional (D'Esmond, 2016). Research regarding attentional control and mindful meditation finds the practice of MM may improve the allocation of cognitive resources and thus improve self-regulation of attention (Moore, Gruber, Derose, & Malinowski, 2012), improve internal ability for orientation of attention and receptive attentional skills (Jra et al., 2007), and improve object detection, thus suggesting improvement of awareness within attentional fields (Anderson et al., 2007).

The operational definition of mindfulness discusses focused and sustained attention and attention switching through the inhibition of mindless non-directed and fleeting attention. One study of this aspect of attentional control involved testing sustained attention, attentional switching, and measures of non-direct attention through detection of objects in the field of attention. The Stroop interference test and object detection and self-reported measures of

emotional well-being and mindfulness were used on a wait list control group and study group that received an MBSR course (Anderson et al., 2007).

Subjects assigned to the intervention group (n=39) completed at least 5 of the 8-week sessions of the MBSR course and all pre- and post-testing, including tests of Object Detection, Sustained Attention, Attention Switching, and Stroop Interference testing followed by a battery of valid and reliable instruments assessing positive and negative mood, depression, anxiety, anger, rumination and worry (Anderson et al., 2007).

The Stroop Task involved identification of ink colors of words to assess accuracy of identification and reaction time in discriminating the color of ink. Stroop Interference is defined as "increased reaction time and lower accuracy associated with naming the ink colors relative to a condition containing neutral words" (Anderson et al., 2007, p.453). While the source of the attentional interference remains unclear, humans tend to be distracted when words did not appear in congruent color, i.e. one would expect the word "sun" to be in yellow or orange tones and "snow" to be in white tones. During the Stroop Task, a word appeared in 32-point Arial font in red, yellow, white, blue or green on a black background. Subjects named the color in which the word appeared, and the screen went blank. Attentional failure occurred when subject responded "white" when asked the color of the red text. Five conditions, or categories of words, were tested: those describing positive self-characteristics, those describing negative self-characteristics, standard (yellow, blue, red, green, white), sematic (snow, sun, blood, sky and grass) and neutral (clear, distinct, general, public, and uniform).

Multivariate ANOVA was utilized to evaluate between group differences on the nine, self-reported psychological measures given as part of the pre- and post-test. Statistically significant differences on all nine measures were identified, revealing larger changes in the

direction of the MBSR group, F (9,53) = 2.87, $p < .01$, indicating improved well-being in areas of depression, anxiety, anger, positive affect, general rumination, anger rumination, anger sensitivity (*p's* <.02), and levels of general worry approaching significance (*p's* = .06) (Anderson et al., 2007).

The researchers were not able to demonstrate a relationship between MBSR training and attentional control; however, MBSR was associated with improved consistency of object detection (F (1,39) = 13.21, $p = .001$), when objects/words were inconsistently presented to subject, suggesting an enhanced awareness of present moment experience (Anderson et al., 2007). Although this study did not demonstrate a relationship between attention and MBSR, the findings of the object detection tests suggested that "mindfulness may be more closely associated with changes in the quality of awareness of present moment experience rather than with basic attentional abilities of humans" (Anderson et al., 2007, p.460).

Neuroscientists have described attention in terms of the functionally and neuroanatomically distinct subsystems of alerting, orienting and conflict monitoring (Jra et al., 2007) and have hypothesized that the dorsal medial prefrontal cortex (dmPFC) and the anterior cingulate cortex (ACC) in both hemispheres are active during MM (Kabat-Zinn, 1994). Not only has the use of functional MRI confirmed the activation of these areas during MM, the activation of these areas has been found to be more pronounced in these areas when subjects were asked to intentionally focus attention during the scan. Also, the ACC acted to integrate aspects of attention, motivation and motor control and the rostral ACC was found to activate during emotional overload (Grecucci et al., 2015). Other researchers have used structural MRI to demonstrate increased cortical thickness in the dorsal ACC of meditators as compared to control subjects – the dorsal ACC was activated during cognitive control tasks (Grecucci et al., 2015).

Neuroimaging provides evidence of mindfulness as a tangible element in brain function beyond self-report and psychological testing (Grecucci et al., 2015). Brain imaging with structural and functional Magnetic Resonance Imaging (MRI) and EEG have provided a means to validate differences in the areas of the brain responsible for attention, emotion and control of cognition in meditators and non-meditators.

Emotional Regulation and Cognition

Emerging evidence, in the form of systematic reviews, laboratory studies and studies of clinical intervention, has provided evidence that attention, memory and other correlates of executive function in adults were enhanced in individuals who engaged in MM.

A systematic review of 23 studies – 15 controlled or randomized controlled and 8 case-cohort studies – met inclusion criteria for this examination of research into the cognitive benefits of MM (Chiesa et al., 2010). All studies were conducted using well validated and tested measures of cognitive function. Heterogeneity of instruments was identified as a limitation of this study, as a wide assortment of instruments was used to capture the elements of cognition and many domains of cognition were tested (Chiesa et al., 2010). A second limitation was that most study designs used wait-list control groups rather than an alternative intervention aimed at improved cognition (Chiesa et al., 2010).

Despite these limitations, researchers argued that the literature supported the two hypotheses from this study: 1.) moderately brief MM training, as contained in the 8-week MBSR training course, resulted in improvements in selective and sustained attention and executive function and 2.) long term meditation practices would be associated with even stronger abilities of attentional control and switching (Chiesa et al., 2010). This finding of the increased benefits of long-term meditation was consistent with findings from an earlier study by Baer (2003) in

which the attribute of ‘observing’, described as a facet of dispositional mindfulness, was found to be strongest in experienced meditators as opposed to novice meditators or non-meditators.

Executive function was examined in nine studies – four of which were case-control studies. One study showed no improvement in executive function. Two case control studies reported positive findings as measured on the Stroop Task – one reported positive correlation between MM and higher Stroop scores and the other reported lower errors on the Stroop Task (Chiesa et al., 2010).

Attention switching was studied in four of the 23 studies in the review and none of the studies reported a significant difference between those using MM and those in the control. The authors suggested this may be a result of instrumentation as measures may not have been sensitive enough to capture the intentions/actions of attention switching (Chiesa et al., 2010). However, attention switching, and cognitive stacking have been identified as having profound negative impact on the cognitive resources necessary to diminish the effect of distraction on practice (D’Esmond, 2016; Ebright et al., 2003; Potter et al., 2005)

Working memory was examined in three of the studies in this review. Two studies found statistically significant improvements in working memory after meditation retreats aimed at longer MM training and practice. Two studies examined MBSR as an intervention to improve memory and cognition in patients who had recovered from depression. Findings indicated that healthy subjects or people formerly treated for depression had a positive outcome as meditators in this cohort, whether healthy or recovered, and had significant improvements in memory (Chiesa et al., 2010). Within the context of the study limitations, this systematic review of the literature provided “preliminary evidence” that MM could enhance cognitive function.

Cognitive flexibility is adaptive cognitive processing capacity to meet the demands of new or unexpected conditions (Moore & Malinowski, 2009). A recent randomized controlled pilot study of MBSR as an intervention to mitigate the cognitive effects of chemotherapy ("chemo-brain') supported other findings described within. 71 cancer survivors were randomly assigned to either MBSR or a fatigue education and support condition (ES). Moderate to severe levels of cancer related fatigue was associated with cognitive impairment in which attention, memory and executive function were affected (Johns et al., 2015). The Attentional Function Index and Stroop Task were used to assess cognition at baseline at the end of the 8-week ES or MBSR intervention and at six months later (Johns et al., 2015). The strength in the design of this study was the comparative effectiveness of a well-described alternative intervention for fatigue and cancer-related cognitive impairment (CRCI) as opposed to a wait-list control group. The ES group met weekly for two hours, just as the MBSR group, and received a structured curriculum providing education and supportive counseling.

A sample of 60 breast cancer and 11 colorectal cancer survivors reporting clinically significant levels of fatigue for at least eight weeks were recruited and randomly assigned to either the ES group or the MBSR group. Cognitive function and mindfulness were evaluated at baseline, after the eight-week intervention and six months after completion of the intervention (Johns et al., 2015). The Attentional Function Index (AFI), a 13-item tool assessing perceived effectiveness in everyday activities requiring attention and cognitive resources, and the Stroop Task used to evaluate executive attentional function and cognitive flexibility were utilized to measure cognition.

Both groups were comparable on demographics and medical condition. Multi-symptom assessment of fatigue, pain, depression, anxiety and sleep disturbance verified no statistically

significant differences between groups (Johns et al., 2015). The statistical analysis of between group and in group performance on the Stroop test and self-perceived cognitive function offered clear evidence of the effectiveness of MBSR for enhancing cognitive function, cognitive flexibility and executive functioning.

The AFI has three sub-scales: 1. effective action, 2. attentional lapses, and 3. interpersonal effectiveness. Total AFI mean score and mean scores for effective action and attentional lapses were "significantly and substantially" higher in the MBSR group at the end of intervention (T2; $p \leq 0.004$). The MBSR cohort scores in these same areas remained stable and significantly higher than the ES group at six months (T3; $p \leq 0.027$). There was never significant difference between groups on the interpersonal effectiveness sub-scale.

Importantly to patients with cancer, both interventions demonstrated efficacy with ES and MBSR cohorts experiencing statistically significant improvements overtime within group. The MSBR group demonstrated significant improvements in all three subscales at T2 with effect enduring with stable scores at T3 also. The ES group did not experience statistically significant improvement across all scales until T3.

This study provided evidence of enduring benefit of MBSR for CRCI – one of the most distressing and life impacting symptoms reported by cancer survivors. Improved attention, focus, working memory, error recognition and reaction times were all demonstrated for patients in the MBSR cohort (Johns et al., 2016). This finding potentially supports the proposition that healthy, undergraduate nursing students and novice nurses would experience improved availability of cognitive resources after MT and MM as pedagogy in an educational program to positively impact cognitive workload and minimize the effects of distractive practice.

Situation Awareness

While attention and awareness are consistently linked together in the discussion of mindfulness throughout this review, in fact, attention and awareness are very different constructs. Tusaie and Edds (2009) provided this statement to differentiate these two related concepts. “Awareness is the background of consciousness, which is constantly monitoring the environment. One may be aware of stimuli without them being the center of attention. Attention is the process of focusing consciously and providing heightened sensitivity to current experience” (p.359).

A hybrid concept analysis research design was used to study SA in nursing work. These researchers suggested the cognitive work of the nurse required the stacking of priorities (cognitive stacking) and focused attention (Sitterding et al., 2012). Sitterding and colleagues also reported that a definition of SA in nursing practice does not exist, and that the phenomenon of SA needed further study as it represented the greatest factor influencing attention (Sitterding et al., 2012). “Nursing attention required to perceive and understand the nature of the clinical situation has been recognized as the starting point for thinking in action in nursing” (Sitterding et al., 2012, p.78).

The qualitative method of hybrid concept analysis involved three broad phases: the theoretical phase in which a cross-disciplinary investigation of the concept is completed, a literature review to determine how the concept was defined across disciplines and to determine ways in which the concept may be measured, and the development of a working definition of the concept for the discipline (Sitterding et al., 2012). Phase two of a hybrid concept analysis would be the fieldwork phase. Sitterding and colleagues (2012) suggest the hybrid concept analysis differs from traditional qualitative research in the following manner: “a single concept has been

identified and the objective of the field work is to further define and measure it…in this phase we build on a framework that aligns with our working definition." (p.83). Finally, the analytic phase in which the researcher reexamined findings from the literature and field work to question the relevancy of the concept to the practice, provide justification of the selection of the process and to what degree the concept was present and with what frequency in nursing work (Sitterding et al., 2012).

Open ended, semi-structured interview questions were developed to explore the concept of SA in acute care nursing. The key aspects of the concept of SA that these researchers explored were attentional dynamics, knowledge factors, goals/tradeoffs and decision choices. The critical decision method (CDM) was used to structure the questions as a means of cognitive task analysis (Sitterding et al., 2012)

A purposive, convenience sample was recruited from nurses on inpatient units at three Magnet designated hospitals. Fifteen nurses responded to the email invitation to attend the interviews and a final sample of seven nurses meeting inclusion criteria were selected to participate. All of the nurses were BSN prepared, providing direct care and working full or part-time in the inpatient nursing division of their hospital. Experience ranged from 12 months to 30 years (Sitterding et al., 2012). Interviews were recorded and transcribed to permit a form of content analysis that these researchers identify as relational analysis in which themes, concepts and relationships among and between them emerge (Sitterding et al., 2012).

Nine themes emerged from the analysis to further define the concept of SA in nursing practice: perception, comprehension, projection, knowledge and expertise, cognitive overload, interruption management, task management, instantaneous learning and cognitive stacking (Sitterding et al., 2012). The researchers concluded that these findings were congruent with other

descriptions of situation awareness in the literature and supported the proposed definition of the concept for nursing in acute care situations. The knowledge management and levels of SA described were congruent with a theory of situation awareness devised decades ago for use in the military and aviation operations (Endsley, 1995).

A theory of situation awareness in dynamic systems was proposed to further develop attributes of the construct, including: goal selection in complex and dynamic situations, salience or attention to critical elements within the situation, predicting future state of the situation based on current focus and the tie between situation awareness and typical actions (Endsley, 1995). From this, Endsley (1995) devised a general definition of SA that was widely accepted and used in military training and operations "Situation awareness is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future." (p.36)

Thus, the three levels of SA, of increasing cognitive work and attentional effect are:

1. Level One SA: Perception of elements in the environment
2. Level Two SA: Comprehension of the current situation
3. Level Three SA: Projection of future status.

Situation awareness impacts the state of the nurse's environment and cognitive workload. Working memory, a critical element of one's cognitive workload, is a critical element of situation awareness (Endsley, 1995; Endsley, 2000), thus any event that impacts cognitive workload or working memory, such as distractions (Stubbings et al., 2012), will impede situation awareness with resultant attentional failure that will interrupt critical thinking and negatively impact the clinical decision making of the nurse. Slips and lapses develop holes in the Swiss cheese model which begin to open and line up for error to occur.

Knowledge is the second critical element of situation awareness; the knowledge one possesses and brings to the situation, the schema and metacognitive activities one uses to organize and retrieve relevant knowledge for use in the situation and finally, adequate and appropriate knowledge selection that informs thinking about the likely trajectory of the current situation (Endsley, 1995; Sitterding et al., 2012). Well-developed technical knowledge and skills of the work then permit one's high level of SA to comprehend the significance of a clinical event and project into the future and understand the consequences and help the nurse decide "what is going on and what is likely to happen" (Stubbings et al., 2012, p.1444). This permits effective clinical decision making in the form of problem-solving and planning that are enough to intervene and prevent mistake development.

An integrative review of the nurse's use of SA in clinical decision making describes the concept as a non-technical skill that at high levels has been linked to improved decision making and that SA can be improved with training (Stubbings et al., 2012). This review observed that experience and intuition are used far less in the practice of experienced nurses than previously reported and decision making within the context of anticipatory thinking and patient needs was associated more with individual characteristics of the nurse (Stubbings et al., 2012). This review also reported that SA was inadequate in graduating students.

McKenna and colleagues (2014) measured SA in 97 senior level nursing students across three universities in Australia using the Situation Awareness Global Assessment Technique (SAGAT). High-fidelity simulation was used for the assessment and standardized patients were used in lieu of human patient simulators. Overall, the students' mean SA was 41% (low) with physiological perceptions scoring the lowest at 26% and projection level of SA highest at 56%.

These researchers reported that across these 97 students, only nine (1%) met the passing grade threshold for the scenarios that involved management of patient deterioration (McKenna et al., 2014).

A similar design was utilized to measure knowledge, skills and SA in 51 'final year' nursing students at a university in the United Kingdom (Cooper et al., 2010). Students with previous experience with simulation were assigned to provide care to a human patient simulator experiencing either hypovolemia or septic shock. Consistent with other research, student SA levels were low overall at 59% (range 38-82%) with the weakest area of SA reported as comprehension at 44% (Cooper et al., 2010). While the student knowledge skills were assessed via a multiple-choice question pre-test as 'adequate,' there were significant performance issues relating to student abilities to identify and manage unstable patients and apply this knowledge.

This review brings three important points to this study:

1. SA can be learned, and it is an essential decision-making skill,
2. Non-technical skills are associated with SA that influence outcomes, and,
3. Increased SA is needed for sound clinical decision making and improved patient outcomes (Stubbings et al., 2012, p.1450).

Measurement Tools for Mindfulness

A systematic review of instruments to measure the construct of mindfulness was conducted to compare the psychometric properties and studies of all identified self-report instruments of mindfulness (Park, Reilly-Spong, & Gross, 2013). Three electronic databases were searched for the entirety of the years the electronic resources covered up until the time of the search: CINAHL (1981-2012), Ovid Medline (1949-2012), and PsycINFO (1806-2012), using mindfulness and psychometric terms describing the testing or development of a self-report

of mindfulness instrument (Park et al., 2013). The initial search yielded 2,588 articles of which 146 were selected for review based on the abstract and finally 46 articles were selected for inclusion in the review. These studies describe the development and testing of ten different self-reports of mindfulness representing dispositional mindfulness through mindfulness techniques adapted for use in specific psychotherapies (Park et al., 2013).

All ten instruments were rated as having 'strong' internal consistency; however, none of the measures provided any evidence of content validity. Measures were also evaluated for structural validity, reliability, hypothesis testing and responsiveness. The two strongest instruments for use in measuring dispositional mindfulness are reviewed here. The Mindful Attention and Awareness Scale (MAAS) (Brown & Ryan, 2003), a measure of mindfulness in everyday life completed as a single scale, was the most tested instrument with 20 studies of the MAAS cited. The quality rating system used for the systematic review rated the MAAS as having strong internal consistency, moderate reliability and only one of two instruments in which test-retest reliability was conducted. The MAAS was rated as 'indeterminant' for content validity and conflicting for structural validity based on findings from the 20 studies of the instrument reviewed (Park et al., 2013).

The Five Facets of Mindfulness Questionnaire (FFMQ) (Baer et al., 2006) (Appendix B) and its five subscales of: observing, describing, acting with awareness, non-judging of experience, and non-reactivity to experience, demonstrated strong internal consistency across 12 studies of the instrument since 2006 (Park et al., 2013). No reliability testing nor evidence of content validity is provided for the FFMQ (Appendix B), but strong evidence of construct validity through hypothesis testing is reported.

While the MAAS had been tested more frequently, the researchers conducting this review ranked the FFMQ (Appendix B) as receiving the highest rating with "consistent findings in multiple studies of good methodological quality" for two properties of internal consistency and construct validation by hypothesis testing (Park et al., 2013, p.2639). Further, all ten mindfulness measurement instruments reviewed lacked comprehensive examination of the construct as no qualitative study methods for any of the instruments was found; thus, confirmation of understanding and discussion of relevance of the construct was lacking in all measures (Park et al., 2013). This important limitation of the measurement of mindfulness is echoed in the concept analysis of mindfulness in nursing. This research called for the qualitative examination of mindfulness in nursing as the construct that was not well understood in this discipline (White, 2013).

Finally, these researchers cautioned against further developing mindfulness interventions given the lack of qualitative examination and external referents to provide evidence of construct validity. While the FFMQ was the highest rated instrument, none of the instruments met all criteria to receive a rating for superior psychometric properties. At best, a rating of ;good' was given the MAAS and FFMQ in this review (Park et al., 2013).

Study Instruments

All instruments utilized in the quantitative arm of this study have been extensively tested among samples of undergraduate university students. The FFMQ and C-CEI have been tested extensively within the United States and the SAGAT has been used to assess SA of senior level nursing students required to care for patients experiencing physiologic deterioration in a simulated care environment.

Five Facets of Mindfulness Questionnaire (FFMQ).

The FFMQ was utilized for this study as it represents a multi-dimensional examination of a complex psychological construct with the goal that these facets would serve to clarify relationships with other variables. The initial study of the facets of mindfulness conducted by Baer and colleague (2006) utilized exploratory factor analysis in a large sample (n=613) of university students who had completed five mindfulness scales examining one of the facets of mindfulness (observing, describing, acting with awareness, nonjudging of inner experience and nonreactivity to inner experience) individually. Findings from this work supported the five-factor description of mindfulness, suggesting the following descriptions:

1. Observing – noticing or attending to internal and external experiences, such as sensations, cognitions and emotions,
2. Describing – the labeling of internal experience with words,
3. Acting with awareness – attending to one's activities of the moment and can be contrasted with acting in autopilot while attention is focused elsewhere,
4. Nonjudging of inner experience – intentionally assuming a nonjudgmental stance towards thoughts and feelings; and,
5. Nonreactivity to inner experience – tendency to let feeling and emotions come and go without getting caught up in examination of the content of these feelings and emotions (Baer et al., 2008, p.330). Internal consistency of the instrument was adequate to good with alpha coefficients ranging from 0.75 to 0.91.

The resultant instrument, the FFMQ, resulted in a 39-item scale with five subscales. Eight items examine "Observe," eight items examine "Describe," eight items examine "Act with Awareness," eight items examine "Nonjudge" and seven items explore "Nonreact". A Likert

scale is used for measurement of each item and then scoring for each subscale is then summed (Table 4).

Table 4

FFMQ Likert Scale

1	2	3	4	5
Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true

The higher the mean score, the higher level of dispositional mindfulness, with each individual facet sum interpreted in the same manner – the higher the score the greater the disposition towards that facet of mindfulness (Appendix B). Negatively stated items in each of the five subscales are reverse coded prior to scoring.

Situation Awareness Global Assessment Technique. The Situation Awareness Global Assessment Technique (SAGAT) was developed based on all elements of SA, permitting comprehensive assessment of the SA requirements. This is one of two methods of assessing SA in the literature.

The SAGAT is executed in simulated environments and employs a "freeze" in the simulation during which the nursing student(s) are queried regarding their perceptions of the situation at that time (Endsley, 2000). All data displays and simulation scenario are suspended during the SA assessment and queries are completed quickly across all three levels of SA: level 1- perception data, level 2 – comprehension of meaning data, and level 3 - projection of the near future. Endsley (2000) maintains that static knowledge is outside of the boundaries of the human experience of SA and thus a dynamic, realistic simulation of the environment must be used to assess SA.

Scientific acceptability of this technique in measuring the phenomenon has been provided by Endsley (2000) and instrument specific for measuring SA in senior level nursing students has been tested also (Lavoie et al., 2016). Endsley (2000) reports that the SAGAT demonstrates strong criterion validity as it has been highly predictive of performance in combat simulations with military pilots: if a pilot demonstrated SA awareness of the presence of enemy air craft, they were three times more likely to kill the target than those pilots who did not describe the presence of the aircraft during the SAGAT. Using four pilots in two simulation trials, test-retest reliability was reported at .98, .99, .99, and .92.

The 'freeze' required to complete the SAGAT has been criticized as intrusive or disruptive. To address this concern and support construct validity of the technique, Endsley (2000) completed freezes of 30 seconds, 1 minute and 2 minutes during performance of a simulation. Feedback from participants was that the freeze was very similar to typical training exercises and was not perceived as intrusive. Endsley further tested the issue of the freeze by creating three test conditions: 1. there was no freeze during the scenario and participants were not expecting one, 2. there was no stop in the scenario and the participants had been informed to expect a freeze, and 3. there was a stop in the scenario and the participants were notified that a freeze would occur during their simulation. Analysis of variance between pilot performance in each of these conditions did not yield any significant difference in simulation outcomes ($F(2,87) = .15$, $p=.861$) (Endsley, 2000).

Lavoie and colleagues (2016) developed and tested a SAGAT procedure to operationalize the levels of SA that reflected the clinical judgment needed by senior level nursing students to effectively manage patient deterioration in a simulated hypovolemic, hemorrhagic shock scenario. Fifteen critical care experts in practice settings provided content validation on the

queries suggested for use in testing each level of SA in the nursing student scenarios. The critical care experts completed electronic questionnaire rating each of 36 queries across three levels of SA on a four-point Likert Scale rating the relevance of the query to the theoretical level of SA to which the query was situated by the research team. Two survey rounds were completed with this panel.

Three indices were reported for each query, included content validity index (I-CVI), index of item clarity (I-IC), and index of necessity (I-NI). An acceptable level of 0.78 was used for all three indices. The final instrument tested contained 31 queries divided over the three levels of SA: Perception, Comprehension, and Projection.

The SAGAT instrument was then tested using video-taped performance of 234 senior level nursing students, divided into three cohorts, in a simulated scenario of patient deterioration related to hemorrhagic shock. Scoring of student responses to the queries was 1-point for a correct answer and 0-points for an incorrect or "I don't know" response. The physiologic question of blood pressure is scored with ½ point for the correct systolic and ½ point for the correct diastolic pressure. An acceptable range for correct recall of measurement is outlined on the query sheet (Appendix C).

Paired t-tests showed no significant differences in mean SA scores between the cohorts: cohort 1 and 2: t (184) = -0.58, p= 0.56; cohort 1 and 3: t(155) = -1.70, p= 0.09; and, cohort 2 and 3: t(123) = -1.03, p= 0.30. Overall, the entire scale had a Kuder-Richardson (KR) – 20 of 0.64. Twelve queries across all SA levels exceeded the "easy" threshold, with four queries demonstrating poor discriminatory values (D<0.25): two first level queries, one second-level query and one third-level query. Twenty-one of the queries (65.5%) demonstrated good discrimination properties and medium-range p-values indicating a good fit to the model desired

for this assessment technique. Finally, students were asked to rate the degree to which the technique impacted their performance in the simulation. A total of 109 students completed the survey and 93 (85%) reported that the SAGAT did not impede their performance in the scenario. Eight students reported "tremendous impact", "a lot of impact" (n=24), "slight impact" on their performance (n=44), and "no impact at all" (n=33) (Lavoie et al., 2016). An analysis of student comments evaluating the experience of the "freeze" and queries indicated that students were very aware of benefits to their performance later in the scenario, as the queries helped them 'realize' what they had forgotten in their initial assessments and provided a 'pause' that provided a brief opportunity for reflection and refocus (Lavoie et al., 2016).

Preparing to use the SAGAT required a systematic definition of the SA requirements, at all three levels of SA, required to make decisions needed by the 'operator' [nursing student] to meet the goals of the simulation (Endsley, 2000). Lavoie and colleagues (2016) proposed a link between Tanner's Evidence-based Clinical Judgement Model (2005) and the SAGAT approach, going so far as to suggest that the use of this technique "operationalized" clinical judgment for the nursing student (p.61).

The SAGAT instrument for nursing students was developed using the equivalent of the goal-oriented task analysis needed for query development suggested by Endsley (2000). As Endsley suggests, the time taken to develop and test the queries for specific application is well spent as the queries would remain valid as long as the goals for the situation under study remained unchanged. The SAGAT instrument developed to assess SA and clinical performance of senior level nursing students would logically then need validation in clinical situations other than patient deterioration that a student nurse would encounter entering practice.

The SAGAT instrument tested by Lavoie et al., (2016) is largely intact in this design. Three queries that did not meet discriminatory thresholds were replaced by queries utilized in the only other reported use of the SAGAT with senior level nursing students in the literature described for use as a simulation/teaching activity and not a research instrument (McKenna et al., 2014). The timing of the freeze in the simulation scenarios for this study at 5-10 minutes after the start of the scenario replicates the approach used by Lavoie et al., (2016) in the pilot testing of their instrument.

Creighton Competency Evaluation Instrument (C-CEI). The C-CEI was adapted from the Creighton Simulation Evaluation Instrument (C-SEI) for use in the National Council of State Boards of Nursing (NCSBN) National Simulation Study (NSS). The C-SEI was validated for use only in the simulated care environment. To fit the needs of the NSS study design, the instrument was modified into the C-CEI to be used in evaluating student performance in both the simulated care environment and actual patient care delivery. For the purposes of the NSS, clinical competency was defined as the ability to "observe and gather information, recognize deviation from expected patterns, prioritize data, make sense of data, maintain a professional response demeanor, provide clear communication, execute effective interventions perform nursing skills correctly, evaluate nursing interventions and self-reflect for performance improvement within a culture of safety" (Hayden et al., 2014, p.244). Thus, the four broad categories of: Assessment, Communication, Clinical Judgment and Patient Safety represent the 23 behaviors that demonstrate competent clinical practice.

Three BSN programs and two ADN programs participated in the testing of the C-CEI. Nursing faculty with at least six years teaching experience were invited to participate in the content validity testing of the instrument. Twenty-five faculty across the programs met this

criterion and participated. Using a 4-point Likert-type scale with scores ranging from 1 – strongly disagree to 4 – strongly agree, participants were asked to rate the Necessity, Fitness and Understanding of each item. Participants strongly agreed that each behavior should be included in the instrument (M = 3.89, SD = 0.19), fit within the category to which it was designated (M = 3.86, SD = 0.22) and be easy to understand (M = 3.78, SD = 0.27).

All clinical faculty at all programs were invited to evaluate inter-rater reliability of the C-CEI. A total of 31 faculty viewed three simulation scenarios representing three levels of proficiency of performance on the part of the nursing student (Hayden et al., 2014). The 31 responses obtained were compared with the responses of expert raters with an overall agreement of 79.4% and Cronbach's alpha coefficients were above .90. Kappa scores reflected fair to moderate agreement between observed and expected agreement (0.316 for circle scenario, 0.443 for square scenario, 0.453 for triangle scenario). The usability for the instrument in the actual clinical environment was rated high at M=3.10, SD = 0.25) as was usability in the simulated care environment (M = 3.25, SD = 0.38).

Scoring of the C-CEI was straight forward, with 1-point assigned when a competent behavior was demonstrated, and no points assigned when performance does not meet competency levels. If the behavior was not evaluated due to the nature of the experience provided, it was rated as NA and the denominator for the scenario was revaluated from the baseline 23 points. Three total points were assigned in the Assessment category; 5 points in the Communication category, 9 points in the Clinical Judgment Category and 6 points in the Patient Safety category. The scoring sheet is attached as Appendix D.

Gaps in the Literature

For all practical purposes, mindfulness is an unexplored construct in nursing. The review of the three studies on the effects of MBSR on stress and burnout in nurses and nurse leaders only validates what psychology has already well-established: MBSR alleviates personal stress and emotional reactivity (emotional distress) when practiced regularly. This was true of the small cohorts of practicing nurses and nurse leaders studied. These studies were also under-powered, limited in sample size, scope and strength of design.

MBSR or MM is also associated with the development of mindfulness in psychology literature. Only one of these three studies directly measured mindfulness with a validated instrument. Findings were "highly significant" for within group improvements in mindfulness after the MBSR training and at 3 months' post intervention (Cohen-Katz, Wiley, Capuano, Baker & Shapiro, 2005).

Another novel construct related to mindfulness worthy of mention was the proposition of Beddoe & Murphy (2004) suggesting mindfulness facilitated empathy development in nursing students. While these researchers were unable to report a significant improvement in measures of empathy post treatment, they did report an upward trend in measures of empathy on the Empathic Concern Scale in these 16 nursing students.

Empirically, nursing has not explored mindfulness within the context of the cognitive human performance factors – either from improving cognitive performance in the face of distracted practice and resultant error or from the stance of enhancing human well-being definition.

No qualitative examination of the construct of mindfulness and its relationship to nursing practice has been conducted. All the quantitative studies of MM interventions in nursing or

nursing students cite emotional well-being, yet none link this finding to the suggested "quadruple aim" of quality improvement in health care: care, cost, health and clinician wellbeing or workplace vitality and joy. A large gap in nursing knowledge exists regarding the impact of mindfulness on safe nursing practice and the experience of mindful skills intentionally applied to nursing care.

Summary

This chapter presented a comprehensive review of the literature regarding the construct of mindfulness as a phenomenon, beginning with a description of the Eastern contemplative approach to the construct and the Western philosophy of phenomenology. A state of science approach was taken with the review examining mindfulness within the disciplines of psychology/medicine, human factors and safety science applied to high-reliability organizations and the field of nursing.

Knowledge of the human cognitive processing mechanism of mindfulness continues to expand as neurobiological study of mindfulness is enhanced by structural and functional MRI scans. The efficacy and effectiveness of mindfulness as an intervention for distress and fatigue associated with cancer and psychopathology (such as depression and bipolar disorders) along with stress management are well established. MT has also been associated with enhanced immune function in healthy adults, persons with cancer and HIV and improvements in biomarkers of glycemic control in diabetics (Park et al., 2013).

Nursing knowledge of the impact of mindfulness on nursing practice and the related implications for nursing education and research are all but unexplored in the literature. This literature provided evidence of a wide gap requiring descriptive study of the construct in both qualitative and quantitative design and the pressing need for development of teaching learning

activities regarding what is known regarding cognitive human factors and mindfulness in nursing practice.

The aim of this study was to describe the relationship and impact of mindfulness as an antecedent to situation awareness that was hypothesized to be a mediator of mindfulness needed to enhance clinical competence. As previously discussed, human performance tools may be used to enhance situation awareness and increase environmental safety. This research supported the study proposition that mindfulness training is a valid human performance tool for nursing practice and thus supports its inclusion in undergraduate nursing curricula as a non-technical skill needed for competent nursing practice.

CHAPTER III

METHODOLOGY

This study employed a mixed method (MM) design. The quantitative phase of this research utilized a cross-sectional, descriptive, correlational design with qualitative descriptive data collected concurrently. The quantitative arm examined the relationship between two independent variables (mindfulness and situation awareness) and the dependent variable of clinical competence. A structural equation model (SEM), in which situation awareness was proposed as a mediator between mindfulness and clinical competence, was also hypothesized. The secondary purpose of this research was to examine the nursing students' description of performance gaps leading to error or near-miss events that may be related to slips, lapses, and mistakes via a qualitative descriptive (QD) approach. The methodology utilized for the current study is described in this chapter, including discussion of study design, sample and sampling plan, instrumentation for the study and procedures for data collection and analysis.

Study Design

A cross-sectional, mixed method, descriptive, correlational design was used for this study as the construct of mindfulness related to nursing practice and nursing education is not well described in the literature. As mindfulness in nursing practice lacks description in the research literature, the use of the multiple and complementary types of data as described added validity to the findings (Polit & Beck, 2015). The practicality of blending quantitative and qualitative descriptive data helped in answering research questions related to this complex phenomenon in which qualitative data is lacking across multiple disciplines, not just nursing.

The specific mixed-method design was that of an embedded, correlational model, in which the qualitative data was used in a supportive capacity to the quantitative arm of the design.

The quantitative data was the dominant data type [QUAN(qual)] in this study with concurrent sequencing of both quantitative and qualitative data collection.

Sample

This section will describe the sampling plan utilized in this study. The population and sample, eligibility criteria, and power analysis are discussed.

Population and Sample

The population for this study included all full-time, pre-licensure, senior level baccalaureate nursing students in the United States. The sample included 102 full-time, pre-licensure, baccalaureate nursing students in two different programs in western Pennsylvania.

Study Setting

Two baccalaureate nursing program sites were utilized to strengthen the study design and recruit a sample large enough to meet targets described in power analysis and requirements for the SEM testing. The two sites recruited for this study represented different organizational structure and potentially different recruitment demographics and candidate selection criteria thus adding to the diversity of the sample. The researcher formally contacted the department chairs for the undergraduate programs for permission to conduct this research upon Indiana University of Pennsylvania institutional review board (IRB) approval of this study (Appendix I).

Eligibility Criteria

The following eligibility criteria was utilized as selection criteria for participation in this study.

Inclusion criteria. This study's inclusion criteria were:

1. Enrollment as a full-time student within a traditional or accelerated second-degree baccalaureate pre-licensure nursing program within the state of Pennsylvania.

2. Registered in the final year (fall, winter or summer term) of a traditional 4-year program or final term (last 15-16 weeks) of an accelerated second-degree baccalaureate nursing program.
3. Participants possessing at least two previous experiences with patient care delivery in high-fidelity simulated care environment meeting the INACSL Standards of Best Practice: Simulation^{SM} (2016) indicating high-quality simulation education in nursing.
4. English speaking.

Exclusion criteria. This study's exclusion criteria were:

1. Part-Time students.
2. Non-English-speaking students.
3. Students not enrolled in the final year, or senior-level, of a pre-licensure baccalaureate nursing program or final term of an accelerated second-degree baccalaureate nursing program.

Power Analysis and Sample Size

To test research questions one, two, and three, a Pearson correlation was calculated. Polit and Beck (2012) report that most nursing research studies demonstrate small-to-medium effect. As no correlation coefficient from another relevant study was available to inform the estimated effect size, a modest estimated effect size of .30, typical of many nursing research studies, was selected along with power = .08 and $\alpha = .05$. The sample size needed for testing these research questions was determined to be 85. Additionally, the structural equation modeling that was hypothesized for the study required a sample of at least 100 participants. A total of 102

participants were recruited to participate from the two study sites to meet the targeted sample size for all statistical testing needed for this study.

Recruitment

Participants were recruited from the pool of senior level nursing students scheduled to participate in a simulated patient care scenario in a high-fidelity simulated clinical environment. within the senior level curriculum. Participation in this simulation experience was required for the course; however, participation in the study was voluntary.

Recruitment emails were distributed to students two weeks prior to scheduled simulation activities in the school. Prior to the first data collection activities at each site, the researcher spent one observation day with the simulation faculty at both universities to learn the workflow related to simulation and answer any questions/concerns from the simulation faculty members at each site. On days when data collection took place, the researcher utilized time prior to the pre-briefing for the scenario to provide students with an overview of the study and obtain informed consent from participants. Students who agreed to participate in the study completed the FFMQ using pencil and paper before or after the simulation scenario. Students not interested in participating in the study completed the simulation experience as directed by their simulation instructors.

Human Subject and Ethical Issues

Approval for conducting this study was obtained from the Institutional Review Board (IRB) at Indiana University of Pennsylvania (IUP) (Appendix H). Approval to conduct this study at two schools of nursing was granted (Appendix I) upon receipt of the IUP IRB approval letter at each site. One participating study site was a state-owned, public university school of nursing in a rural location and the other a privately-owned university school of nursing in an urban

location. An overview of the study aims, research instruments, and data collection methods was provided to each study site prior to participation in the study (Appendix A). Informed consent was obtained from participants prior to data collection procedures.

All information obtained in this study is confidential. The self-report of mindfulness data was held confidential and anonymous by the researcher. To achieve this end, participants were assigned an identification code consisting of a randomly generated 4 figure alpha-numeric participant code assigned by the researcher. All other data (SAGAT, C-CEI, and PEARLS responses) was collected by the researcher during simulated care experiences and debriefing. While student identity was evident to the researcher during the simulation, the data collected during these experiences had been de-identified and linked by identification code and not the name of participant.

The researcher did not have any knowledge of student academic standing nor was the researcher affiliated with the universities in which data was collected. No ethical concerns were identified during this study. Students were informed that they may experience mild discomfort or anxiety related to the additional observer and data collection during the care scenario; however, all participants verified having had at least two previous simulated care experiences prior to data collection for this study to minimize the experience of discomfort or anxiety related to simulation. No participants withdrew from the study and there were no concerns raised by faculty, staff, students or participants regarding the conduct of this research.

Instruments

The psychometric properties of each of the research instruments used in this study were described in chapter two of this proposal. The following table summarizes the instruments, the measurement characteristics and scoring of the quantitative data.

Table 5

Overview of Study Constructs and Instruments

	Construct			
	Mindfulness	Situation Awareness	Clinical Competence	Performance Gaps Analysis
Instrument	Five Facets of Mindfulness (FFMQ)	Situation Awareness Global Assessment Tool (SAGAT)	Creighton Competence Evaluation Instrument (C-CEI)	Promoting Excellence and Reflective Learning in Simulation (PEARLS)
Type of Data	Quantitative	Quantitative	Quantitative	Qualitative
Types of Scores Produced	39-item self-evaluation assessing five facets (attributes) of mindfulness: observing (8 items), describing (8 items), acting with awareness (8 items), nonjudging (8 items) and nonreacting (7-items) (Appendix B)	30-item rating of participant SA with subscales of: physiologic perception (6 items), global situation perception (9 items), comprehension (7 items), projection (8 items) (Appendix C)	Researcher assessment of student competence across four areas of performance: assessment skills (3 measures), communication skills (5 measures), clinical judgment (9 measures), patient safety actions (6 measures) (Appendix D)	Researcher selects interview questions based on student triad identification of performance gaps: behavioral, cognitive, technical or unidentified issues of performance. (Appendix E)

Data Collection Procedures

The simulation of patient care is developed in three phases: pre-briefing, engagement in scenario and de-briefing. Data collection for this study took place in all three phases of the patient care simulation event (Figure 4). The FFMQ was administered to students immediately prior to pre-briefing or debriefing for the simulated experience, depending on the scheduled scenarios. The instrument took less than 10 minutes to complete and was completed via paper and pencil format. The participant identification codes were also placed on the SAGAT worksheet completed by participants and the C-CEI evaluation tool completed by the researcher. These data were entered into the SPSS software by the researcher. At no time did anyone other than the researcher access to the study data.

During the pre-briefing, the researcher introduced the study and described the 'freeze' in the scenario as a brief interruption in which students would be asked to record their recollection of patient specific clinical data. The freeze occurred between 5 and 10 minutes into the scenarios for all participants. A 'rapid-fire' questioning approach was used, in which at total of 12 SAGAT questions (Appendix C) were utilized to capture the participant's immediate recollection of pertinent clinical information. The freeze lasted for no more than 120 seconds. The questions selected from the SAGAT instrument (Appendix C) were determined by the patient's condition at the point in the scenario when the freeze is enacted. Three questions from each of the four sub-categories of SA levels (physiologic perception, global situation perception, comprehension and projection) were selected for use. The researcher read the questions out loud, while the students wrote their responses to each question on a large index card provided to participants. These cards were collected by the researcher at the conclusion of the questioning.

During the freeze, all clinical data on monitors was removed from student view. The researcher utilized the C-CEI to evaluate the clinical competency demonstrated by the student during the simulation scenario. Rating of clinical competence was completed by the researcher while viewing the scenario in the simulation control room out of sight of the students participating in the simulation. As previously discussed, the C-CEI (Appendix D) was developed as an instrument to evaluate clinical competence in both simulated and actual patient care environments. The simulations selected for inclusion in this study met the International Nursing Association for Clinical Simulation Learning (INACSL) Standards of Best Practice: Simulation℠ (2016) and included acute care scenario in which communications, assessment and medication administration were expectations of the students. Prior to data collection at each participating site, the researcher reviewed the simulation scenarios to verify concordance to the simulation standards and appropriateness for use in the study protocol.

Finally, the PEARLS Decision Support Matrix was used by the researcher to select the appropriate structured questions for the debriefing based on the students' descriptions of performance gaps during the simulation – which fell into four broad categories: Behavioral Gaps, Cognitive Gaps, Technical Gaps, and Unidentified Gaps (Appendix E). The last category of unidentified gaps was used when students are unable to identify any performance gaps or areas for improvement during their care experience. Technical gaps were identified as issues across the C-CEI categories and cognitive gaps fell under the categories of slips, lapses or mistakes. Behavioral gaps were identified as any type of medical error and the debriefing questions asked participants to describe reasons for the error.

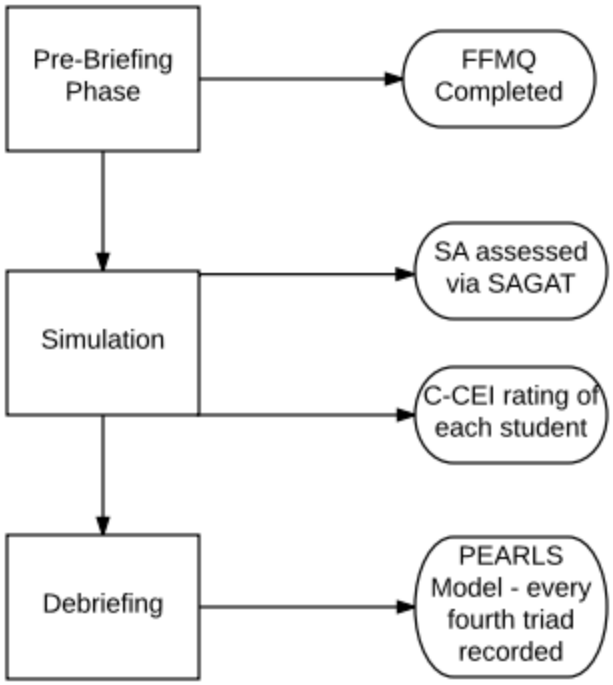


Figure 4. The study flowchart. This figure identifies the phases of simulation and the data collection that took place during that phase of the simulated learning experience.

The researcher determined the moderately structured interview questions for students were selected for QD data collection during the post-simulation debriefing. Qualitative data was obtained during debriefing at both sites, with four groups of students debriefed at one site and seven groups of students at the second site. Debriefing questions were selected from the PEARLS matrix (Appendix E) based on the performance gaps described by students during the care delivery in the simulation.

Data Analysis

Scoring of instruments measuring the theoretical constructs of mindfulness, situation awareness and competency for this study have been previously described but were all similar in that a total score was calculated, and a higher score indicated stronger/higher levels of the attributes being measured. The scores for each of the measures were aggregated for participants across both universities, with both overall scores and scores for all sub-scales within the

instruments determined. Additional analysis of scores was performed comparing results for the individual schools. Detailed explanation of statistical testing for each specific aim and related research question(s) is provided below.

Data Analysis Plan by Aims of Study

The following specific aims and related research questions were examined during this study:

Specific Aim 1: Describe the relationship between dispositional mindfulness and level of situation awareness demonstrated by senior level nursing students in a simulated patient care scenario and thus answer the research question:

> RQ1: What is the relationship between dispositional mindfulness (as measured on the Five-Facets of Mindfulness Questionnaire) and level of situation awareness (as evaluated using the Situation Awareness Global Assessment Tool) during simulated patient care delivery?
>
> RQ2: Is situation awareness a mediator between mindfulness and clinical competency?

The strength and direction of the relationship between dispositional mindfulness and situation awareness needed to address RQ1 was tested using the Pearson product movement correlation coefficient (*r*) test. RQ2 was the first question addressed in the structural equation model (SEM) hypothesized for this study. The independent variable of situation awareness within this SEM was identified as a potential mediator between mindfulness and clinical competency. This description permits a deeper exploration of the interplay of the indicator variables that goes beyond the simple account of the relationship described in the bivariate analysis (Wu & Zumbo, 2008) completed for this question (see Figure 5).

Specific Aim 2: Explore the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students in a simulated care scenario and answer the following research question:

> RQ3: What is the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students during simulated patient care delivery?

The strength and direction of the relationship between dispositional mindfulness and competency of clinical performance was tested using the Pearson product movement correlation coefficient (*r*) test.

Specific Aim 3: Determine which of the five facets (attributes) of dispositional mindfulness (observing, describing, acting with awareness, non-judging, non-reacting) may be most predictive of safe/competent clinical practice as measured by the Creighton Competency Evaluation Tool (C-CEI) and answer the following research question:

> RQ4: Which of the five facets (attributes) of dispositional mindfulness are most predictive of competent clinical practice?

The Pearson product moment correlation coefficient between variables as described in aims 1 and 2, was utilized to determine a relationship between these variables. These findings were utilized to explore the relationship between variables using Structural Equation Modeling (SEM) in which the indicator measures (instrument sub-scales for the FFMQ and C-CEI) were further examined to validate a causal model (link) between these multiple indicators of the complex theoretical constructs of mindfulness and clinical competency.

For the purposes of the SEM representing this study, the researcher proposed a recursive model in which there is a one-way flow of causation between the indicator variables of the

constructs of mindfulness and situation awareness, in which situation awareness is a mediator of the relationship between mindfulness and clinical competence. The demographic data of age, gender, GPA and meditation history was also collected with the FFMQ (Appendix B).

Path coefficients, referred to as parameters within the SEM, would be calculated to define the strength of causal relationship between each indicator variable within the model in the event the statistical assumptions for the SEM were met as part of the data analysis.

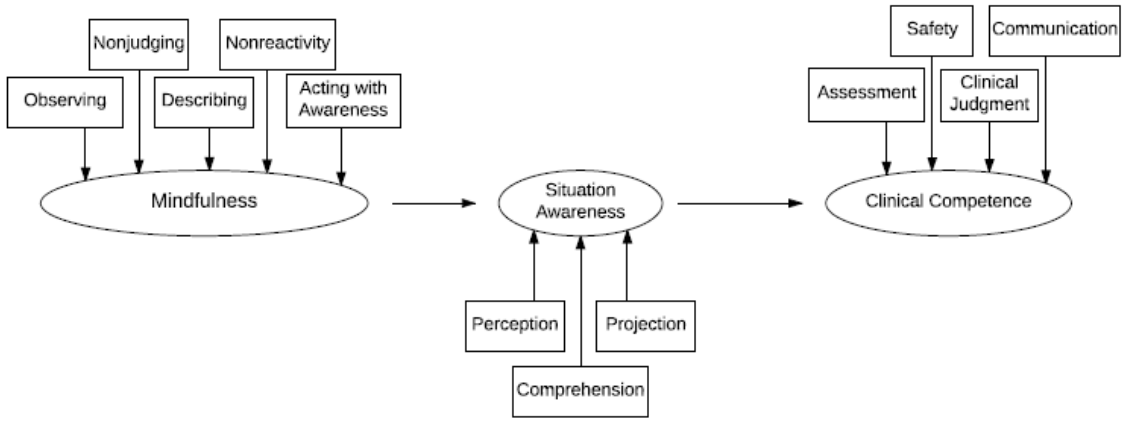


Figure 5. The structural equation model proposed for this study. The model is recursive in nature in which mindfulness is antecedent to situation awareness and SA is a mediator between mindfulness and competence.

Specific Aim 4: Provide a descriptive summary of themes identified by nursing students as they self-assess their clinical performance and outcomes to provide insights into the experience of errors (slips, lapses, and mistakes) during simulated practice and answer the following research questions:

RQ5: What themes are identified by nursing students describing perceptions of their clinical outcomes and insights into errors using a metacognitive/reflective approach within the PEARLS Model of Debriefing?

NVivo for Qualitative Data Analysis was utilized to help complete the thematic analysis of student responses to the debriefing questions. The outcome of the QD method was a descriptive summary of the interview content and the identification of themes related to the participant experience of slips, lapses, and mistakes during simulated patient care experiences.

Specific Aim 5: Evaluate a recursive model of mindfulness, SA and clinical competence in which SA is a mediator between mindfulness and clinical competence with resultant impact on the competent clinical practice demonstrated by the student during the simulated care experience.

Summary

This chapter has provided an overview of the methodology of this mixed method, descriptive correlational study of mindfulness, situation awareness and clinical competency in care provided by senior-level nursing students in a simulated care environment.

CHAPTER IV

RESULTS

This chapter presents the results of the statistical analysis of this study. Beginning with a description of the sample demographics, results pertaining to the research questions will be discussed. This discussion also includes a description of the degree to which the structural equation model proposed for this study was supported by the sample data.

Sample Description

The study participants were eligible senior-level baccalaureate nursing students from two universities in western Pennsylvania. Across both study sites, 126 eligible participants consented to participate in the study, with observation and data collection completed on 102 of these senior level nursing students. Fifty-seven participants attended a state-owned public university in a rural area and 45 attended a private university in a suburban area adjacent to a major metropolitan area. Table 6 provides additional demographic statistics by study site including age of participants, gender, BSN program type, race/ethnicity, and experience with meditation.

Most participants were female (*n* = 92*)* and self-identified as white, Caucasian (*n* = 92*).* Seventy-one percent of participants were enrolled in a traditional BSN program (*n* = 72*)* and 29% (*n*=30*)* were full-time students in an accelerated second-degree BSN program. Twenty of the study participants (19.8%) indicated that they had experience with mindfulness meditation and 24 participants (23.5%) acknowledged that they regularly engaged in other forms of meditation including yoga (Table 6).

Table 6

Frequency Distribution of Selected Demographic Variables

Variable	Category	Public (*n*=57) *n (%)*	Private (*n*=45) *n (%)*	Overall (*N=102)* *n (%)*
Gender	Male	5 (8.8)	6 (13.3)	11 (10.8)
	Female	52 (91.2)	39 (86.7)	91 (89.2)
Program	Traditional BSN	57(100)	15 (33)	72 (71)
	Accelerated BSN		30 (67)	30 (29)
Race	Black, African American	5 (8.8)	1 (2.2)	6 (5.9)
	Asian	3 (5.3)		3 (2.9)
	White, Caucasian	48 (84.2)	44 (97.8)	92 (90.2)
	Pacific Islander	1 (1.8)		1 (1.0)
Meditator	Mindfulness	9 (15.8)	11 (24.4)	20 (19.8)
	Other	12 (21.1)	12 (26.7)	24 (23.5)

Note. Total percentages may not equal 100 due to rounding.

As described in Table 7, the participants' age ranged from 21-53 (*M* = 23.25, *SD* = 3.738*)* with most participants between the ages of 22 and 24 years. The private university site demonstrated a slightly older sample (*n = 45, M = 24.27, SD = 5.3, range 21 – 53 years)* as compared to public university site (*n* = 57, *M* = 22.46, *SD* = 1.23, *range* 21 – 27 years*)* related to the inclusion of the second-degree BSN program at this university. Participants at the private university reported a mean GPA of 3.59, while participates at the public setting reported a mean GPA of 3.16 and an overall self-reported GPA of 3.24 for the entire sample.

Table 7

Descriptive Statistics of Selected Demographic Variable

Variable	Public *(n*=57)	Private (*n*=45)	Overall (*N=102)*
Age in Years	22.35	24.27	23.25
GPA (Self-Report)	3.16	3.59	3.24

Participant overall scores on the three study measures is provided in Table 8. Participants' overall mean dispositional mindfulness score as measures on the FFMQ was 129.69 with the public university reporting a mean of 130.18 (*SD* = 15.68*)* and the private university reporting a mean score of 129.07 (*SD* = 12.97*).* Overall mindfulness scores varied from a minimum score of 99 and a maximum score of 184. The range of possible scores on the FFMQ is a low score of 39 and a maximum score of 195. The SAGAT assessment completed by students during a time-out in the simulation scenario has a maximum score of 12 and study participants had a mean score of 9.69 (*SD = .86),* with the public university achieving a mean score of 9.66 and the private a score of 9.72 out of 12.

As the denominator of the C-CEI varied depending on the objectives of the simulation scenario, the scores were normalized to proportions. Overall clinical competency demonstrated by the 102 participants in the study was 81% (*SD = .86),* with the public university achieving a mean competency rating of 79% (*SD = .57)* and the private site achieving a mean competency rating of 84% (*SD = .88).* Table 9 provides overall descriptive statistics by study site for sub-scales of each of the study instruments.

Table 8

Descriptive Statistics of Participant Overall Scores on Measures of Study Variables

Variable	Public (*n*=57)	Private (*n*=45)	Overall (*N=102)*
Mindfulness (FFMQ)			
Mean	130.18	129.07	129.69
SD	15.68	12.97	14.49
Situation Awareness (SAGAT)			
Mean	9.66	9.72	9.69
SD	.32	.24	.33
Clinical Competency (C-CEI)			
Mean Rating	79	84	81
SD	.57	.88	.86

Note. Maximum score on FFMQ is 195 and on SAGAT is 12.

Differences between study site means on all scales (FFMQ, SAGAT, C-CEI) and related sub-scales were compared using independent sample T-test. No statistically significant differences were found in overall dispositional mindfulness, situation awareness or clinical competency between sites; however, one statistically significant between group difference was identified within the CEI patient safety sub-scale. Participants from the public university (n=57) had a mean score of 64% (*M* = .6416, *SD* = .248*)* on competency related to patient safety while participants at private university (n=45) obtained a mean score of 74% *(M* = .7458, *SD* = .266*; t* (100) = -2.040, *p* = .044, two-tailed). The magnitude of the differences in means (mean difference = -.10420, 95% *CI:* -.220556 to -.00284) was very small (eta squared = .0001).

Table 9

Descriptive Statistics of Participant Scores on Study Instrument Sub-Scales by Site

Variable	Public (*n*=57)	Private (*n*=45)	Overall (*N=102)*
Mindfulness (FFMQ) Sub-Scales			
Observing	25.98 (*SD = 4.4)*	26.69 (*SD = 4.2)*	26.29 *(SD = 4.2)*
Describing	28.53 (*SD = 4.8)*	28.22 (*SD = 5.7)*	28.39 *(SD = 5.2)*
Acting w/ Awareness	26.91 *(SD = 5.9)*	27.22 (*SD = 5.3)*	27.02 *(SD = 5.7)*
Non-Judging	27.40 *(SD = 5.3)*	25.70 (*SD = 5.2)*	26.65 *(SD = 5.3)*
Non-Reacting	21.32 *(SD = 2.9)*	21.29 *(SD = 2.9)*	21.30 *(SD = 2.9)*
Situation Awareness (SAGAT)			
Physiologic Perception	2.03 (*SD = .993)*	2.19 *(SD = .973)*	2.10 (*SD = .983)*
Global Situation Perception	2.58 *(SD = .653)*	2.51 *(SD = .626)*	2.55 *(SD = .639)*
Comprehension	2.53 *(SD = .735)*	2.60 *(SD = .580)*	2.56 *(SD = .669)*
Projection	2.47 *(SD = .758)*	2.47 *(SD = .625)*	2.47 *(SD = .699)*
Clinical Competency (C-CEI)			
Assessment	.8302 *(SD = .295)*	.8871 *(SD = .205)*	.8553 *(SD = .260)*
Communication	.8596 *(SD = .207)*	.8982 *(SD = .178)*	.8767 *(SD = .195)*
Clinical Judgment	.8477 *(SD = .204)*	.8780 *(SD = .168)*	.8611 *(SD = .187)*
Patient Safety	.6416 (SD = .248)	.7458 *(Sd = .266)*	.6875 *(SD = .260)*

Note. Maximum score on FFMQ is 195 and on SAGAT is 12. Highest score on the C-CEI sub-scales is 1.0 (100%)

Results and the Specific Aims of the Study

This study investigated the relationship between disposition mindfulness, situation awareness and the clinical competency demonstrated by senior-level nursing students. Key to defining this relationship was determining if mindfulness is antecedent to the desired behavior of situation awareness on the part of the nursing student. A structural equation model in which situation awareness was proposed as a mediator between mindfulness and clinical competency on the part of the nursing student was hypothesized for this study. Using a mixed-method, descriptive, correlational study design, the relationship between dispositional mindfulness and situation awareness and the impact on the ability of these students to deliver quality and safe care outcomes in a simulated care environment was investigated.

Specific Aim One – Research Question 1 and 2

Describe the relationship between dispositional mindfulness and level of situation awareness demonstrated by senior level nursing students in a simulated patient care scenario and answer the following research questions:

Research Question 1. What is the relationship between dispositional mindfulness (as measured on the Five-Facets of Mindfulness Questionnaire) and level of situation awareness on the part of the nursing students (as evaluated using the Situation Awareness Global Assessment Technique) during simulated patient care delivery?

The relationship between dispositional mindfulness as measured by the overall FFMQ scores and situation awareness as determined by the overall SAGAT scores of 102 study participants was investigated using Pearson product-moment correlation coefficient. Primary data analysis was conducted to ensure no violation of the assumptions of normality, linearity and homoscedasticity. There was no correlation demonstrated between the constructs of mindfulness and situation awareness ($r = 0.091$, $n = 102$, $p = 0.363$). Pearson correlation coefficients were also calculated to determine a relationship between any of the five mindfulness sub-scales (observing, describing, acting with awareness, non-judging, and non-reacting) and the four sub-scales of the SAGAT (physiologic perception, global situation perception, comprehension and projection). No statistically significant correlation coefficients were generated in this analysis, thus there is no statistical relationship between dispositional mindfulness as measured on the FFMQ and situation awareness in a simulated patient care scenario.

Research Question 2. Is situation awareness a mediator between mindfulness and clinical competency? NO relationship between mindfulness and situation awareness was demonstrated by the analysis described in research question 1; therefore, situation awareness is

not a possible mediator between mindfulness and clinical competency in this sample of nursing students. This finding supports the conclusion that dispositional mindfulness is not antecedent to situation awareness in this study.

Specific Aim Two – Research Question 3

Explore the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students in a simulated care scenario and answer research question 3.

Research question 3. What is the relationship between dispositional mindfulness and the competency of clinical performance demonstrated by senior level nursing students during simulated patient care delivery?

The relationship between dispositional mindfulness and clinical competency was investigated using Pearson product-moment correlation. No relationship was found between these variables for this sample (n = 102, r = .099, p = .320, 2- tailed). Examination of the sub-scale/indicator variables of mindfulness and clinical competency demonstrated a small, positive relationship between the observing FFMQ scale and the communication scale of the C-CEI (r = 0.193, p = 0.053).

Analysis of the relationship between SA and clinical competency revealed that overall higher levels of assessed SA were found to have a medium strength, positive relationship with overall clinical competency scores on the C-CEI (n =102, r = .301, p = .002, 2-tailed). In addition, the level of overall situation awareness demonstrated a strong, positive correlation to three of the four C-CEI sub-scales: assessment, communication, and clinical judgment (Table 10). Further analysis of the inter-relationships of the SA sub-scales and C-CEI sub-scales

revealed additional moderate to strong relationships among these indicator variables of the constructs of SA and clinical competency (Table 11).

Table 10

Pearson Product-Moment Correlations Between Overall Situation Awareness Level and Elements of Clinical Competency in Nursing Students

Scale	1	2	3	4	5
1. Overall Situation Awareness	-				
2. C-CEI Assessment	.212*	-			
3. C-CEI Communication	.340**	.481**	-		
4. C-CEI Clinical Judgment	.388**	.711**	.642**	-	
5. C-CEI Patient Safety	.114	.310**	.277**	.310**	-

Note. * Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Specific Aim Three – Research Question 4

Determine which of the five facets (attributes) of dispositional mindfulness (observing, describing, acting with awareness, non-judging, non-reacting) may be most predictive of safe/competent clinical practice as measured on the C-CEI.

Research question 4. Which of the five facets of dispositional mindfulness are most predictive of competent clinical practice?

As research question 3 described that no relationship was found between dispositional mindfulness and clinical competency, then the third specific aim of this study is to report that dispositional mindfulness is not predictive of competent clinical practice on the part of senior level nursing students in a simulated care environment. A weak, positive correlation between the observing sub-scale of the FFMQ and the communication sub-scale of the C-CEI was identified (r = .193, p = .053, 2-tailed) (Figure 6 and Table 11). While no direct relationship between the

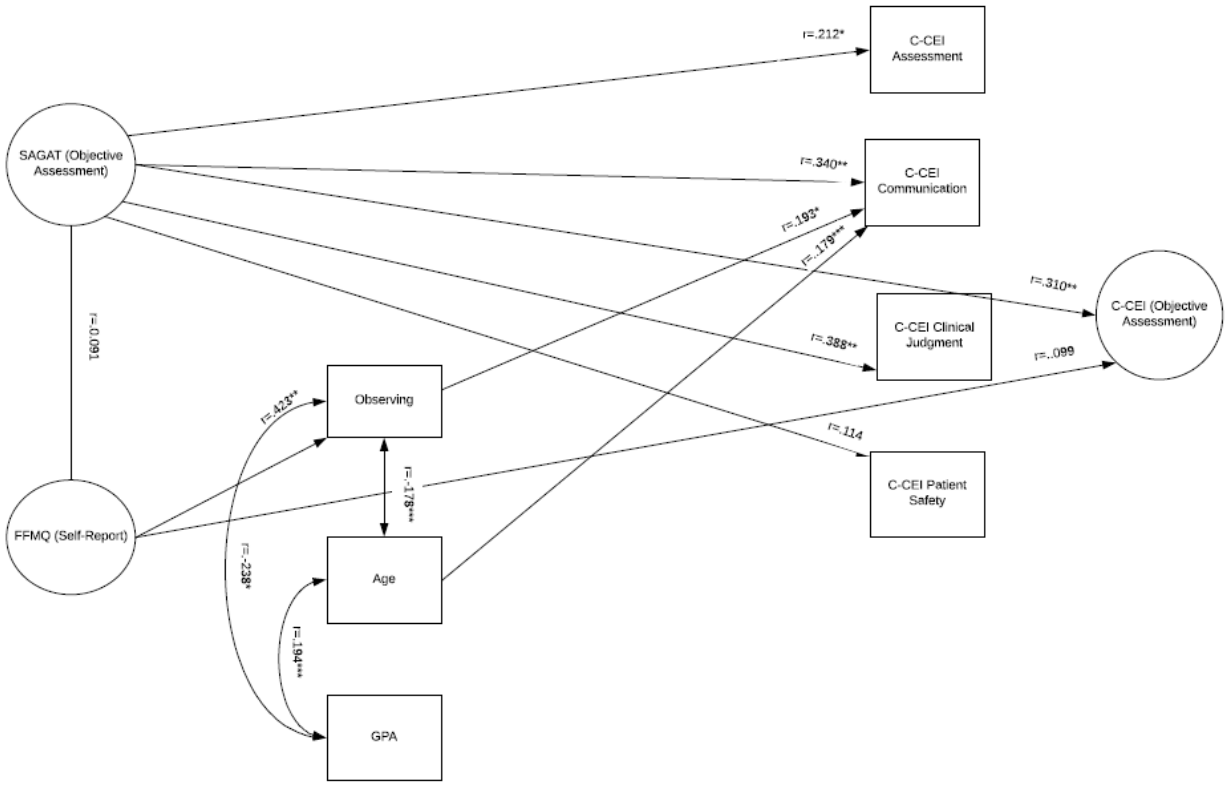
latent variables of mindfulness and clinical competence was identified in this study, a medium strength, positive relationship between the latent variable of situation awareness and clinical competency was revealed (r = .310, p = 0.002, 2-tailed). This included medium to strong positive relationships between the indicator variables (sub-scales) of situation awareness and clinical competency (Figure 7).

Table 11

Pearson Product-Moment Correlations Between Indicator Variables (Sub-Scales) of the Latent Variables of Situation Awareness and Clinical Competency

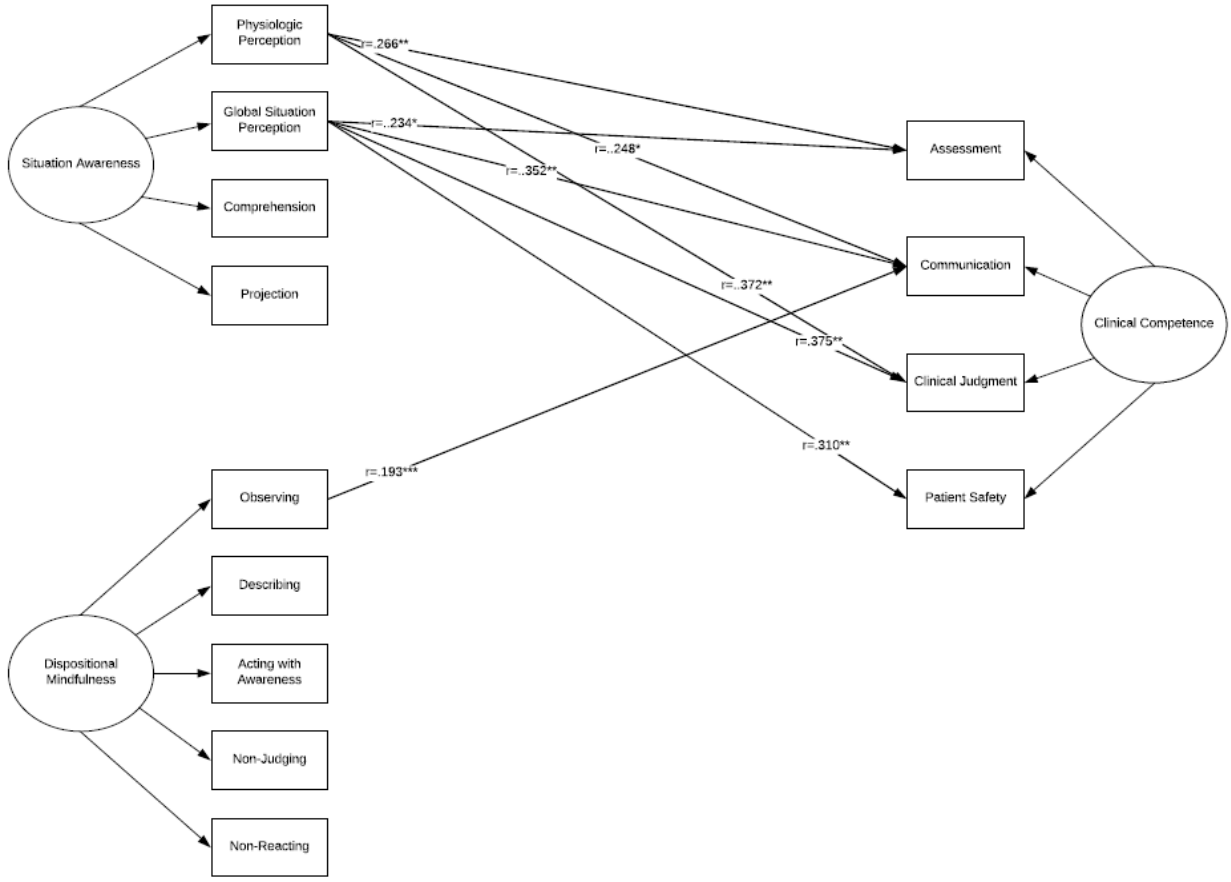
Scale	1	2	3	4	5	6	7	8	9	10
1. Overall SA	-									
2. Overall C-CEI	.310**	-								
3. C-CEI Assessment	.212*	.770**	-							
4. C-CEI Communication	.340**	.703**	.481**	-						
5. C-CEI Clinical Judgment	.388**	.856**	.711**	.642**	-					
6. C-CEI Patient Safety	.114	.681**	.310**	.277**	.310**	-				
7. SA – Physiologic Perception	.687**	.266**	.266**	.248**	.372**	.075	-			
8. SA – Global Perception	.595**	.410**	.234**	.352**	.375**	.310**	.300**	-		
9. SA – Comprehension	.455**	.058	.056	.141	.107	.011	.066	.063	-	
10.SA – Projection	.590**	.088	.122	.146	.133	-.410	.119	.103	.237*	-

Note. * Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)



Note: * Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
*** Approaching statistical significance

Figure 6. Empirical results of the study model with focus on relationship between latent variables.



Note: * Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
*** Approaching statistical significance

Figure 7. Empirical results from a multivariate analysis of the indicator variables of dispositional mindfulness, situation awareness and clinical competency.

Specific Aim Four

The fourth specific aim of this study was to utilize a qualitative descriptive approach to provide a summary of themes identified by nursing students as they self-assessed their clinical performance and outcomes. This method also provided insight into the students' experience of errors (slips, lapses, and mistakes) during simulated clinical experiences.

The PEARLS Model for debriefing was utilized during 11 debriefings after patient care simulations at the two study sites. Transcripts of each debriefing were typed by the researcher

and uploaded into NVivo to support coding of qualitative data that included debriefing after 2 heart failure scenarios, 3 scenarios related to acute coronary syndrome, 2 shock state scenarios, 1 scenario related to care of the patient with ischemic stroke, 1 scenario of a patient with overdose of a prescribed medication (lithium) and 2 scenarios related to care of the patient with small bowel obstruction and related hypovolemia.

All scenarios were selected to meet course objectives and were taken from peer-reviewed faculty resources, including the Elsevier Simulation Learning System and the Clinical Simulations for Nursing Education published by F.A. Davis. Four debriefings obtained from the private university and seven debriefings from the public university were utilized for this qualitative analysis.

While the quantitative data from this study did not support a relationship between dispositional mindfulness and safe clinical practice, the qualitative findings identified two areas in which nursing students described lacking mindfulness in their clinical practice. Participants described resultant slips, lapses, and mistakes during simulated clinical experiences observed for this study. The two major themes identified by participants as contributing to cognitive errors were lack of focused attention (acting with awareness, observing) and ineffective/inadequate communication skills (describing). A third aspect of mindfulness in nursing practice, present moment orientation, was evident in several student comments and is also reviewed in this section.

Lack of focused attention. Focus, or lack thereof , by participants was the most frequently described experience when asked to assess their performance and what went wrong during the simulation within the Reaction Phase of the PEARLS Debriefing Model used for this study.

- I'm really not sure [what went wrong]. My mind was all over the place, I only had 3 hours sleep last night. I honestly don't remember what happened during the scenario right now.
- I'm never sure what to say to the family when they interrupt me during an assessment. I'm getting the impression that it is best to ask the family to leave while I'm doing the assessment, so I can think.

Slips and Lapses were well represented in the qualitative description of cognitive error and participant inability to focus:

- "My mind was all over the place".
- "I'm not really sure what happened right now, I need to think".
- "I honestly don't remember what happened during the scenario right now".
- "I was all over the place... I just didn't know what we were looking for".
- "I wish we would have taken a blood pressure earlier, as we started the assessment – we never even realized how hypotensive he was. I should have taken a blood pressure as soon as I saw how fast his rate was on the monitor."

The lack of ability to focus may have resulted in abandonment of participant's plan of care for the simulated clinical scenario. For instance, the participant who described not realizing the degree of hypotension her patient was experiencing described having a plan that began with taking a set of vital signs and completing a focused physical examination. This plan was "forgotten" when encountered with the patient's complaints of extreme difficulty breathing. The participant further acknowledged that she should have explicitly delegated the work of vital signs to her patient care technician while she worked to administer oxygen and troubleshoot a chest tube drainage system for a cause of the patient's symptoms. Simulation faculty at both

universities utilized pre-briefings with participants and frequently provided coaching related to teamwork and delegation that students acknowledged but typically failed to execute once the scenario began to unfold.

Not only was inability to focus attention an experience described by participants, so was the experience of inability to switch attention related to fixation or continued focus on one aspect of the situation. For example:

- I was focused on vital sign changes and her response to medications.
- I was only taking her blood pressure and focused on her response to the nitroglycerine. I never even looked at her EKG and I can't say what her rhythm was or if she did have ST-segment elevations".
- Participants also described behavioral issues that lead to mistakes during their scenarios but also discussed the experience of "thinking about" or "worrying about" making a mistake as an internal distractor during the clinical experience.
- "Well, this is my critical care course and I want to learn and do well. I didn't want to do poorly with my instructors and peer watching back in the room. But I didn't want anything to go wrong with the patient either, so **I just kept telling myself to pay attention every time I noticed myself starting to think about making a mistake**".
- "Half the time I was confused [during the scenario], I felt like I really didn't know what was going on and was concerned that I was going to make a mistake."
- "I wish I would have said more. I didn't really contribute [during the scenario]. I like to know what I'm doing – to have a plan. I didn't have a plan this time. All I could think about was 'what should I say'. I didn't have a plan and I didn't want to say the wrong thing".

Of interest, two medication errors did occur, one at each site, during care delivered by study participants. Neither of the participants making a medication error realized an error had been made until a peer brought the issue out during the debriefing.

- I really didn't realize that I made the error until they mentioned it now (during debriefing)."
- In fact, one error evolved and reached the patient even while the patient's "mother" questioned the participant about her daughter's medication allergies and with a peer member of the care team asking if the participant wanted to use the electronic tablet to access the resources needed to verify the brand name with the generic name of the medication.
- "I really thought that I had given the right medication – I thought I was right. I'm not sure I really paid attention to the discussion her daughter started about her medication allergy, I was focused on getting the meds out of the med cart."

Even in the face of focused attention on the correct nuance of the clinical situation by participants, knowledge-based mistakes still occurred.

- "I was focused on vital sign changes and her response to medications, this is why I went right to the maximum amount of oxygen. I increased her oxygen to 4 liters of oxygen by nasal cannula without clinical improvement and then went to simple face mask to increase oxygen delivery.
- Instructor: "How many liters of oxygen did you administer with the simple face mask?"
- Participant: "15 liters per minute"
- Instructor: "What is the maximum flow rate that should be used with simple face mask?

- Participant: “Isn’t it 15 liters per minute?”
- Peer: “No it is 10 liters per minute. You need a non-rebreather mask to administer 15 liters of oxygen per minute.”

Lack of communication skills, knowledge and confidence. When asked about what performance deficit most directly contributed to a slip, lapse, or mistake during the simulated patient care scenario during the analysis phase of the debriefing, the most frequently cited issues were related to communication skills and know-how. The issue of “not knowing the communication rules” to support their practice during complex care scenarios was a constant theme at both study sites.

- “…I guess I did not do well with SBAR (Situation-Background-Assessment-Recommendation) [communication technique]. The doctor thanked me for the information but asked me what the situation was. What was I supposed to say – ‘she’s having a heart attack’?”
- “I felt that we could have communicated more with the support staff in the room”
- “She (the nursing assistant) started making crazy and inappropriate comments to the patient and his family. I didn’t know how to respond to that”
- “They [the nurses] could have asked me more about the patient. I was the sitter and I had been with him all night”
- “I just felt awkward waiting and not knowing what to say” (regarding waiting for response to treatment).

While communication as a clinical competency was an intervention that participants described themselves as being poorly prepared to utilize, they clearly realized the importance of communication for safe clinical practice.

- "I tried to communicate therapeutically while we waited….I attempted to use distraction and 'normal' language when I talked with the patient and daughter."
- I kept thinking that they (the family) would freak out on me if I said, "heart attack". What can we say, or should we say when a patient isn't responding to interventions and getting worse?
- "I'm never sure what to say to the family when they interrupt me during an assessment. I'm getting the impression that it is best to ask the family to leave while I'm doing the assessment so I can think".

Present moment awareness and the non-judging of self. The final theme that emerged from debriefings across both universities were insights into how participants could engage in present moment awareness and non-judging of self to move to greater insights and accountability for their performance weaknesses.

- "I realized that clinical judgment means my decisions made and why I made them… not that you [faculty] are tricking us. It was clear to me today in a way that I never realized before".
- "I was also having an 'a ha' moment as we did the NIH stroke assessment. I was really appreciating how important my assessment would be – I was really trying to focus and get it right. Important clinical decisions would be made based on observations I provided to the doctors."

- "Confidence. Confidence is what is missing for me. If I were more confident in my assessment skills, I would be more confident to communicate with doctors and family members."

This qualitative analysis of participant experience of slips, lapses and mistakes during simulated patient care scenarios suggests that mindful nursing practice requires focused attention so that the nurse may act with awareness and observe the entire clinical picture – both patient and environmental factors – that may affect safety. Findings suggest that mindful nursing practice requires a level of skill beyond dispositional mindfulness. Qualitative description of the experience by participants further supports that mindful practices of observing and describing of the present moment experience are necessary for effective communication on the part of the nurse. The analysis also suggests that simulation as a nursing pedagogy provides the students opportunity to reflect and explore aspects of mindfulness in nursing practice as described in this analysis.

Specific Aim Five

The final aim of the study was to evaluate a proposed recursive structural equation model in which SA is a mediator between mindfulness and clinical competence demonstrated by senior level nursing students during a simulated patient care experience. For the purposes of this model, mindfulness and situation awareness occurred prior to competent practice on the part of the nursing students. The original model proposed was one in which a direct mediating effective would be demonstrated (Figure 8). In fact, as none of the required statistical assumptions necessary for this analysis were met in the study. The SEM was not built or tested due to a lack of a relationship between dispositional mindfulness, SA and clinical outcomes in the quantitative analysis of study data.

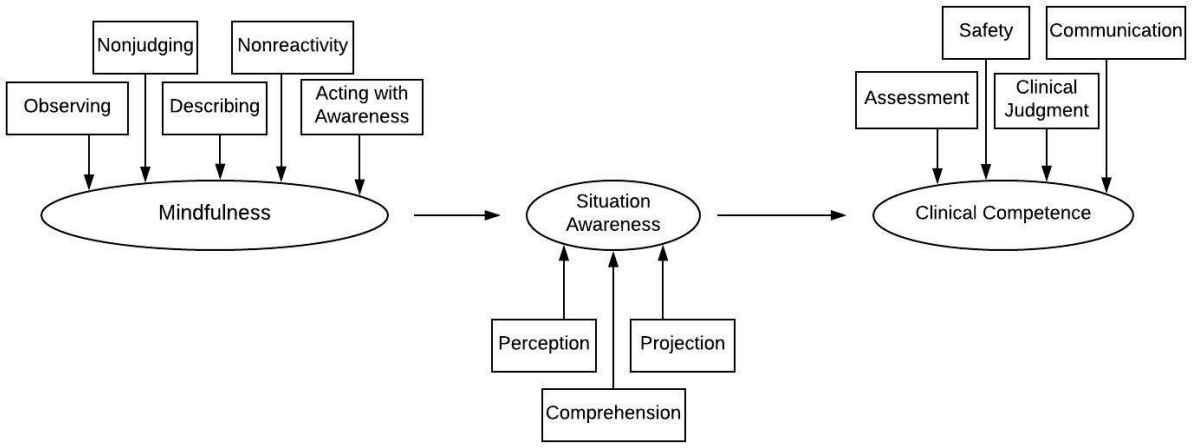


Figure 8. Structural equation model proposed for the study.

Reliability of the Questionnaire

The FFMQ has demonstrated adequate to good internal consistency in normative studies of this instrument with a Cronbach's alpha coefficient of reported from 0.75 – 0.91. In the current study, the Cronbach's alpha coefficient was 0.868 the FFMQ. Cronbach's alpha was also performed on each of the five FFMQ sub-scales with the following results:

Observing sub-scale: .675

Describing sub-scale: .889

Acting with Awareness sub-scale: .873

Non-Judging sub-scale: .868

Non-Reacting sub-scale: .558

All the sub-scales consist of 8 items or less per scale. Pallant (2013) reports that it is typically difficult to get an acceptable Cronbach alpha value on scales of less than 10 items. As presented, three of these small scales demonstrated good internal consistency, supporting the

overall good internal consistency of the instrument in this study. Previous psychometric testing of the internal consistency of the five facets had demonstrated lower Cronbach alpha values on the non-reacting scale in samples of undergraduate students with values as low as .67 (Baer et al., 2008).

Summary

A summary of the data analysis to address the specific aims and research questions for this study was presented in this chapter. A discussion of the research findings, conclusions, limitations of the study and implication for nurse educators and future research are presented in the following chapter.

CHAPTER V

DISCUSSION AND IMPLICATIONS

This study utilized a mixed-method, descriptive correlational design to examine the relationship between levels of self-reported dispositional mindfulness, situation awareness of the patient care environment and clinical competency demonstrated by senior level baccalaureate students in a simulated care environment. This chapter begins with a discussion of the participant demographics, a description of the study sites, data analysis with findings related to the research questions and the incidental findings uncovered during data analysis that were highlighted in Chapter Four. The discussion of the study includes the qualitative findings in relationship to the construct of mindfulness as it relates to nursing practice and situation awareness, in addition to comparing findings in relationship to the literature and the conceptual model for the study. Limitations of the study are presented, as well as information regarding implications and recommendations for pedagogical practices of nursing faculty teaching pre-licensure nursing students. This chapter ends with suggestions for future research into the development of mindfulness and situation awareness as non-technical skills that support quality and safe clinical outcomes on the part of nursing students preparing to enter professional practice.

Discussion of the Sample and Setting

Little research exists related to the construct of mindfulness and its impact on safe nursing practice. Despite numerous quantitative studies of the construct of mindfulness across disciplines over the past three decades, no qualitative studies of the construct were identified in the nursing education or practice literature. Situation awareness is a cognitive skill needed for safe nursing practice and, like mindfulness, little empirical evidence regarding this construct exists to guide nursing educators to develop quality and safe nursing practice in their students.

However, the mediating effect of SA on attention in demand situations has been reported in the literature for disciplines outside of health care (Sitterding et al., 2012) and this may have implications for nursing education. This chapter begins with a review of the demographics and an overview of the study sites in which data was collected. A discussion of the statistical outcomes for the specific aims of the study is included along with an analysis of the effectiveness of the Accident Causation Model as a framework for the further development of teaching/learning strategies to overcome cognitive human factors and improve clinical outcomes of nurses new to professional practice.

Demographic Variables

The demographic variables used to describe the participants of this study included age, race, gender, self-reported grade point average (GPA), and experience with mindfulness and other forms of meditation. The overall sample of 102 participants across two universities located in the state of Pennsylvania was predominantly white/Caucasian, n=92 (90.2) with 97.8% (n=44) white/Caucasian participants at the private university (private school, suburban campus) and the public university reporting 84.2% (n=48) of participants as white/Caucasian (state school, rural campus). This demographic is considerably less diverse in relationship to race/ethnicity as compared to data reported across baccalaureate nursing programs in a 2016 study published by the American Association of Colleges of Nursing (AACN) in which 67.7% (n=128,752) of baccalaureate students were reported as white.

AACN (2016) further reports that African Americans represent 9.7% (n=18.529) of baccalaureate nursing students in nursing programs in the United States, with those described as Hispanic/Latino representing 11% (n=20,988), Asian, Native Hawaiian or other Pacific Islander representing 8.3% (n=15,765), with a total minority population of 32.3% (n=61,462). Minorities

represented only 9.8% (n=10) of the entire sample described in this study (Table 6), in which no participants described themselves as Hispanic/Latino, 5.9% selected African American for race, 2.9% self-described as Asian and 1% as Pacific Islander.

Twenty participants (19.8%) reported experience with mindfulness meditation with an additional 24 participants (23.5%) describing regular meditation practices other than mindfulness meditation. The percentage of Americans in the general population practicing mindfulness meditation is unknown.

Both study sites reported similar admission criteria on their websites. The public university required Scholastic Aptitude Test (SAT) scores ≥ 1020, the American College Testing (ACT) score of ≥ 22 and high school GPA of at least 3.39. The private university required SAT score ≥ 1080, ACT composite score of ≥ 22, and high school GPA of 3.0. Participants at both sites were asked to report current GPAs in their overall program. Participants from the private university reported a mean GPA of 3.59 and those from the public reported 3.16. This finding suggests that all participants were in good academic standing in their programs and likely to graduate according to the typical curriculum plan for nursing students at their respective universities.

Characteristics of the Simulation Programs

As the setting for this study was a high-fidelity simulated inpatient care nursing scenario the characteristics of the setting warrant discussion. Both study sites provided high-quality simulation experiences for learners in their programs under the direction of educators knowledgeable and well skilled in the use of this pedagogy. Faculty in the simulation centers at both study sites acknowledged the intentional design of their simulation programs utilizing the International Nursing Association for Clinical Simulation Learning (INACSL): Standards of Best

Practice[SM] (2016) for guidance in the development and on-going operation of their simulation programs.

The International Nursing Association for Clinical Simulation and Learning (INACSL) describes a vision to be "the global leader in transforming practice to improve patient safety through excellence in healthcare simulation" (INACSL Mission, Vision, Value. n.d. Retrieved from https://inacsl.org/about/mission-vision-values/). With a mission to advance the science of simulation in healthcare, INASCL has developed and published the INACSL Standards of Best Practice (SOBP): Simulation[SM] (2016) providing educators with evidence-based guidelines for the implementation of simulation in academic and practice settings. Guidance is provided in the following areas:

- Simulation Design
- Outcomes and Objectives
- Facilitation
- Debriefing
- Participant Evaluation
- Professional Integrity
- Simulation-Enhanced Interprofessional Education (Sim-IPE)
- Simulation Operations (SimOps)
- Simulation Glossary (INACSL, 2016)

This discussion will be limited to a description of SOBP related to simulation design, outcomes and objectives, facilitation, debriefing, professional integrity, and simulation operations, in which a brief definition of each standard is provided and an overview of the

evidence of concordance to the standard demonstrated by each study site. A definition for each standard is provided in Table 12.

Both sites provided learners with measurable objectives for the simulated care experience prior to the scenarios with review of the objectives during the pre-briefing. The stated objectives were documented by the researcher on the C-CEI evaluation tool, thus facilitating an accurate determination of the instrument denominator prior to observing participants. All patient care scenarios selected for inclusion in this study utilized high-fidelity human simulators or standardized patients to create maximum realism for student engagement. All scenarios used to evaluate mindfulness, SA and clinical competency in this study were planned as learning experiences and were not evaluative in nature. Although participants received feedback from faculty, sometimes during, and always after the scenario during the debriefing, those scenarios in which students were subject to performance assessment as part of the evaluation plan for the course were not selected for use as a part of data collection for this study.

Table 12

Description of Selected Standards of Best Practice: Simulation^{SM}

Standard	Definition
Simulation Design	Simulation-based experiences are purposefully designed to meet identified objectives and optimize achievement of expected outcomes.
Outcomes and Objectives	All simulation-based experiences begin with the development of measureable objectives designed to achieve expected outcomes.
Facilitation	Facilitation methods are varied and use of specific methods is dependent on the learning needs of participants and the expected outcomes. A facilitator assumes responsibility for and oversight of managing the entire simulation-based experience.
Debriefing	All simulation-based experiences include a planned debriefing session aimed at improving future performance.
Professional Integrity	Professional integrity is demonstrated and upheld by all involved in the simulation-based experiences.
Simulation Operations	All simulation-based education programs require systems and infrastructure to support and maintain operations.

The INACSL SOBP (2016) describes a learner-centered facilitation approach driven by the objectives and expected outcomes. The private university utilized only peer-reviewed and published scenarios from the Elsevier Simulation Learning System. Priority actions and a flow chart outlining the expected physiological or psychologic response to nursing actions were provided to the nursing instructors and simulation technicians assigned to facilitate the scenario. Real-time voice modulation was used to provide a male voice to female faculty facilitators and vice versa. One scenario was enacted with a Spanish speaking patient and another with a physician actor for whom English was a second language. Students were permitted to initiate a

time out during the scenario at the private university site to elicit feedback from faculty facilitating the scenario or to engage peers in the scenario to help develop a plan of action and/or SBAR communication. This strategy was effective in helping students work through the elements of the Situation-Background-Assessment-Recommendation elements for communication to other members of the team.

The public university utilized peer-reviewed published scenarios from the Clinical Simulations for Nursing Education textbook by Patricia Dillon published by F.A. Davis and two scenarios developed from faculty clinical experience. Only scenarios from the published resource were selected for data collection purposes in this study at the public university, as published sources were assumed to represent a more unbiased and rigorous review of the congruence between scenario elements, objective and expected outcomes.

One potentially relevant difference identified by the researcher between the two study sites was that students at in the private university setting were expected to engage in SBAR communication more frequently than the public university and were generally more successful in formulating a statement of the situation. The most frequently observed error in SBAR noted by students at both sites was the exclusion of a concise and accurate statement of the situation, with students immediately reciting vital signs and discussing background information. Facilitators at the private university never permitted an error in SBAR to go unaddressed during the scenario and were very effective in working the correction into the flow of the scenario. For instance, one "cardiologist" thanked the nurse for the detailed information that she provided to him, but then stated he was confused as to what the clinical situation was that had prompted her to call. The student was then able to focus her communication and state the situation. Participants verbalized

much concern about their lack of skill and confidence related to clinical communication as was discussed in chapter four.

Facilitation of scenarios at the public university was subject to a greater degree of pretending on the part of students and participants thus impacting the level of realism available for learners to use to "suspend disbelief" and effectively engage in the learning experience. The most obvious cause of this disparity between sites in relation to facilitation was the physical design of the simulation rooms and resources availability in both personnel and patient care materials at the state-related public school as compared to the private school.

Both study sites provided learners with a lengthy prebriefing prior to the start of any scenario. However, the structure and context for prebriefing were considerably different between the sites. The private university setting enjoyed a ratio of 1 or 2 instructors per between 6 and 8 senior level students in the same course for the entirety of the scheduled simulation. The prebriefing and debriefing took place in a 12-seat conference room. The public university also provided intense pre-simulation discussion; however, the prebriefing and debriefings took place in a large lecture hall, with a typical faculty to student ratio of 1 or 2 faculty for about 30-40 students from both the junior and senior class.

Debriefing at the public university utilized a faculty developed framework in which safety, nursing process, leadership, technical sills, communication and critical reasoning were address through facilitator lead questions (Appendix F). The private setting utilized the Promoting Excellence and Reflective Learning in Simulation (PEARLS) framework (Appendix G) to guide debriefings. One notable difference in the execution of debriefings between the two study sites involved the practice of immediately meeting with students outside of the simulation room at the conclusion of the scenarios at the private university. At that point, facilitators

initiated the “reaction phase” of the PEARL method to get students immediate response to questions related to how the experience went and what went well or went wrong. The adaptation of the typical debriefing procedure was very effective in meeting the aim of the reaction phase of the PEARLS method and was integrated informally by the researcher into the data collection procedure at the public university.

Students at both sites received preparation materials as dictated by the scenario objectives. Related to SOBP for SimOps, both study sites had a technician available to the simulation center during operations. This technician role was newly filled at the public site and the instructors worked with the technician to prepare for the scenario. The private setting had at least one simulation technician assigned to each control room and a formal checklist that was to be completed by both the simulation facilitator and the simulation technician prior to the start of the simulation experience.

This summary was intended to describe the depth to which both study sites utilized the INACSL SOBP to guide the development and execution of simulated care experiences for nursing students. For the purposes of this study and the findings from this research, both sites provided students with rigorous and well executed patient care scenarios with structured prebriefing and debriefings as a part of each experience.

Discussion of the Research Findings

Mindfulness is an emerging concept in health professions education at both the pre-licensure phase and as an element of continuing professional development. Increasingly recognized as an important non-technical skill, mindful clinical practice is thought to be directly related to quality and safety competence and experts suggest it promotes reflective practice and decreased clinical mistakes such as medication errors (Pezzolesi, Ghaleb, Kostrzewski, & Dhillon, 2013). While the construct of mindfulness is typically defined as present moment awareness, focused attention in a non-reacting and non-judging manner (Kabat-Zinn, 1992) , the process of mindfulness in clinical practice is most frequently described as reflection and reflective practice (Pezzolesi et al., 2013; Tusaie & Edds, 2009), metacognition (Tusaie & Edds, 2009) and meditation (Baer et al., 2008; Bishop et al., 2004). This remaining ambiguity in the definition of the construct makes it difficult to translate raw, overall FFMQ scores and sub-scales into descriptive levels of mindfulness such as high, medium, or low. Despite this limitation, a review of the levels of dispositional mindfulness reported by this sample of senior-level baccalaureate nursing students is important to better understanding both construct and process as it related to nursing practice and teaching nursing students.

The FFMQ instrument has been used numerous times in studies involving large cohorts of undergraduate university students This discussion begins with a comparison of the study cohort to findings from several studies in which cohorts of undergraduates with similar demographic characteristics is reported (Table 13).

Table 13

Published FFMQ Scores Among University Undergraduate Students

	Source and Year		
	Study	Carmody & Baer, 2008	Bodenlos et al., 2015
Scale	Mean±SD	Mean±SD	Mean±SD
FFMQ Total Score	130.18±15.68	118.72±na	130.60±16.43
Subscales			
Observing	26.29±4.2	23.79±5.8	25.81±5.0
Describing	28.39±5.2	26.90±6.4	28.35±5.9
Acting with Awareness	27.02±5.7	23.72±5.7	26.67±5.5
Non-Judging	26.65±5.3	26.34±7.0	28.28±6.3
Non-Reacting	21.30±2.9	17.97±4.9	21.54±3.6

Note. The possible range of scores for the total FFMQ score is 39-195. The range of scores for the FFMQ subscales is 8-40 except for the non-reacting subscale with a possible range of 7-35. (n=269 for Carmody & Baer; n=310 for Bodenlos et al.). Adapted from "Relationships between mindfulness practice and levels of mindfulness, medical and psychological well-being," by J. Carmody and R. Baer, 2008, *Journal of Behavioral Medicine, 1*, p. 52.

The participants in this study reported levels of dispositional mindfulness as high as or higher than two large cohorts of undergraduates asked to participate in a study in which the FFMQ was utilized (Carmody & Baer, 2008). As described, awareness and attention are key attributes of mindfulness. Regarding nursing practice, attention is the ability to stay focused on the moment to moment situation (White, 2013) and awareness is the backdrop that is monitoring the environment (Tusaie & Edds, 2009). Baer and colleagues (2008) further delineate observing as noticing or attending to internal and external experiences such as sensations, cognitions, emotions, sights, sounds and smells with describing the ability to capture the experiences of observations effectively in words. Mindful attention requires the nurse to intentionally focus on the current situation and reflect non-judgmentally on the salient features in which attention is focused.

Participants in this study described considerable difficulty focusing their attention in the present moment. In fact, several students described intentionally trying not to think about making

a mistake and focusing on remembering what they knew about caring for an unstable patient. Pezzolesi and colleagues (2013) argue that mindful reflective practice and intentionally teaching pre-licensure health sciences students mindfulness meditation and other mindful clinical practices is an important strategy to improve one's skill at reflection-in-action as described by Schon theory of reflective practice. This argument serves to emphasize the importance of the observing facet of mindfulness that has been repeatedly demonstrated to be the most amenable to development through the practice of mindfulness meditation (Baer et al., 2006; Carmody & Baer, 2008; Pearson et al., 2015). Nurses are unable to focus attention on signals of patient instability if they are not able to notice or observe the signal, whether obvious or not. Study participants demonstrated moderate levels of overall dispositional mindfulness, but this dispositional level did not translate into improved clinical outcomes for participants, except for a weak, positive relationship between the observing facet of mindfulness and communication competency on the part of participants across study sites. This important finding supports the argument that mindfulness training is needed in nursing programs to achieve a level of mindfulness beyond the dispositional or innate levels typical of undergraduate students to achieve a level of mindfulness that supports enhanced attentional control, SA and clinical competency.

Another intriguing and potentially relevant area for further exploration is that the observing facet is the facet MOST amendable to improvement with meditation practice (Baer et al., 2008; Bodenlos et al., 2015; Carmody & Baer, 2008; Pearson et al., 2015) and one of the facets that contributed independently to the prediction of psychological well-being (Baer et al., 2008; Bodenlos et al., 2015) in meditators versus non-meditators. In addition, Baer and colleagues (2008) reported that meditators were better able to focus attention in a more flexible manner, perceiving without judging or reacting, and this skill prevented meditators from

becoming “rigidly absorbed” by any one type of stimuli, a phenomenon often referred to as fixation in health care. Student participants described the experience of becoming fixated on thoughts or external stimuli during scenarios. Table 14 compares the FFMQ subscale score for the study population to the published scores from a sample of 213 people reporting regular use of mindfulness meditation/practices. Study participants scores were lower across all five subscales than those of experience meditators.

Table 14

Published FFMQ Scores for Experienced Meditators Compared With Study Participants

	Study	Baer et al., 2008
Scale	Mean±SD	Mean±SD
Observing	26.29±4.2	31.96±4.16
Describing	28.39±5.2	31.84±5.30
Acting with Awareness	27.02±5.7	28.08±5.10
Non-Judging	26.65±5.3	32.44±5.63
Non-Reacting	21.30±2.9	25.70±4.01

Note. The range of scores for the FFMQ subscales is 8-40 except for the non-reacting subscale with a possible range of 7-35. Adapted from “Construct validity of the five facets of mindfulness questionnaire in meditating and nonmeditating samples,” (2008), by R. Baer, et al., *Assessment, 15,* p.335.

Increased levels of mindfulness on the part of nursing students developed through the inclusion of mindfulness meditation and training within nursing programs may have the potential to improve attentional switching and prevent fixation or the experience of inattentional blindness during clinical practice. The phenomenon of inattentional blindness was described by one participant during debriefing in which she recounted never noticing the rhythm strip on the patient monitor. When questioned by her instructor, “didn’t you see the ‘tombstone’ ST-segment elevations?”, her response was that she never even noticed the baseline rhythm let alone the very significant change that the instructor described despite standing next to the monitor and repeatedly engaging with the monitor to retake vital signs during the scenario. Her response “I

was so focused on watching for a response to the nitroglycerin and tracking the time between doses that I don't recall anything else that I did." This participant described a focus on task as opposed to the global physiologic situation experienced by her patient – she had lost this level of situation awareness.

This exemplar further suggests that situation awareness is very likely more influenced by one's ability to engage mindful attention and awareness (mindfulness as an antecedent to SA) as opposed to SA mediating attention as suggested in a recently published concept analysis of situation awareness in nursing work (Sitterding et al., 2012). This research hypothesized a mediating effect of SA between mindfulness and clinical outcomes that was not supported by the data. Findings also suggests that once one can focus attention in a non-judging, non-reacting manner one can more clearly observe (and thus describe/communicate) the situation (SA) across all levels of the construct captured in the SAGAT used for this study. This level of SA permits ongoing surveillance of the multiple data points monitored by a nurse in a complex patient care scenario.

This study also provides argument for the inclusion of MM and mindfulness building strategies throughout the curriculum based on the statistical relationship between the facet of observing and the clinical competency of communication. This argument is strengthened by findings from the SAGAT in this study, in which participants were unable to immediately recall critical physiologic indices even minutes after "seeing" the parameters on the monitor or having a technician report the parameter in a verbal report. This recurring phenomenon during the study supports arguments that the observing facet (mindful focused attention and awareness) requires far greater cognitive effort than the simple visualization or auditory reporting of clinical data.

Findings of this study also suggest that dispositional mindfulness, in and of itself, is not an adequate level of mindfulness to support the "constant state of attention to the unexpected" (Sitterding et al., 2012, p. 77) required of health care professionals, and a significator factors influencing clinical outcomes on the part of nursing students preparing to enter practice is their ability to control internal stimuli such as anxiety, emotionality, and mind-wandering to attain focused attention and achieve SA.

Situation Awareness and Clinical Outcomes

Prior to this study the impact of SA on attention, specifically mindful attention, had been unexplored in nursing practice but was hypothesized by this researcher and nursing faculty experts (Sitterding et al., 2012) that situation awareness was likely the greatest factor influencing attention in nursing practice. Findings from this study demonstrated that dispositional levels of mindful attention in senior-level nursing students participating in this study were not adequate to attain and sustain the level of focused attention and of attention switching needed for consistent achievement of competent clinical outcomes across all areas of the construct: assessment, communication, clinical judgment and patient safety.

Two previously completed international studies of SA in senior-level baccalaureate students during simulated care scenarios describes overall SA on the part of senior-level nursing students as "low". The instrument that was modified for use in the SAGAT technique used in this study, demonstrated on overall SA rating of 67.6% across three cohorts of senior level students for a total sample of 234 participants in the instrument validation studies (Lavoie et al., 2016).

The overall SA rating for this study sample was 80%; however, it should be noted that the use of the technique differed between this study and the research previously referenced. This

research protocol dictated the selection of only 12 relevant items across the four levels of SA (see Appendix C) while the instrument validation study by Lavoie et al. (2016) included the use of all 31 questions during the SA assessment. The SA assessment technique utilized in this study was similar to the approach Bogossian et al. (2014) utilized in a study of senior-level nursing students' SA during resuscitation scenarios. This research team selected 12 items across the four levels of SA within the SAGAT in a procedure more closely aligned with the use of the technique in this study. Researchers from this study (Bogossian et al., 2014) reported overall student SA levels of about 41% using a 12-item approach to SAGAT. Participants in this study demonstrated levels of SA almost twice as high as the participants at one Australian university using similar questions, scenarios (cardiac, shock, and respiratory) and technique (12 rapid fire items recorded by participants in response to researcher questions during time-out) (Bogossian et al., 2014).

The finding of a significant, positive relationship between the latent constructs of SA and clinical outcomes as measured by the overall C-CEI (r=.301; $p < 0.01$, 2 tailed) and its four subscales (Figures 6 & 7) validates the expert opinion in nursing that there is a requisite level of "nursing attention required to perceive and understand" the clinical situation (Sitterding et al., 2012) and that this level of nursing attention is also required to inform the first phase of nursing clinical judgement, noticing (Tanner, 2005), and is a starting point for "thinking in action" (Benner, Kyriakidis, & Stannard, 2012) and reflecting-in-action (Pezzolesi et al., 2013) for health professionals. Based on these findings, nursing educators need to consider for the inclusion in programs curricular activities aimed at the development of SA in nursing students such as the use of the 60-Second Situation Assessment (Struth, 2009) that has been identified as a best practice for clinical teaching and learning in a recently published guide for nursing faculty

teaching in a concept-based nursing curriculum (Ignatavicius, 2019). Incorporating the SAGAT instrument adapted for this study into simulated care experiences may also represent a useful educational tool for the development of insight into SA on the part of nursing students.

The literature provides some expert opinion that SA is an essential clinical skill for nurses and that this skill can be taught (Stubbings et al., 2012). In addition, the nursing literature calls for faculty to be more aware of the non-technical skills associated with safe nursing practice (Cronenwett et al., 2007; Stubbings et al., 2012) and further identify SA as essential for effective clinical decision making necessary to influence clinical outcomes (Stubbings et al., 2012). This study demonstrates that dispositional mindfulness alone is likely not adequate to promote focused attention and SA during clinical care on the part of a nursing student. The qualitative findings from this study suggest that focused attention and higher levels of mindfulness may enhance nursing student clinical competency and situation awareness thus supporting the inclusion of mindfulness training in nursing curricula.

The Accident Causation Model Relative to the Findings

The Accident Causation Model (ACM), commonly referred to as the "Swiss cheese" model (Reason, 2000) is a widely discussed model used to describe the etiology of operational issues that result in organizational risk or errors. Specifically, in health care these operational issues may result in harm to patients. The model describes intentionally designed safety strategies or layer of defense as slices of swiss cheese, in which holes open and align to let mistakes move through the holes and cause error or harm to patients. The holes in the cheese open for two reasons: active errors that are human performance related and latent errors that are the result of system issues, most typically described as inadequate decision on the part of top management (Reason, 2000). As depicted in Figure 2, the ACM outlines psychological elements

of human error including slips and lapses (execution failures in which the plan of care was adequate but did failed to work as intended) and mistakes (in which the plan of care was never adequate to achieve the desired care goal or outcome) (Reason, 1995). For the purposes of this research, latent failures related to organization factors were controlled using high-fidelity human patient simulation in a laboratory setting. This simulated care setting permitted closer examination of human performance factors associated with mindful nursing practice in senior-level students without the confounding variables of actual patient care delivery in a hospital setting.

This research proposal presented the traditional ACM in which slips, and lapses are execution failures of attention, selection, memory or recognition. More contemporary discussion of human error recognizes the significance of Reason's early work and categorizes slips and lapses within the category of skills-based error (Carayon, 2016; Wachter & Yorio, 2013). These human errors are unintentional causes of harm and are not the result of intentional, at-risk behavior such as short-cuts that violate or circumvent policy and procedures (Wachter & Yorio, 2013). The findings of this study are supported by either iteration of the accident causation models described here; however, the inclusion of slips and lapses within the category of skills-based error lends itself to correction using human performance tools that are evidence-based, and easily adapted as teaching/learning tools in a nursing curriculum. In fact, mindfulness training in the form of meditation within the mindfulness-based stress reduction (MBSR) training would meet these criteria and many of the instructional tools used by experts in simulation education are analogous to the human performance tools discussed by experts to reduce human error (Carayon et al., 2013; Wachter & Yorio, 2013).

Within these accident causation models, mistakes are described as planning or problem-solving failures attributed to skills-based, rule-based or knowledge-based errors. To better understand the errors related to problem-solving, Wachter & Yorio (2013) described associated performance behaviors for each of these categories. Skills-based behaviors are "highly practiced actions in familiar situations usually executed from memory or without conscious thought" (Wachter & Yorio, 2013, p. 71). To further support the impact of skills-based error in healthcare, the pharmacy literature reports that most pharmacists involved in error are not-aware of their error at the time of occurrence as a result of the highly skilled, repetitive procedures used by pharmacists in their typical workflow characterized by "auto-pilot" type, automatized mindlessness (Pezzolesi et al., 2013). In fact, highly-skilled, tacit type knowledge is attributed to medication errors on the part of pharmacists (Pezzolesi, 2013) and nurses (Roth, 2015).

Mistakes, Slips of Action, and Lapses of Memory

Throughout this research, participants were observed in the conduct of human performance errors of all types: mistakes, slips, and lapses. The impact of these errors was captured most consistently in the overall patient safety score on the C-CEI outcome measure used in the study. Participants routinely neglected to use proper patient identification techniques (a skills-based error for participants) during simulated care experiences with the rate of error noted more frequently at one site than the other. Additional performance criteria within the patient safety competency include utilizing standardized practices and precautions including hand-hygiene, administering medications safely, proper use and management of technology and equipment, overall correct performance of required procedures, and the ability to reflect on potential hazards and errors, either during the scenario or debriefing. Hand-hygiene was demonstrated consistently at both sites, while errors of safe medication administration were

noted at both sites in a variety of configurations including failure to recognize existing errors related to infusions or not properly administering IV push medications.

Another objectively captured area of human performance error on the part of study participants was the SBAR communication procedure. As previously discussed, students at both sites often failed to communicate the patient situation in a cogent, concise and coherent manner when required to provide SBAR formatted communication. As a result, the receiver of the communication, typically the physician, was unable to identify the salience of the situation and the clinical need or urgency. This was observed even after students were reminded by faculty facilitators that they would be accountable to use SBAR communications as a performance objective during the scenario. In addition, many participants failed to engage in the process of written order read back as a part of SBAR. Unfortunately, this omission was seldom called out by nurse faculty facilitators at either site, this omission was not the topic of discussion at any debriefing observed by the researcher. However, within the ACM, read back procedures are identified as a best practice tool to mitigate human performance factors related to errors from communication failures.

The final areas of concern related to the clinical outcomes of participants and the ACM was in the area of interpreting lab results and delegating appropriately. The derivation of clinically relevant conclusions from lab results for decision making and action is a complex and knowledge-based performance activity. The performance errors noted in this area were largely knowledge based and almost universally addressed during the debriefing of the scenarios. However, appropriate delegation is a critical nursing action/skill that was almost completely ignored by nursing students during simulations at both sites, even when delegation was identified as a performance objective by their instructors during the scenario pre-briefing. Failure to

delegate appropriately was most frequently related to attentional failures – in which participants were so focused on tasks - they failed to notice the opportunity to delegate these tasks to others on the team available to help with care. In addition, recognition failures were also noted related to delegation, in which participants described never even thinking to delegate or recognition of opportunities to delegate based on what others on the team were doing.

Appropriate delegation involves the ability to maintain SA of patient-centered care goals and track the actions of all on the care team. It is a complex activity requiring both the ability to focus attention and shift attention quickly in dynamic situations. This performance failure was seldom called out as a mistake during the scenario and not consistently identified during debriefings as an issue and thus represents an area for improvement in both teaching strategies for faculty and skilled performance for the leaners. This performance failure manifested in the tendency of students to execute actions in parallel – both nursing students trying to address the same issue such as answering an alarm. As one student quipped, "I felt silly when I realized I was trying to do everything myself including taking vital signs when I had a vital sign tech in the room with me."

The qualitative and quantitative findings of this study supported the human performance factors identified within the ACM as relevant to competent clinical practice by participants. Findings also support the premise that cognitive human factors, including mindfulness and situation awareness impact quality and safe patient care. The human performance issues observed during the study are also likely to be responsive to mindfulness/attentional training and other performance tools identified in the literature (Wachter & Yorio, 2013) and discussed in the following section.

Implications for Nursing Education and Recommendations

The collective mindfulness of nurses in clinical practice has been described by safety scientists as a key component to the development of high reliability health care organizations (Weick & Sutcliffe, 2007). Nurse scholars have called for the development of cultures that cultivate this characteristic of mindfulness in nursing practice (Kerfoot, 2005; White, 2013) and have recognized mindfulness as the most relevant characteristic of the theory of high reliability organizations applied to health care delivery by nurses (Kerfoot, 2005). Despite discussion of the importance of mindful clinical practices, little research in nursing or nursing education has examined the construct of mindfulness in nursing or developing mindfulness in clinical practice. This study provides both qualitative and quantitative descriptions of the relationship between mindfulness and situation awareness and the relationship of these two variables on the level of clinical competency demonstrated by nursing students about to enter professional practice. The findings support intentional education and training in mindfulness techniques for nursing students, as other health professional have suggested for their discipline. Nurse educators need to be aware of current research and expert opinion on best practices regarding mindfulness training, nursing education and interprofessional training strategies to improve human performance related to errors in practice.

Mindful clinical practice for physicians has been described as a function of human cognition, memory, emotion and decision making (Epstein, 1999) and it has been argued that physicians need to be taught to be mindful practitioners who are able to engage in the everyday work of patient care in a reflective and non-judgmental manner (Epstein, 1999). A more recent opinion was published in the literature calling for curriculum to support “mindful reflective practice” for pharmacists in training as a requirement for pre-licensure education and for

continuing professional development (Pearson et al., 2015). These experts suggest that the requirement for the inclusion of mindfulness-based techniques applied in the pharmacist's workflow would allow for protected time to refocus attention, decreased the amount of automatized repetition in work and reduce medication errors (Pearson et al., 2015).

The qualitative findings of this study support the benefit of mindfulness training as a curricular element within and across the baccalaureate nursing curriculum. Participants in this study described struggles with focusing their attention during patient care experiences. Also disturbing to participants was their awareness of episodes of mind wandering negatively impacting the ability to think-in-action about the patient care procedures and goals.

Mindful strategies within educational design are beginning to permeate health professions education literature. One interprofessional team of experts in the field of continuing medical education describe the need to develop opportunities for pre-licensure and practicing nurses, physicians and pharmacist engagement in "deliberate practice" as a required element of interprofessional education for healthcare disciplines (Moore, Chappell, Sherman, & Vinayaga-Pavan, 2018). These practice sessions would be designed to provide learners with purposeful and systematic practice of skills accomplished through intentionally focused attention as opposed to the unorganized practice more typical of skills building sessions. Moore and colleagues (2019) argue that deliberate practice sessions with purposeful focused attention to skills development would "provide learners the opportunity to prepare for engagement in clinical scenarios with skills practice and with experience observing when the mind wanders and successful refocusing of attention" (Moore et al., 2019, p. 906). This provides nurse educators with one example of teaching already incorporated in many nursing programs providing elements of attentional/mindfulness training.

Situation awareness is positively related to overall clinical competence (r=.310, p=0.002, 2-tailed) and each of the C-CEI subscales: assessment (r=.212, p=0.0320, 2-tailed), communication (r=.340, p=.000, 2-tailed), clinical judgement (r=.388, p=0.000, 2-tailed) and patient safety (r=.114, p=0.254). The SA level of perception was positively correlated to assessment and communication with global situation perception is positively correlated to assessment, communication, and clinical judgment (Figure 7). All nursing students involved in simulations, whether study participants or not, were witness to the use of the SAGAT during scenarios and all were intrigued by the clinical questions asked during the process. Many students noted that they could not recall key vital signs or other parameters that were asked of participants. Nursing instructors from both universities commented on student response to the experience and commented on the value that they saw in the SA assessment technique as a teaching tool. Simulation faculty found the SAGAT to be a very feasible teaching/learning strategy amenable to routine use during simulation experiences. This SA exercise prompted student reflection on the experience and may be worthy of consideration as a teaching strategy to support a very specific reflection on attention and awareness during clinical practice.

The human factors literature also provides relevant insights into the most effective tools to develop human performance, some of which are a routine part of the simulation experience at the study sites. For instance, conducting a pre-task and post-task briefing to promote more communication and engagement around safe performance is a standard best practice for simulation in use at the study sites and most simulation centers in nursing schools. Another relevant teaching tool to promote safe communication and prevent error is the three-way (repeat back) communications tool in which the sender states the message and the receiver acknowledges the message and repeats it back to ensure proper interpretation of the message

(Wachter & Yorio, 2013). This practice is incorporated into the SBAR communication protocol for safe health care communications. This SBAR tool represents a potentially underutilized resource to help improve communication, even practice communication validation, with nursing students in a simulated or actual care scenario.

A revised model representing the relationship between mindfulness, SA, and clinical competency emerges from the study findings in which mindfulness and SA may have a more direct relationship to the competencies for nursing practice than to each other (Figure 9)

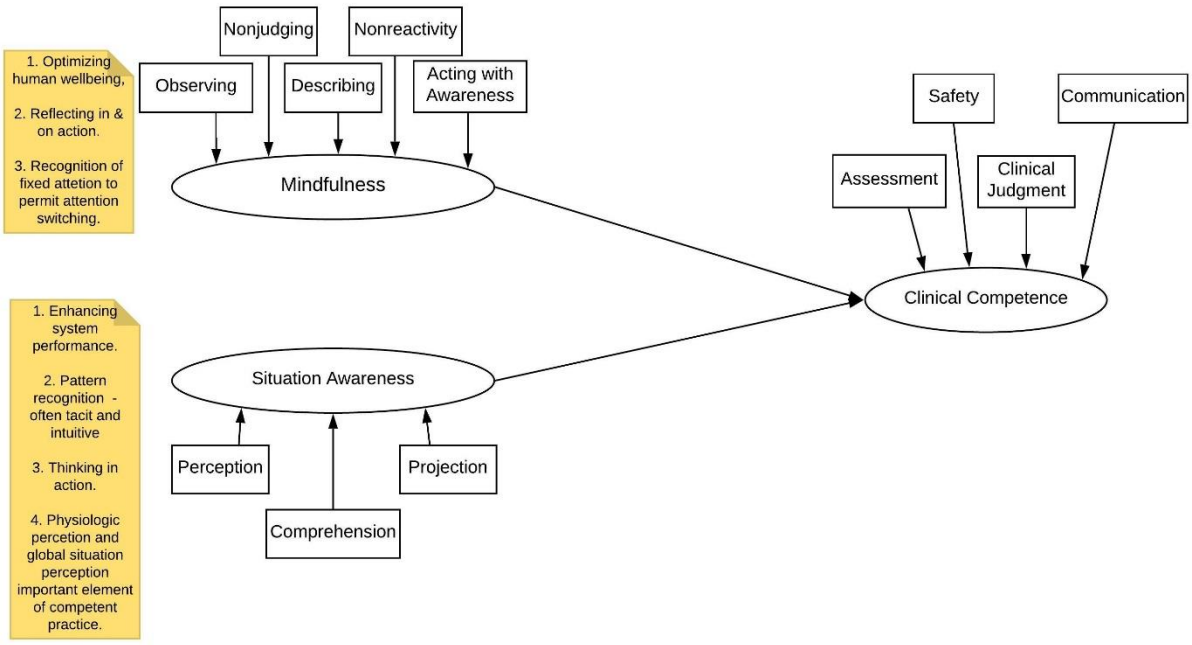


Figure 9. Study model of mindfulness, SA, and competency of senior-level nursing students.

Examining this model (Figure 9) through the filter of the HFE theory, mindfulness training incorporated into pre-licensure nursing programs would serve as a strategy to optimize human wellbeing. Key implications for faculty and their students related to mindfulness in nursing practice include:

- Student participants consistently described feeling a lack of focus during the clinical scenario and often associated this lack of ability to focus on known precursors to error such as fatigue or anxiety; however, an equally concerning aspect of failed attention was identified in this study, numerous episodes of fixed attention.
- Student participants described episodes of fixed attention during the evolving clinical situation and often lacked the ability to engage in the mindful practice of attention switching to correct this failed attention. Mindfulness training would provide the nursing student insights into episodes of fixed attention or wandering attention and help to develop the skilled ability to switch attention to other aspects of the clinical situation. Attention switching may provide the student with the opportunity to reflect on the broader clinical situation.
- Mindfulness appears to require the intentional behavior of reflection in practice or the ability of the student to think about their thinking and the quality of the decisions they made on behalf of safe patient care. This skill would be particularly valuable in instances when the student is encountering a clinical scenario in which they have a lack of experience, knowledge or rules to guide decision making. This may provide a stronger signal to the nurse as to when to ask for help from a more experienced colleague.

Situation awareness appears to be more closely associated with the HFE theory related to enhancing system performance. Situation awareness was positively correlated to better clinical outcomes empirically linking this cognitive factor to safer care, and better communication and assessment skills in this sample. Key implications for faculty related to situation awareness and competent nursing practice in senior level nursing students include:

- The Situation Awareness Global Assessment Technique (SAGAT) with the rapid-fire method provided participants (and the researcher) with immediate insight into the degree to which the student was tracking and processing key aspects of the patient care scenario.
- Participants who were unable to recall key elements of the situation consistently described wanting to 'look' at patient data and 'get the answer'; outside of the research protocol this would be the desired action on the part of the nurse.
- Several participants with high SAGAT and high overall C-CEI scores described feeling as if they weren't focused or that they weren't sure 'what happened' during the scenario when questioned during the reaction phase of the debriefing. This suggests that situational awareness may operate in a tacit manner when a student possesses sound knowledge, skills and attitudes as the foundation for acute and complex nursing care. This may provide further validation that quality and safety competency must be built on a solid clinical knowledge-based and technical nursing skills (Cronenwett, et al., 2007).
- The rapid-fire questioning did not give the participant the opportunity to reflect on action and suggests that SA is associated with the ability to think in action or engage in thinking linked with action in an evolving clinical situation in acute and critical care as described in the literature by Benner and colleagues (2012).
- Faculty could consider incorporating the SAGAT into routine clinical experiences as a teaching/learning activity – with a focus on developing students' global situation perceptions as outlined on the SAGAT tool utilized in this study (Appendix C).

To summarize, this study identified quantitatively and qualitatively nursing students' struggles with key attributes of mindfulness and SA in simulated patient care scenarios. Further, results suggest that dispositional or innate levels of human mindfulness are inadequate to support

the degree of attention with observing, describing, acting with awareness, non-reactivity and non-judgmentalism, and the skill of attention switching, necessary for situation awareness and optimal clinical performance on the part of student study participants. The inclusion of MM and other mindful practice and situation awareness development tools described in this research may represent elements necessary to improve the ability to focus attention in the present moment without emotional reactivity and in a non-judging manner. Participants described in detail their struggles relating to focusing attention, switching attention and controlling their mind-wandering tendencies during care experiences. Students, participants and non-participants alike, described great concerns about their perceived lack of confidence and skills in communication with physician colleagues, patients, and families.

Limitations of the Study

Several limitations are identified with this study. This study utilized a mixed method, descriptive, correlational design. While the addition of both quantitative and qualitative collections of descriptive data adds rigor to this cross-sectional correlational design, the lack of a true experimental design limits the generalizability of the findings and increases the likelihood of the introduction of bias to the study. While a correlation was identified between SA and clinical competency, this does not establish causation and may be confounding as very little is known about SA and mindfulness in nursing practice. The strength of this relationship is not strong and this likely suggests that presence of unknown variables also mediating the relationship between SA and clinical competence in the sample. In addition, the relationship between the observing facet of mindfulness and the communication subscale of the C-CEI approaching statistical significance is an intriguing notion but unknown in relevance within the context of dispositional mindfulness, MM, and clinical practice.

Another limitation of this study is the lack of ethnic/racial and gender diversity in the sample of 102 participants at two baccalaureate nursing programs in western Pennsylvania. Nursing is a profession dominated by white, females and the nursing student participants represented white females in a greater proportion than the average nursing school in the United States and nurses practicing in the state of Pennsylvania.

Implications for Future Research

The findings from this study of mindfulness, SA and clinical outcomes in senior-level nursing students has generated many questions to form the basis for future nursing and interprofessional education research. Of great interest for this researcher is the question of whether enhanced mindfulness on the part of nursing students through the inclusion of MM training would result in the findings of a statistical relationship between mindfulness and clinical outcomes and/or situation awareness. The findings of this study support the development of an interventional study with an experimental design testing the impact of MM training on a study cohort versus control cohort of nursing students.

In additional to an experimental design to test mindfulness training as an educational strategy for nursing practice, the use of the ACM as a framework for this study presents the opportunity for at least one integrative review of the literature in which human performance tools identified as best practices within the safety sciences are reviewed for possible utility as educational strategies for quality and safety competency development in health professions pre-licensure education. Additionally, such a review would permit nursing pedagogy experts to compare strategies of a similar nature within nursing education, particularly simulation, for opportunities to enhance the understanding and use of such educational/performance enhancing tools related to safe practice.

Further study of the ACM and human performance factors as related to nursing quality and safety education strategies for pre-licensure students is also recommended. Graduates of these programs enter practice at the 'sharp-edge' of the human factors model in which latent factors meet human factors in the care of patients and families. Findings from this research suggest that the models most frequently used to educate health care leaders regarding human error have evolved and the knowledge and skills of health care professionals' needs reviewed and updated. There is opportunity for collaboration between nurse educators, academic nursing and safety science professionals to advance the culture of safety at the local levels of care.

Finally, this study describes a previously unknown relationship between the construct of SA in nursing practice and clinical competency in senior-level nursing students that needs to be further examined. Additional research related to the use of the SAGAT as a measure of the construct of SA in nursing practice is justified to further define the values and construct that define levels of situation awareness for entry level practice in nursing. At a more pragmatic level, the SAGAT needs further examination as a clinical teaching tool as opposed to a research instrument. An unanticipated discovery of this study was the degree of engagement and interest in the technique demonstrated by students and faculty. With continued use, the utility of this tool as an educational tool began to emerge and represents another area of inquire for the development of an evidence-based teaching strategy to promote SA in nursing practice.

Conclusions

This study sought to add to the science of nursing education through the investigation of the impact of cognitive human factors such as mindfulness, mindlessness, and situation awareness on the clinical performance of senior-level nursing students engaged in a simulated patient care experience. Results of this study indicated that human cognitive factors negatively

impacted the participants' ability to focus attention, achieve and sustain SA and consistently deliver quality and safe nursing care. Quantitative analysis of study data revealed that self-reported dispositional levels of mindfulness captured on the FFMQ did not correlate to the latent variables of clinical competence or SA; however, a weak correlation between that mindfulness facet of observing and the clinical competency of communication was identified. This finding warrants further investigation.

Qualitative analysis of structured debriefing interviews with participants identified that focused attention and the ability to switch attention while maintaining awareness of the overall clinical picture was very difficult for students. Further analysis of the findings indicated that student participants struggled with their perceived inability to effectively communicate the clinical situation in a cogent manner to both physicians and patients/families.

Numerous slips, lapses and mistakes were observed and documented during this research that support the validity of the ACM and more contemporary human performance models that may provide additional sources of understanding and educational intervention in the adoption or adaptation of human performance tools as teaching strategies in pre-licensure nursing programs. This study also supports further examination of MM as an educational tool for nursing students. Examination of the construct of mindfulness and its impact on SA and clinical outcomes using an experimental design is warranted. This study also provided results that contribute to the further development of quality and safety education for nurses necessary to meet the objectives identified for health care quality within the IOM report related to bridging the quality chasm through health professions educational and further educational research of teaching the promotes the development of safe professional practice (IOM, 2000).

References

American Nurses Association (ANA) (2017). Executive summary: American Nurses Association Health risk appraisal. (Key findings: October 2013-October 2016). Retrieved from http://nursingworld.org/MainMenuCategories/WorkplaceSafety/Healthy-Nurse/HRA-Executive-Summary/ANA-HRA-Executive-Summary.pdf

Anderson, N. D., Lau, M. A., Segal, Z. V., & Bishop, S. R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology and Psychotherapy*, *14*, 449-463. doi. 10.1002/cpp.544

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10*, 125-143. doi:10.1093/clipsy/bpg015

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27-45. doi:10.1177/1073191105283504

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., . . . Williams, M. G. (2008). Construct validity of the five facets of mindfulness questionnaire in meditating and nonmeditating samples. *Assessment, 15*, 329-342. doi:10.1177/1073191107313003

Beaman, C. P., Hanczakowski, M., & Jones, D. M. (2014). The effects of distract on metacognition and metacognition on distraction: Evidence from recognition memory. *Frontiers in Psychology*, *5*, 1-13. doi:10.3389/fpsyg.2014.00439

Beddoe, A. E., & Murphy, S. O. (2004). Does mindfulness decrease stress and foster empathy among nursing students? *Journal of Nursing Education*, *43*, 305-312. Retrieved from https://pdfs.semanticscholar.org/300b/3ad60388f35a12b37fcada3267dce6a0cf9f.pdf

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park, CA: Addison-Wesley.

Benner, P., Kyriakidis, P.H., & Stannard, D. (2012). *Clinical wisdom and interventions in acute and critical care (*2nd ed.*)* .New York, NY: Springer.

Berwick, D.M. (2015, December 10). 15 year after "To Err is Human": What we've learned about health care errors. *2015 Richard & Hinda Rosenthal Symposium: Protecting Patients: Advances and Future Directions in Patient Safety.* Symposium conducted at the meeting of the National Academy of Medicine, Washington, DC.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11,* 230-240. doi:10.1093/clipsy/bph077

Black, D. S., & Slavich, G. M. (2016). Mindfulness meditation and the immune system: A systematic review of randomized controlled trails. *Annuals of the New York Academy of Sciences,* 1-12. Retrieved from https://biomind.usc.edu/files/publications/Black_2016_immune.pdf

Bodenlos, J. S., Wells, S. Y., Noonan, M., & Mayrsohn, A. (2015). Facets of dispositional mindfulness and health among college students. *The Journal of Alternative and Complementary Medicine, 21,* 645-652. doi:10.1089/acm.2014.0302

Bogossian, F., Cooper, S., Cant, R., Beauchamp, A., Porter, J., Kain, V., . . . Phillips, N. N. (2014). Undergraduate nursing students' performance in recognising and responding to sudden patient deterioration in high psychological fidelity simulated environments: An Australian multi-centre study. *Nurse Education Today, 34,* 691-696. doi:10.1016/j.nedt.2013.09.015

Brown, K. W., & Cordon, S. (2010). Toward a phenomenology of mindfulness: Subjective experience and emotional correlates. In F. Dedonna, *Clinical handbook of mindfulness* (pp. 59-81). New York, NY: Springer.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822-848. doi:10.1037/0022-3514.84.4.822

Cannon, M. D., & Edmondson, A. C. (2001). Confronting failure: Antecedents and consequences of shared beliefs about failure in organizational work groups. *Journal of Organizational Behavior*, *22*, 161-177. doi:10.1002/jobs.85

Carayon, P. (2010). Human factors in patient safety as an innovation. *Applied Ergonomics*, *41*, 657-665. doi:10.1016/j.apergo.2009.12.011

Carayon, P., Xie, A., & Kianfar, S. (2013, June 28). Human factors and ergonomics as a patient safety practice. *BMJ Quality & Safety Online*, 1-10. doi:10.1136/bmjqs-2013-001812

Carayon, P. (2016). Work redesign for patient safety: The SEIPS model. *Quality and Safety in Health Care, 15, (*Suppl.,1*),* i50-i58. doi:10.1136/qshc.2005.015842

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 1,* 23-33. doi:10.1007/s10865-007-9130-7

Chiesa, A., Calati, R., & Serretti, A. (2010). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review*, *31*, 449-464. doi:10.1016/j.cpr.2010.11.003

Cohen-Katz, J., Wiley, S. D., Capuano, T., Baker, D. M. & Shapiro, S. (2004). The effects of mindfulness-based stress reduction on nursing stress and burnout: A quantitative and qualitative study. *Holistic Nursing Practice, 18,* 302-308. Retrieved from https://journals.lww.com/hnpjournal/Abstract/2004/11000/The_Effects_of_Mindfulness_based_Stress_Reduction.6.aspx

Cohen-Katz, J., Wiley, S. D., Capuano, T., Baker, D. M., & Shapiro, S. (2005). The effects of mindfulness-based stress reduction on nurse stress and burnout, part II. *Holistic Nursing Practice*, *19*(1), 26-35. Retrieved from https://journals.lww.com/hnpjournal/Abstract/2005/01000/The_Effects_of_Mindfulness_based_Stress_Reduction.8.aspx

Cooper, S., Kinsman, L., Buykx, P., McConnell-Henry, T., Endacott, R., & Scholes, J. (2010). Managing the deteriorating patient in a simulated environment: Nursing students' knowledge, skill and situation awareness. *Journal of Clinical Nursing, 19,* 2309-2318. doi:10.1111/j.1365-2702.2009.03164.x

Cronenwett, L., Sherwood, G., Barnsteiner, J., Disch, J., Johnson, J., Mitchell, P., & Warren, J. (2007). Quality and safety education for nurses. *Nursing Outlook, 55,* 122-131. doi:10.1016/j.outlook.2007.02.006

Currie, L. M., Desjardins, K. S., Stone, P. W., Lai, T., Schwartz, E., Schnall, R., & Bakken, S. (2007). Near-miss and hazard reporting: Promoting mindfulness in patient safety education. *Studies in Health Technology & Informatics*, *129,* 285-290. Retrieved from http://ebooks.iospress.nl/publication/10980

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S., . . . Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, *65*, 564-570. doi:10.1097/01.PSY.00000

Delizonna, L. L., Williams, R. P., & Langer, E. J. (2009). The effect of mindfulness on heart rate control. *Journal of Adult Development*. *16*, 61-65. doi: 10.1007//s10804-009-9050-6

D'Esmond, L. (2016). *Distracted practice and patient safety: The healthcare team experience* (Doctoral dissertation). Retrieved from http://escholarship.umassmed.edu/gsn_diss/41

D'Esmond, L .K. (2015, November 25). Distracted practice: A concept analysis. *Nursing Forum*, 1-11. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/nuf.12153/abstract;jsessionid=2AD3D6F9AAD3CAF12BC6A9FEE63EE58B.f01t03

Dilles, T., Vander Stichele, R. R., Van Bortel, L., & Elseviers, M. M. (2010). Nursing students' pharmacological knowledge and calculation skills: Ready for practice? *Nurse Education Today*, *31*, 499-505. doi:10.1016/j.nedt.2010.08.009

Disch, J., & Barnsteiner, J. (2014). Developing a reporting and tracking tool for nursing student errors and near misses. *The Journal of Nursing Regulation*, *5*(1), 4-10. doi:10.1016/S2155-8256(15)30093-4

Ebright, P. R., Patterson, E. S., Chalko, B. A., & Render, M. L. (2003). Understanding the complexity of registered nursing work in acute care settings. *JONA*, *33*, 630-638. Retrieved from https://journals.lww.com/jonajournal/Abstract/2003/12000/Understanding_the_Complexity_of_Registered_Nurse.4.aspx

Endsley, M. R. (1995). Towards a theory of situation awareness in dynamic systems. *Human Factors, 37,* 32-64. doi:10.1518%2F001872095779049543

Endsley, M. R. (2000). Direct measurement of situation awareness: Validity and use of SAGAT. In M.R. Endsley & D.J. Garland, *Situation awareness analysis and measurement* (pp.1-21). Mahwah, NJ: Lawrence Erlbaum Associates.

Endsley, M. R. (2015). Final reflections: Situation awareness models and measures. *Journal of Cognitive Engineering and Decision Making, 9,* 101-111. doi:10.1177/1555343415573911

Eppich, W., & Cheng, A. (2015). Promoting Excellence and Reflective Learning in Simulation (PEARLS): Development and rationale for a blended approach to health care simulation debriefing. *Simulation in Healthcare, 10,* 106-115. doi:10.1097/SIH.0000000000000072

Epstein, R.M. (1999). Mindful practice. *Journal of the American Medical Association, 282,* 833-839. doi:10.1001/jama.282.9.833

Feil, M. (2013). Distractions and their impact on patient safety. Retrieved from http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2013/Mar;10(1)/Pages/01.aspx

George, E. L., Henneman, E. A., & Tasota, F. J. (2010). Nursing implications for prevention of adverse drug events in the intensive care unit. *Critical Care Medicine, 38,* S136-S144. doi:10.1097/CCM.Ob013e3181deOb23

Grecucci, A., Pappaianni, E., Suigzdaite, R., Theuninck, A., & Job, R. (*2015*). Mindful emotion regulation: Exploring the neurocognitive mechanisms behind mindfulness. *Biomedical Research International*, 2015(670724), 1-9. doi:10.1155/2015/670724

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research, 57,* 35-56. doi: 10.1016/S0022-3999(03)00573-7

Hallman, I. S., O'Connor, N., Hasenau, S., & Brady, S. (2014). Improving the culture of safety on a high-acuity inpatient child/adolescent psychiatric unit by mindfulness-based stress reduction training of staff. *Journal of Child and Adolescent Psychiatric Nursing*, *27,* 183-189. doi:10.1111/jcap.12091

Hayden, J., Keegan, M., Kardong-Edgren, S., & Smiley, R.A. (2014). Reliability and validity testing of the Creighton Competency Evaluation Instrument for use in the NCSBN National Simulation Study. *Nursing Education Perspectives, 35,* 244-252. doi:10.5480/13-1130.1

Henneman, E. A., Roche, J. P., Fisher, D. L., Cunningham, H., Reilly, C. A., Nathanson, B.H., & Henneman, P.L. (2010). Error identification and recovery by student nurses using human patient simulation: Opportunity to improve patient safety. *Applied Nursing Research, 23,* 11-21. doi:10.1016/j.apnr.2008.02.004

Henneman, E. A., & Gawlinski, A. (*20*04). A "near-miss" model for describing the nurse's role in the recovery of medical errors. *Journal of Professional Nursing,* 20, 196-201. doi:10.1016/j.profnurs.2004.04.006

Horner, J. K., Piercy, B.S., Eure, L., & Woodard, E. K. (2014). A pilot study to evaluate mindfulness as a strategy to improve inpatient nurse and patient experiences. *Applied Nursing Research, 27,* 198-201. doi:10.1016/j.apnr.2014.01.003

Ignatavicius, D. (2019). *Teaching and learning in a concept-based curriculum.* Burlington, MA: Jones and Bartlett.

International Nursing Association for Clinical Simulation and Learning (INACSL). (2016). Standards of Best Practice: Simulation[SM.] *Clinical Simulation in Nursing, 12, (*Suppl.*),* S1-S50. Retrieved from http://www.nursingsimulation.org/issues/S1876-1399(16)X0014-X

Institute for safe medication practice (ISMP) survey helps define near miss and close calls. (2005). Retrieved from www.ismp.org/Newsletters/acutecare/articles/20090924.asp

Institute of Medicine. (2000). *To err is human: Building a safer health system*. Washington, DC: National Academy Press. Retrieved from http://www.nap.edu/books/0309068371/html/

Institute of Medicine. (2001). *Health professions education: A bridge to quality*. Greiner, A.C. & Knebel, E., (eds). Washington, DC: National Academy Press.

International Ergonomics Association. (2017). *Definition and domains of ergonomics*. Retrieved from http://www.iea.cc/whats/index.html

Jennings, B. M., Sandelowski, M., & Marks, B. (2011). The nurse's medication day. *Qualitative Health Research, 21,* 1441-1451. doi:10.1177/1049732311411927

Johns, S. A., Ah, D.V., Brown, L. F., Beck-Coon, K., Tulip, T. L., Alysa, J. M., ...Giesler, R. B. (2015). Randomized controlled pilot trial of mindfulness-based stress reduction for breast and colorectal cancer survivors: Effects on cancer-related cognitive impairment. *Journal of Cancer Survivorship*. doi:10.1007/s11764-015-0494-3

Jra, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, and Behavioral Neuroscience, 7,* 109-119. Retrieved from https://www.researchgate.net/profile/Michael_Baime/publication/6167711_Mindfulness_training_modifies_subsystems_of_attention/links/54077d0e0cf23d9765aaac0f.pdf

Kabat-Zinn, J. (1994). *Where every you go, there you are: Mindfulness meditation in everyday life*. New York, NY: Hyperion.

Kabat-Zinn, J. (2018). *Guided mindfulness meditation practices with Jon Kabat-Zinn.* Retrieved 8/30/18 from https://www.mindfulnesscds.com/pages/faq.

Kabat-Zinn, J., Massion, M. D., Kristeller, J., Peterson, L. G., Flecther, K. E., & Pbert, L. (1992). Effectiveness of meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry, 149*, 936-943. Retrieved from https://s3.amazonaws.com/academia.edu.documents/3467193/sg3b-disposition=inline%3B%20filename%3DEffectiveness_of_a_meditation-based_stre.pdf

Kalisch, B.J. (2015). *Errors of omission: How missed nursing care imperils patients.* Silver Springs, MD: American Nurses Association.

Kerfoot, K. (2005). Attending to weak signals: The leadership challenge. *Urologic Nursing, 25,* 488. Retrieved from http://search.proquest.com/openview/0add40506f23167c5ade9f6e68f30289/1?pq-origsite=gscholar&cbl=29865

Killam, L. A., Luhanga, F., & Bakker, D. (2011). Characteristics of unsafe undergraduate nursing students in clinical practice: An integrative literature review. *Journal of Nursing Education, 50,* 437-446. doi:10.3928/0148434-20110517-05

Langer, E. J., & Moldoveanu, M. (2000). The construct of mindfulness. *The Journal of Social Issues, 56,* 1-9. Retrieved from http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1540-4560

Lavoie, P., Cossette, S., & Pepin, J. (2016). Testing nursing students' clinical judgment in a patient deterioration simulation scenario: Development of a situation awareness instrument. *Nurse Education Today, 38*, 61-67. doi:10.1016/j.nedt.2015.12.015

Lucian Leape Institute of the National Patient Safety Foundation. (2016). *Transforming Healthcare: A compendium of reports from the National Patient Safety Foundation's Lucien Leape Institute*. Retrieved from http://www.npsf.org/page/reportcompendium

Ludwig, D. S., & Kabat-Zinn, J. (2008). Mindfulness in medicine. *Journal of the American Medical Association, 300*, 1350-1352. doi:10.1001/jama.300.11.1350

Makay, M. A., & Daniel, M. (2016, May 3). Medical error the third leading cause of death in the US. *The BMJ*, 1-5. doi:10.1136/bmj.i2139

McKenna, L., Missen, K., Cooper, S., Bogossian, F., Bucknall, T., & Cant, R. (2014). Situation awareness in undergraduate nursing students managing simulated patient deterioration. *Nurse Education Today, 34*, e27-e31. doi:10.1016/j.nedt.2013.12.013

Miller, J. J., Fletcher, K., & Kabat-Zinn, J. (1995). Three-year follow-up and clinical implications of a mindfulness medication-based stress reduction intervention in the treatment of anxiety disorders. *General Hospital Psychiatry, 17*, 192-200. doi:10.1016/0163-8343(95)00025- M

Mindful, mindfulness. (2017). In Merriam-Webster Dictionary. Retrieved On-Line

Moore, A., Gruber, T., Derose, J., & Malinowski, P. (2012, February 10, 2012). Regular, brief mindfulness meditation practice improves electrophysiological markers of attentional control. *Frontiers in Human Neuroscience, 6*(18), 1-15. doi:10.3389/fnhum.2012.00018

Moore, A., & Malinowski, P. (2009). Meditation, mindfulness, and cognitive flexibility. *Consciousness and Cognition, 18,* 176-186. doi:10.1016/j.concog.2008.12.008

Moore, D .E., Chappell, K., Sherman, L., & Vinayaga-Pavan, M. (2019). A conceptual framework for planning and assessing learning in continuing education activities designed for clinical in one profession and/or clinical team. *Medical Teacher, 40,* 904-913. doi: 10.1080/0142159X.2018.1483578

Munro, B. H. (2005). *Statistical methods for health care research*, 5th ed. Philadelphia, PA: Lippincott, Williams, & Wilkins.

National Academy of Medicine (NAM), (2015, December). Fifteen years after 'To Err is Human': What have we learned? panel discussion. In the Richard & Hinda Rosenthal Annual Symposium of the National Academy of Medicine. Symposium conducted at the National Academy of Science, Washington, DC.

Ortner, C. N., Kilner, S .J., & Zelazo, P. D. (2007). Mindfulness meditation and reduced emotional interference on a cognitive task. *Motivation & Emotion*, *31*, 271-283. doi:10.1007/s11031-007-9076-7

Pallant, J. (2013). *SPSS Survival Manual: A step by step guide to data analysis using IBM SPSS* (5th). New York, NY: McGraw-Hill.

Pape, T. M., Guerra, D. M., Muzquiz, M., Bryant, J. B., Ingram, M., Schranner, B., . . . Welker, J. (2005). Innovative approaches to reducing nurses' distractions during medication administration. *Journal of Continuing Education in Nursing, 36*, 108-116. doi:10.3928/0022-0124-20050501-08

Park, T., Reilly-Spong, M., & Gross, C. R. (2013). Mindfulness: A systematic review of instruments to measure and emergent patient-reported outcome (PRO). *Quality of Life Research*, *22,* 2639-2659. doi:0.1007/s11136-013-0395-8

Pearson, M. R., Lawless, A. K., Brown, D. B., & Bravo, A. J. (2016). Mindfulness and emotional outcomes: Identifying subgroups of college students using latent profile analysis. *Personality & Individual Differences, 76,* 3-38. doi: 10.1016/j.paid.2014.11.009.

Pezzolesi, C., Ghaleb, M., Kostrzewski, A., & Dhillon, S. (2013). Is mindful reflective practice the way forward to reduce medication errors? *International Journal of Pharmacy Practice, 21,* 413-416. doi: 10.1111/ijpp.12031

Pipe, T. B., Bortz, J. J., Dueck, A., Pendergast, D., Buchda, V., & Summers, J. (2009). Nurse leader mindfulness meditation program for stress management: A randomized controlled trial. *Journal of Nursing Administration, 39,* 130-137. doi:10.1097/NNA.0b013e31819894a0

Polit, D. F., & Beck, C. T. (2012). *Nursing research: Generating and assessing evidence for nursing practice* (9th ed.). Philadelphia, PA: Lippincott, Williams & Wilkins.

Potter, P., Wolf, L., Boxerman, S., Grayson, D., Sledge, J., Dunagan, C., & Evanoff, B. (2005). Understanding the cognitive work of the nursing in the acute care environment. *Journal of Nursing Administration, 35,* 327-335. Retrieved from https://journals.lww.com/jonajournal/Abstract/2005/07000/Understanding_the_Cognitive_Work_of_Nursing_in_the.4.aspx

Rasmussen, J., & Vicente, K. J. (1989). Coping with human errors through system design: Implications for ecological interface design. *International Journal of Man-Machine Studies, 31,* 517-534. Retrieved from http://www.cse.chalmers.se/research/group/idc/ituniv/courses/11/hcd/literatures/Rasmussen%201989.pdf

Reason, J. (1995). Understanding adverse events: Human factors. *Quality in Health Care, 4,* 80-89. Retrieved from https://qualitysafety.bmj.com/content/4/2/80.short

Reason, J. (2000). Human error: Models and management. *BMJ, 320,* 768-771. doi:10.1136/bmj.320.7237.768

Reid-Searl, K., Moxham, L., & Happell, B. (2010). Enhancing patient safety: The importance of direct supervision for avoiding medication errors and near misses by undergraduate nursing students. *International Journal of Nursing Practice, 16,* 225-232. doi:10.1111/j.1440-172X.2010.01820.x

Roth, C., Wieck, K. L., Fountain, R., & Haas, B. K. (2015). Hospital nurses' perceptions of human factors contributing to nursing errors. *Journal of Nursing Administration*, 45, 263-269. doi:/10.1097/NNA.0000000000000196

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine, 21,* 581-599. Retrieved from https://link.springer.com/article/10.1023/A:1018700829825

Sipe, W. E., & Eisendrath, S. J. (2012). Mindfulness-based cognitive therapy: Theory and practice. *Canadian Journal of Psychiatry, 57,* 63-69. doi:10.1177%2F070674371205700202

Sitterding, M. C., Broome, M. E., Evertt, L. Q., & Ebright, P. (2012). Understanding situation awareness in nursing work: A hybrid concept analysis. *Advances in Nursing Science, 35,* 77- 92. doi: 10.1097/ANS.0b013e3182450158

Spadaro, K. C., & Hunker, D. F. (2016). Exploring the effects of an online asynchronous mindfulness meditation intervention with nursing students on stress, mood and cognition: A descriptive study. *Nurse Education Today, 39,* 163-169. doi:10.1016/j/nedt.2016.02.006

Struth, D. (2009). TCAB in the curriculum: Creating a safer care environment through nursing education. *American Journal of Nursing, (109)*11, Suppl., 55-58. doi:10.1097/01.NAJ.0000362027.23741.5b

Stubbings, L., Chaboyer, W., & McMurray, A. (2012). Nurses' use of situation awareness in decision-making: An integrative review. *Journal of Advanced Nursing, 68,* 1443-1453. doi:10.1111/j.1365-2648.2012.05989.x

Tamuz, M., & Harrison, M. I. (2006). Improving patient safety in hospitals: Contributions of high-reliability theory and normal accident theory. *Health Services Research, 41,* 1654-1676. doi:10.1111/j.1475-6773.00570

Tanner, C.A. (2005). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education, 45,* 204-211.Retrieved from https://www.healio.com/journals/jne/2006-6-45-6/%7B01c3e3a4-a0a0-4853-a63a-403745cc995a%7D/thinking-like-a-nurse-a-research-based-model-of-clinical-judgment-in-nursing

Teasdale, J. D. (1999). Metacognition, mindfulness and the modification of mood disorders. *Clinical Psychology and Psychotherapy, 6,* 146-155. dio:10.1002/(SICI)1099

Teasdale, J. D., Pope, M., Moore, R. G., Hayhurst, H., & Segal, Z. V. (2002). Metacognitive awareness and prevention of relapse in depression: Empirical evidence. *Journal of Consulting and Clinical Psychology, 70,* 275-287. doi:10.1037//0022-006X.70.275

Tusaie, K., & Edds, K. (2009). Understanding and integrating mindfulness into psychiatric mental health nursing practice. *Archives of Psychiatric Nursing, 23*, 359-365. doi:10.1016/j.apnu.2008.10.006

Valdez, L. P., Guzman, A., & Escolar-Chua, R. (2012). A structural equation modeling of the factors affecting student nurses' medication error. *Nurse Educator Today*, 12, 88-98. doi:10.1016/j.nedt.2012.01.001

Van der Riet, P., Rossiter, R., Kirby, D., Dluzewska, T., & Harmon, C. (2015). Piloting a stress management and mindfulness program for undergraduate nursing students: Student feedback and lessons learned. *Nurse Education Today*, *35*, 44-50. doi:10.1016/j.nedt.2014.05.003

Vogus, T. J., & Sutcliffe, K. M. (2012). Organizational mindfulness and mindful organizing: A reconciliation and path forward. *Academy of Management Learning & Education, 11,* 722-735. doi: 10.5465/amle.2011.0002C

Vogus, T. J., & Sutcliffe, K. M. (2007a). The impact of safety organizing, trusted leadership, and care pathways on reported medication errors in hospital nursing units. *JONA, 45*, S25-S30. doi: 10.1097/MLR.0b013e318053674f

Vogus, T .J., & Sutcliffe, K. M. (2007b). The safety organizing scale: Development and validation of a behavioral measure of safety culture in hospital nursing units. *Medical Care, 45*, 1-9. Retrieved from https://psnet.ahrq.gov/resources/resource/4873

Wachter, J. K. (2016). Human performance improvement. *Module 16.* Unpublished manuscript, Department of Safety Science, Indiana University of Pennsylvania.

Wachter, J .K. & Yorio, P. L. (2013). Current practices related to use of human performance improvement & worker engagement tools. *Journal of Safety, Health & Environmental Research 8,* 70-80. Retrieved from https://www.researchgate.net/publication/265316685_Current_Practices_Related_to_the_use_of_human_performance_improvement_and_worker_engagement_tools

Weick, K. E., & Sutcliffe, K. M. (2007). *Managing the unexpected: Resilient performance in the age of uncertainty*. San Francisco, CA: Josey-Bass.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (1999). Organizing for high reliability: Processes of collective mindfulness. *Research in Organizational Behavior, 21*, 81-123. Retrieved from http://www.drillscience.com/DPS/Organizing%20for%20High%20Reliability.pdf

Westbrook, J. I. (2013). Interruptions to clinical work: How frequent is too-frequent? *Journal of Graduate Medical Education,* 337-339. doi:10.4300/JGME-D-00076.1

Westbrook, J. I., Woods, A., Rob, M. I., Dunsmuir, W. T., & Day, R. O. (2010). Association of interruptions with an increased risk and severity of medication administration errors. *Archives of Internal Medicine, 170,* 683-690.Retrieved from http://archinte.jamanetwork.com

White, L. (2013). Mindfulness in nursing: An evolutionary concept analysis. *Journal of Advanced Nursing, 70,* 282-294. doi:10.1111/jan.12182

Wolf, Z. R., Hicks, R., & Farley Serembus, J. (2006). Characteristics of medication errors made by students during the administration phase: A descriptive study. *Journal of Professional Nursing, 22,* 39-51. Retrieved from https://psnet.ahrq.gov/resources/resource/3344

Wu, A. D., & Zumbo, B .D. (2008). Understanding and using mediators and moderators. *Social Indicator Research,87,* 367-392. doi: 10.1007a/s1205-007-9143-1

Xie, A., & Carayon, P. (2015). A systematic review of human factors and ergonomics (HFE)-based healthcare system redesign for quality of care and patient safety. *Ergonomics,58,* 33-49. doi: 10.1080/00140139.2014.95970

Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition, 19,* 597-605. doi:10.1016/j.concon.2010.03.014

Appendix A

Informed Consent Form

Dispositional Mindfulness in Senior Level Nursing Students: Examining Its Relationship to Situation Awareness and Clinical Outcomes

My name is Deborah Struth and I am a doctoral student in the Department of Nursing and Allied Health at Indiana University of Pennsylvania. I am currently conducting my dissertation on the construct of mindfulness in nursing practice and its impact on clinical outcomes. You are invited to participate in the study. The following information is being provided to you, so you can make an informed decision to participate or not. You are eligible to participate if you meet the following criteria: (1.) enrolled full-time in a traditional or accelerated second-degree baccalaureate pre-licensure nursing program within the state of Pennsylvania, (b.) currently registered in the final year (fall, winter or summer term) of a traditional 4-year program or final term (last 15-16 weeks) of an accelerated second-degree baccalaureate nursing program, (c.) have at least two previous experiences with patient care delivery in a high-fidelity simulated care environment, and are (d.) English speaking.

Purpose and Benefit of this Study:
The purpose of the study is to examine the relationship between the mindful attention and awareness (mindfulness) and its relationship with safe nursing practice (situation awareness), and clinical outcomes achieved by senior level nursing students while delivering care in a simulated care environment.

Your Involvement in this Study:
On the day of your scheduled simulation, you will read this consent form. Then you will access the survey via a link provided in your university mailbox or a paper form provided to you this morning by the researcher. You will begin by typing your identification number from your study information into the survey and you will be asked to provide some brief demographic information. After this you will complete the 39 question Five-Facets of Mindfulness Questionnaire, this should take less than 15 minutes to complete. Following completion of this questionnaire, you will participate in pre-briefing for your scheduled simulation activity with your instructor along with your peers.

During the simulation:
You will be observed throughout the simulation by the researcher or a research assistant who will document clinical actions that are observed during the scenario.

- This observation data will be collected on the Creighton Clinical Competency Evaluation Instrument.
- At one point during the scenario the simulation will be paused, and the researcher or research assistant will ask you to quickly answer 12 questions regarding what you recall and know about the patient's clinical situation.
    - You will record your answers on the color note card provided.
    - This will take less than 2 minutes to complete and the simulation will re-start and work toward conclusion under the direction of your instructors.

After the simulation:
Approximately 10 randomly selected participants in groups of two or three will de-brief with the researcher or research assistant. The discussion questions during the research team lead debriefing may be very similar to what other groups of students will experience with the simulation instructors from your university. It is likely the study related debriefing will seem very familiar to the participant, however,

- The debriefing discussion will be audiotaped for purposes of the study.
- The identify of any participant debriefing with the researcher will not be recorded.

As is consistent with the ground-rules for patient care simulations, all activities related to the simulation and the debriefing of participants by the researcher are to remain confidential. This means that you MAY NOT share the identifies of other participants or the content of the discussion outside of the debriefing room.
I cannot guarantee that all focus groups debriefing with the researcher for this study will maintain the confidence of all focus group members.

Potential Risks:
No risk beyond the minimal risks of daily living will be involved.

Potential Benefits:
It is anticipated that participants in this study may experience greater insight into the construct of situation awareness and mindfulness in nursing practice with a resultant positive impact on their insights into safe nursing practice.

Your participation in this study is voluntary:
You are free to choose to participate in this study or not to participate. Participation or non-participation will neither affection your grade in this course nor your relationship with your university. You can withdraw at any point during the study simply by closing the survey and your data will be discarded. If you choose to withdraw during the simulation, simply turn in a blank answer card and continue with the simulation under the direction of your instructor. You will not be asked to participate in a debriefing with the researcher if you initiate any of these actions that signal your decision not to participate.

Your responses will be kept confidential and WILL NOT be shared with your university instructors or administrators. The physical data collected will be kept in a locked file cabinet that can only be accessed by the researcher and the digital data will be kept in a password protected hard disk for use by the researcher only. When the study is finished, the study results may be presented at conferences and/or published in academic journal. This information will only be used for academic purposes.

If you are willing to participate in this study, please sign the statement below and return to Deborah Struth in the envelop provided. Please take the extra, unsigned copy of this form with you for your records. Please provide your email on this consent where indicated so that I may send you the link for the Five-Facets of Mindfulness Questionnaire.

Thank you for consideration and assistance with this study. If you have questions or would like additional information, please contact Deborah Struth, the researcher for this study.

Researcher: Mrs. Deborah L. Struth
Doctoral Student
Department of Nursing and Allied Health Professions
Indiana University of Pennsylvania
cmss@iup.edu
724-554-1591

Faculty Sponsor: Dr. Lora K. Hromadik
Associate Professor
Department of Nursing and Allied Health Professions
Department of Nursing and Allied Health Professions
Indiana University of Pennsylvania
1010 Oakland Avenue, 246 Johnson Hall
Indiana, PA 15705
724-357-3261

THIS PROJECT HAS BEEN APPROVED BY THE INDIANA UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS (724) 357- 7730.

Voluntary Consent for Participation

☐ I have read and understand the information on this form and I consent to volunteer to be a participant in this study. I understand that my responses are completely confidential and that I have the right to withdraw at any time. I have received an unsigned copy of this consent to keep in my possession.

Name (Please Print): _____

Signature: _____

Date: _____

University email for link to questionnaire: _____

I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participating in this research study and have made myself available to answer any questions that may be raised.

Date: _____

Researcher Signature: _____

Deborah L. Struth
724-554-1591
d.l.struth@iup.edu

Appendix B

Demographic Questions and FFMQ

A. Identifier Assignment: University Abbreviation then last six digits of personal phone number belonging to participant

B. Demographic Data Collection:

1. Please indicate your gender:
____ Male ____Female

2. What is your year of birth? _____

3. Your ethnic/racial background is:
____Black, African-American
____Asian
____White, Caucasian
____Native American
____Pacific Islander
____Spanish/Hispanic/Latino/Mexican
____Other (Name) _____

4. Please indicate your program status:
____Full Time
____Part Time

5. Are you currently enrolled in the courses for the senior year/end of your curriculum plan?
____Yes
____No, please explain: _____

6. What is your current GPA? ____

7. Do you have experience practicing Mindfulness Meditation or Mindfulness-based Stress Reduction?

8. Do you have experience practicing other form of meditation? If yes, describe:

Five Facets of Mindfulness Questionnaire

Please rate each of the following statements using the scale provided. Please select the choice that best describes your own opinion of what is generally true for you.

1	2	3	4	5
never or very rarely true	rarely true	sometimes true	often true	very often or always true

	1. When I'm walking, I deliberately notice the sensations of my body moving.
	2. I'm good at finding words to describe my feelings.
	3. I criticize myself for having irrational or inappropriate emotions.
	4. I perceive my feelings and emotions without having to react to them.
	5. When I do things, my mind wanders off and I'm easily distracted.
	6. When I take a shower or bath, I stay alert to the sensations of water on my body.
	7. I can easily put my beliefs, opinions, and expectations into words.
	8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
	9. I watch my feelings without getting lost in them.
	10. I tell myself I shouldn't be feeling the way I'm feeling.
	11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
	12. It's hard for me to find the words to describe what I'm thinking.
	13. I am easily distracted.
	14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.
	15. I pay attention to sensations, such as the wind in my hair or sun on my face.
	16. I have trouble thinking of the right words to express how I feel about things.
	17. I make judgments about whether my thoughts are good or bad.
	18. I find it difficult to stay focused on what's happening in the present. 19. When I have distressing thoughts or images, I "step-back" and am aware of the thought or image without getting taken over by it.
	20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

	21. In difficult situations, I can pause without immediately reacting.
	22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.
	23. It seems I am "running on autopilot" without much awareness of what I'm doing.
	24. When I have distressing thoughts or images, I feel calm soon after.
	25. I tell myself that I shouldn't be thinking the way I am thinking.
	26. I notice the smells and aromas of things.
	27. Even when I'm feeling terribly upset, I can find a way to put in into words.
	28. I rush through activities without being really attentive to them.
	29. When I am having distressing thoughts or images, I am able just to notice them without reacting.
	30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
	31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
	32. My natural tendency is to put my experiences into words.
	33. When I have distressing thoughts or images, I just notice them and let them go.
	34. I do jobs or tasks automatically without being aware of what I'm doing.
	35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.
	36. I pay attention to how my emotions affect my thoughts and behaviors.
	37. I can usually describe how I feel at the moment in considerable detail.
	38. I find myself doing things without paying attention.
	39. I disapprove of myself when I have irrational ideas.

Scoring Information:

Observing items:
1, 6, 11, 15, 20, 26, 31, 36

Describing items:
2, 7, 12R, 16R, 22R, 27, 32, 37

Act with Awareness items:
5R, 8R, 13R, 18R, 23R, 28R, 34R, 38R

Nonjudge items:
3R, 10R, 14R, 17R, 25R, 30R, 35R, 39R

Nonreact items:
4, 9, 19, 21, 24, 29, 33

Appendix C

Situation Awareness Global Assessment Technique

Situation Awareness Global Assessment Technique (SAGAT)
Dispositional Mindfulness, Situation Awareness and Clinical Outcomes of Senior Level Baccalaureate Nursing Students

Key Goal: Goal directed management of any physiologic instability
Sub Goal: Effective management of patient leading to stabilization of clinical situation.

SAGAT Queries:

Physiological Perception: Objective Signs

1. At this moment, what is the blood pressure? ±5mmHg for systolic and diastolic
2. At this moment, what is the heart rate? ± 5 bpm
3. At this moment, what is the respiratory rate? ± 2 breaths/min
4. At this moment, what is the oxygen saturation? ± 2%
5. At this moment, what is the patient's temperature? ± 0.5°C/
6. At this moment, how much oxygen is being administered? *

Global Situation Perception: Less Quantifiable Signs of Physiologic Perception

7. At this moment, are his/her breath sounds normal?
8. At this moment, is his/her pulse regular?
9. At this moment, is he/she having trouble breathing?
10. At this moment, does he/she need more oxygen?
11. At this moment, is he/she reporting unusual pain?
12. At this moment, is he/she reporting increasing pain?
13. At this moment, is he/she reporting that something serious is about to happen to him/her?
14. Is suction equipment available at the bedside? *
15. Where the prescribed IV fluids infusing? *

Comprehension:

16. Do you think his/her respiratory effort is adequate?
17. Do you think his/her cardiac output is normal?
18. Do you think he is hypothermic or hyperthermal?
19. Is he/she showing signs of shock?
20. Is he/she showing signs of neurological involvement?
21. Is he/she showing signs of infection?
22. What is wrong with the patient?

Projection

23. In the next few minutes, will you need to administer a fluid bolus?
24. In the next few minutes, will you advise the physician of your observations?
25. In the next few minutes, will you ask the physician to come STAT to the patient's bedside?
26. In the next few minutes, what will happen to his/her blood pressure?
27. In the next few minutes, what will happen to his/her respiratory rate?
28. In the next few minutes, what will happen to his/her oxygen saturation?
29. In the next few minutes, what will happen to his/her systemic circulation?
30. What medications may be required to stabilize his/her condition? *

Select three items from each of the four SAGAT query subscales.
Scoring of the SAGAT:
A mean total SA score will be calculated, along with a mean score for each subscale.

(Adapted from techniques/tools developed by Lavoie et al., 2016; Bogossian et al., 2014)

Appendix D

Creighton Competency Evaluation Instrument

Creighton Competency Evaluation Instrument (C-CEI) will be used to evaluate overall clinical performance/decision making.
Instrument selected based on comprehensive nature of four subscales and simplicity of scoring.
Four Subscales of the C-CEI:

- Assessment
- Communication
- Clinical Judgment
- Patient Safety

Total of 23 items on the instrument rated as

0 = Does not demonstrate competency
1 = Does demonstrate competency
NA = Behavior not applicable

A mean total C-CEI will be calculated, along with a mean score for each subscale.

Rating Matrix on page 161.

Creighton UNIVERSITY College of Nursing

Creighton Competency Evaluation Instrument (C-CEI)

Student(s) Name: Scenario: Evaluator:	0= Does not demonstrate competency 1= Demonstrates competency NA= Not applicable			Date: _____/_____/_____
ASSESSMENT	Circle Appropriate Score for all Applicable Criteria - If not applicable, circle NA			**COMMENTS:**
1. Obtains Pertinent Data	0	1	NA	
2. Performs Follow-Up Assessments as Needed	0	1	NA	
3. Assesses the Environment in an Orderly Manner	0	1	NA	
COMMUNICATION				
4. Communicates Effectively with Intra/Interprofessional Team (TeamSTEPPS, SBAR, Written Read Back Order)	0	1	NA	
5. Communicates Effectively with Patient and Significant Other (verbal, nonverbal, teaching)	0	1	NA	
6. Documents Clearly, Concisely, & Accurately	0	1	NA	
7. Responds to Abnormal Findings Appropriately	0	1	NA	
8. Promotes Professionalism	0	1	NA	
CLINICAL JUDGMENT				
9. Interprets Vital Signs (T, P, R, BP, Pain)	0	1	NA	
10. Interprets Lab Results	0	1	NA	
11. Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1	NA	
12. Prioritizes Appropriately	0	1	NA	
13. Performs Evidence Based Interventions	0	1	NA	
14. Provides Evidence Based Rationale for Interventions	0	1	NA	
15. Evaluates Evidence Based Interventions and Outcomes	0	1	NA	
16. Reflects on Clinical Experience	0	1	NA	
17. Delegates Appropriately	0	1	NA	
PATIENT SAFETY				
18. Uses Patient Identifiers	0	1	NA	
19. Utilizes Standardized Practices and Precautions Including Hand Washing	0	1	NA	
20. Administers Medications Safely	0	1	NA	
21. Manages Technology and Equipment	0	1	NA	
22. Performs Procedures Correctly	0	1	NA	
23. Reflects on Potential Hazards and Errors	0	1	NA	

COMMENTS

Total: _____

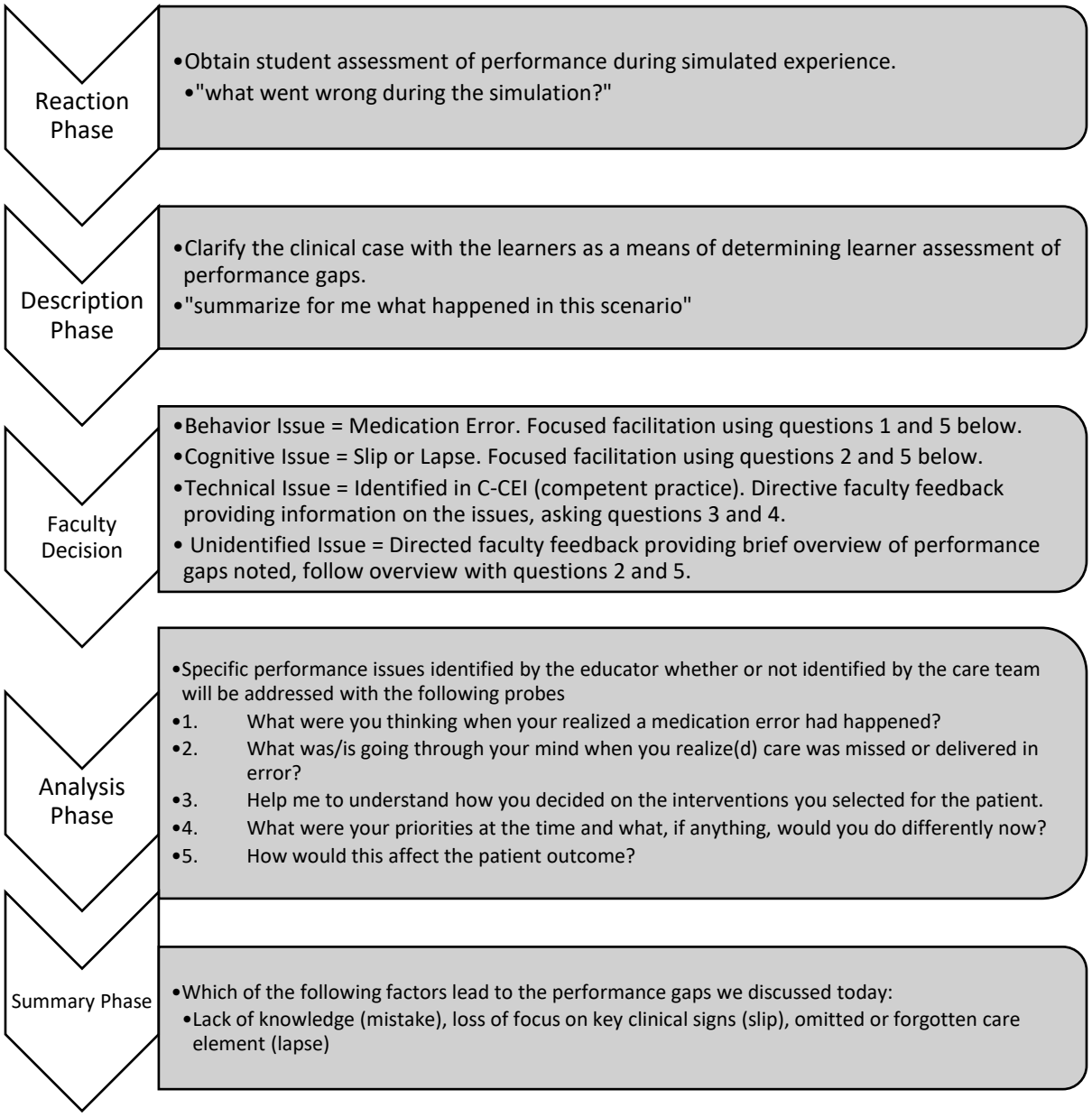
Total Applicable Items:

For more information, please contact Martha Todd, MS, APRN @ mtodd@creighton.edu

Revised 4/22/2014

Appendix E

PEARLS Structured Debriefing



Appendix F

Debriefing Method Utilized by Public University Site

Nursing Practice (Safety)

Did the nurse wash his/her hands?
Did the nurse identify the patient prior to providing care?
Did the nurse properly identify the patient prior to giving any medications?
Did the nurse check allergies prior to administration of medication?
Did the nurse maintain patient confidentiality? (HIPAA)
Any other safety issues?
Comments:

Nursing Practice (Nursing Process)
Did the nurse thoroughly assess the patient?
Did the nurse assess prior to intervening?
Did the nurse implement the indicated care?
Actions that the nurse needed to implement based on this particular simulation?
Did the nurse evaluate the patient's response to treatment?
Did the nurse respond appropriately following the evaluation?
Comments:

Leadership:
The nurse demonstrated professional behavior during the simulation?
The primary nurse demonstrated leadership and lead the team?
Comments:

Technical Skills:
List the clinical skills that were performed and were the skills performed correctly?
Comments:

Communication:
Did the nurse communicate effectively with the patient?
Did the nurse communicate effectively with the family?
Did the health care team communicate effectively between each other?
Did the nurse communicate with the physician using the SBAR?
Did the nurse repeat back to the physician the physician's order to ensure accuracy?
Did the nurse demonstrate caring towards the patient?
Were the nurses' actions during the simulation patient focused?
Did the nurse provide patient teaching appropriately?
Comments:

Critical Reasoning:
Did the nurse make appropriate decisions during the simulation?
Was care prioritized appropriately?
Would you have responded differently to this simulation? If so, how?
Comments:

Identify two strengths of this simulation.

Identify two areas of improvement in this simulation.

Identify one lesson learned from this simulation experience.

Appendix G

Debriefing Method Utilized by Private University Site

PEARLS Debriefing Method
(Promoting Excellence and Reflective Learning in Simulation)

1. START Debriefing HERE…." how did it go?"

2. Don't assume. Ask about reasoning for the right and incorrect actions.

Right action, right reason
Right action, wrong reason
Wrong action, right reason
Wrong action, wrong reason

Explore Performance Gaps

Express Your Point of View

Appreciation
I liked that….I thought that it was fascinating that….I noticed that….I heard you say….

Appreciation or Concern
I was thinking…That makes me think that…
I had the impression that…It seemed to me that…
I noticed that…I saw that…I heard you say…

Concern
I was wishing that…I felt uncomfortable because…
I was worried/concerned…I was troubled by…
I heard you say…I saw that

Ask about the Students/other Perspectives
How do you all see it?
I wonder what your thoughts were at the time?
What were you thinking when…?
What was going through your mind?
What were your priorities at the time?
Help me understand how you decided to…
How would the patient view…?
What would the legal consequences be…?
How would this affect the patient outcome…

Closing the Performance Gap

Clarify Thinking and Learning Needs
So, what I am hearing you say is that… (insert student performance gap) was related to … (student thinking)

If I understand your correctly, you are saying that (performance gap) was due to …(insert student thinking here).

Explore Student Thinking & Close Performance Gap
Negative
Identify and explore new thinking through discussion
Teach to close performance gap when learning need is clear
Positive
Identify and reinforce existing frame through discussion
Teach to highlight positive performance

Help Student Generalize
What strategies do you see going forward that would be helpful here?

How will this impact your performance next time?

How would you manage the situation differently next time?

What will you be thinking the next time you encounter a situation like this?

Appendix H

Indiana University of Pennsylvania IRB Approval Letter

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

February 08, 2018

Dear Deborah Struth:

Your proposed research project, "Dispositional Mindfulness in Senior Level Nursing Students: Examining Its Relationship to Situation Awareness and Clinical Outcomes.," (Log No. 18-007) has been reviewed by the IRB and is approved for data collection at **IUP only**. In accordance with 45CFR46.101 and IUP Policy, your project is exempt from continuing review. This approval does not supersede or obviate compliance with any other University requirements, including, but not limited to, enrollment, degree completion deadlines, topic approval, and conduct of university-affiliated activities.

To submit additional research site approval letters, please log into IRBManager, open your study, click Start xForm and choose "submit research site approval letter". Follow the directions to electronically submit your letter to expedite the review process. As you know, data can only be collected and analyzed from sites with official research site approval on file. You must submit the approvals and receive a formal letter of IRB approval for each site before you initiate data collection.

You should read all of this letter, as it contains important information about conducting your study.

Now that your project has been approved by the IRB, there are elements of the Federal Regulations to which you must attend. IUP adheres to these regulations strictly:

1. You must conduct your study exactly as it was approved by the IRB.
2. Any additions or changes in procedures must be approved by the IRB before they are implemented.
3. You must notify the IRB promptly of any events that affect the safety or well-being of subjects.
4. You must notify the IRB promptly of any modifications of your study or other responses that are necessitated by any events reported in items 2 or 3.

The IRB may review or audit your project at random *or* for cause. In accordance with IUP Policy and Federal Regulation (45CFR46.113), the Board may suspend

or terminate your project if your project has not been conducted as approved or if other difficulties are detected

Although your human subjects review process is complete, the School of Graduate Studies and Research requires submission and approval of a Research Topic Approval Form (RTAF) before you can begin your research. If you have not yet submitted your RTAF, the form can be found at http://www.iup.edu/page.aspx?id=91683 .

While not under the purview of the IRB, researchers are responsible for adhering to US copyright law when using existing scales, survey items, or other works in the conduct of research. Information regarding copyright law and compliance at IUP, including links to sample permission request letters, can be found at http://www.iup.edu/page.aspx?id=165526.

I wish you success as you pursue this important endeavor.

Sincerely,

Timothy Runge, Ph.D.
Interim Chairperson, Institutional Review Board for the Protection of Human Subjects
Professor of Educational and School Psychology

TJR:bkj

Cc: Dr. Lora Hromadik, Dissertation Advisor

Appendix I

Permission From Director of RISE Simulation Center

Deborah Struth
Doctoral Student
Indiana University of Pennsylvania
210 Johnson Hall
1010 Oakland Avenue
Indiana, PA 15705

19 February, 2018

School of Nursing and Health Sciences

Robert Morris University
6001 University Boulevard
Moon Township, PA 15108

412-397-3000 phone
412-397-3277 fax

RMU.EDU

Dear Ms. Struth,

As director of the RISE Center and Professor of Nursing at Robert Morris University, I am notifying you of our decision to support your research proposal titled "Dispositional Mindfulness in Senior-Level Nursing Students: Examining the Relationship to Situation Awareness and Clinical Outcomes." After discussing your study protocol with Dr. Katrina Pyo, director of the BSN program, and the staff at the RISE Center, we are pleased to provide you the opportunity to complete data collection for your study.

Upon receipt of the Indiana University of Pennsylvania Institutional Review Board approval documents for your research, we will permit your access to the RISE Center at Robert Morris University beginning after 2/1/18 for the purposes of recruiting senior-level/advanced medical-surgical, pre-licensure nursing students for participation in your study. Per our discussion, students will receive a recruitment email regarding the study two weeks prior to the regularly scheduled simulation scenarios with in their nursing course. Data collection for your study will take place during the simulation scenario that is facilitated by staff at the RISE Center.

Your contacts at the RISE Center are Dana Bargerstock, Operations Manager (412-397-6216) and Janet Barber (412-397-6350), Standardized Patient Educator.

Sincerely,

Suzan "Suzie" Kardong-Edgren PhD, RN, ANEF, CHSE, FSSH, FAAN
Professor and RISE Center Director
412-397-3534

Appendix J

Additional Site IRB Approval Letter

Indiana University of Pennsylvania
www.iup.edu

Institutional Review Board for the
Protection of Human Subjects
School of Graduate Studies and Research
Stright Hall, Room 113
210 South Tenth Street
Indiana, Pennsylvania 15705-1048

P 724-357-7730
F 724-357-2715
irb-research@iup.edu
www.iup.edu/irb

February 20, 2018

Dear Deborah Struth:

The IRB office received research site approval from Robert Morris University RISE Center for your proposed research project, "Dispositional Mindfulness in Senior Level Nursing Students: Examining Its Relationship to Situation Awareness and Clinical Outcomes.," (Log No. 18-007) and is approved.

To submit additional research site approval letters, please log into IRBManager, open your study, click Start xForm and choose "submit research site approval letter". Follow the directions to electronically submit your letter to expedite the review process. As you know, data can only be collected and analyzed from sites with official research site approval on file. You must submit the approvals and receive a formal letter of IRB approval for each site before you initiate data collection.

I wish you success as you pursue this important endeavor.

Sincerely,

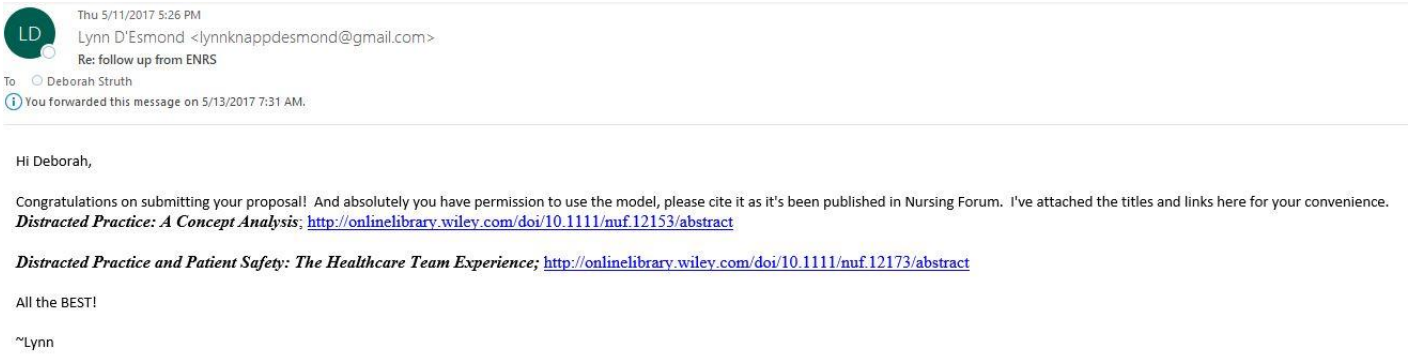
Timothy Runge, Ph.D.
Interim Chairperson, Institutional Review Board for the Protection of Human Subjects
Professor of Educational and School Psychology

TJR:bkj

Cc: Dr. Lora Hromadik, Faculty Advisor

Appendix K

Permission to Use the Distracted Practice Model



Thu 5/11/2017 5:26 PM

Lynn D'Esmond <lynnknappdesmond@gmail.com>

Re: follow up from ENRS

To Deborah Struth

You forwarded this message on 5/13/2017 7:31 AM.

Hi Deborah,

Congratulations on submitting your proposal! And absolutely you have permission to use the model, please cite it as it's been published in Nursing Forum. I've attached the titles and links here for your convenience.
Distracted Practice: A Concept Analysis; http://onlinelibrary.wiley.com/doi/10.1111/nuf.12153/abstract

Distracted Practice and Patient Safety: The Healthcare Team Experience; http://onlinelibrary.wiley.com/doi/10.1111/nuf.12173/abstract

All the BEST!

~Lynn