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Psychological Safety in Pre-licensure Nursing Simulation

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Abstract

Background

Simulation-based experiences (SBEs) allow learners to use clinical decision-making, clinical judgment, and hands-on skills to analyze and respond to realistic clinical situations in a controlled, interactive environment. Psychological safety (PS) is essential for increasing a learner's engagement in an SBE. Psychologically safe learning environments allow students to feel valued and comfortable speaking up and taking risks without consequences to themselves or others, promoting learning and innovation. Measuring PS may help simulation faculty improve their learning environment by supporting learning-oriented behavior and boosting students' clinical competency.

Purpose

The purpose of this Doctor of Nursing Practice (DNP) scholarly project was to examine the level of PS experienced by pre-licensure nursing students while participating in SBEs at a Tennessee university's school of nursing simulation program.

Design

A cross-sectional descriptive survey design was used to examine the level of PS experienced by pre-licensure nursing students while participating in SBEs. Park & Kim's (2021b) Psychological Safety in High Fidelity Simulation was used to obtain the mean overall PS score for the sample group of 545 students was 45.4 (*SD* = 10.7).

Results

Results indicated that senior-level students have the highest mean PS score of 51.6 (*SD* = 10.4). Certain simulations, such as an Opioid Withdrawal and Eating Disorder Simulation, had lower PS scores of 42.3 (*SD* = 9.6) and 43.5 (*SD* = 10.6).

Conclusion

The results of this study support previous studies that demonstrated higher levels of PS in senior-level students. This project highlighted the need to examine grading and faculty training in SBE at this simulation center. Evaluation and feedback on student performance are necessary in simulation-based learning, but it also may place psychological pressure on participants. Simulation faculty should support the PS of students by creating a supportive, respectful, confidential, non-threatening, and non-punitive learning environment.

Keywords: psychological safety, simulation-based experiences, pre-licensure nursing students, nursing education, high-fidelity patient simulation

Introduction and Background

Simulation-based experiences (SBEs) allow learners to develop and enhance knowledge, skills, and attitudes in a controlled and interactive manner (Coomes, 2019; International Nursing Association for Clinical Simulation and Learning [INACSL], 2016; Lateef, 2010). In a simulated environment, learners have the opportunity to use clinical decision-making, clinical judgment, and hands-on skills to analyze and respond to realistic clinical situations without the fear of harming actual patients (Coomes, 2019; INACSL, 2016; Lateef, 2010). SBEs in pre-licensure nursing education are widely utilized to supplement in-hospital clinical, and approximately 96% of nursing programs in the United States use SBEs in their curriculum (Fey & Jenkins, 2015). The National Council of State Boards of Nursing's (NCSBN) 2014 randomized, controlled, and longitudinal study determined high-quality simulation can successfully replace up to 50% of clinical experiences (Hayden et al., 2014). End-of-program learning outcomes and new graduate nurse preparation for practice were comparable to students who had more traditional in-hospital clinical (Hayden et al., 2014). Furthermore, NCLEX pass rates and employers' ratings of clinical competency and critical thinking for graduates with up to 50% SBE replacement for clinical were statistically similar to graduates with more in-hospital clinical experiences (Hayden et al., 2014).

Psychological safety (PS) is an essential factor for increasing a learner's engagement in SBE. PS was defined by William Kahn in 1990 as "feeling able to show and employ one's self without fear of negative consequences to self-image, status, or career" (p.708). Simulation can be a stress-inducing event to students as they may be fearful of ridicule, punishment, judgment, failure, embarrassment, negative evaluation, and cognitive overload (de Goes & Jackman, 2020; Ko & Choi, 2020; McMullen et al., 2016; Rudolph et al., 2006; Zigmont et al., 2011). These

fears can interfere with recalling events, diminish learning, and reduce engagement (Cheng, Grant, et al., 2016; Ko & Choi, 2020). In SBEs, PS is typically established during a pre-briefing session by creating a shared mental model, preparing learners for the simulation, and setting ground rules (INACSL Standards Committee et al., 2021). A psychologically safe SBE environment is supportive, respectful, confidential, non-threatening, and non-punitive (Cheng et al., 2012; de Goes & Jackman, 2020; Fraser et al., 2018; Gum et al., 2011; Kahn, 1990; Kuiper et al., 2008; Palaganas et al., 2016; Zhang et al., 2018; Zinns et al., 2020). In unpredictable and intimidating environments, students may perceive engagement as risky and unsafe (Kahn, 1990). Psychologically safe learning environments allow students to feel valued and comfortable speaking up and taking risks without consequences to themselves or others, promoting learning and innovation (Turner & Harder, 2018).

Problem Statement

PS was recognized as a vital component of SBE learning, and the attributes of a psychologically safe environment were well-documented in the literature. However, evidence evaluating nursing students' experiences of PS during SBEs was limited. To ensure that nursing schools are promoting psychological safe SBEs in their curricula, routine evaluation of students' PS is necessary. A Tennessee university's school of nursing simulation program with over 800 undergraduate students conducted 278 simulation sessions during the 2020 – 2021 academic year. Despite faculty efforts to create psychologically safe SBEs, nursing students' experiences of PS while participating in simulation at this university was unknown. Anecdotal data suggested a high level of PS during SBEs, but no confirmatory data existed as routine evaluation of student experiences of SBEs using post-simulation surveys did not explicitly address PS. A deeper

understanding of learners' PS while participating in SBEs was needed to evaluate the effectiveness of faculty efforts to create a psychologically safe environment.

Purpose

The purpose of this Doctor of Nursing Practice (DNP) scholarly project was to examine the level of PS experienced by pre-licensure nursing students while participating in SBEs at a Tennessee university's school of nursing simulation program.

Research Questions and Hypotheses

The following research questions were addressed: 1) What are students' overall level of PS when participating in SBEs in the pre-licensure nursing simulation program? 2) Are students' level of PS during SBEs significantly different across nursing courses? 3) Are students' level of PS during SBEs significantly different across simulations? The researcher hypothesized that the students level of PS during SBEs was significantly different across nursing courses and simulations.

Review of Evidence

Origins of Psychological Safety

PS had roots in organizational change research dating back to the 1960s (Schein & Bennis, 1965). Schein and Bennis' 1965 book *Personal and Organizational Change through Group Methods: The Laboratory Approach* introduced the concept of a psychologically safe environment and its role in mediating anxiety and increasing one's desire to learn. Further research on PS came later in the century, beginning with William Kahn's seminal work in 1990. Kahn (1990) explored the importance of PS in fostering employee engagement. He further described PS as being able to show one's self without fear of harm to self-image, status, or career (Kahn, 1990). In 1993, the concept of PS was applied to learning by Schein in 1993. He stressed

that PS was vital for helping people overcome “learning anxiety” and defensiveness when unexpected challenges occur. Amy Edmondson’s work in the 1990s led to an accidental discovery of the importance of PS in organizations. While researching hospital medication errors, she found that teams that were more psychologically safe reported more errors which led to improved patient safety and quality of care. Increased PS allowed hospital staff to feel safe to report errors without fear of retribution or shame (Edmondson, 2019). Edmondson (2019) also found that PS is a group-level phenomenon, of which leaders must cultivate an environment, not an individual personality trait. Edmonson further explained the roots PS had in neuroscience. Fear diverted physiologic resources away from areas of the brain that manage working memory and new information processing, impairing creative insight, analytic thinking, and problem-solving (Edmonson, 2019). Therefore, PS increased one’s engagement in learning behaviors, such as asking for help, information sharing, and experimenting (Edmonson, 2019).

Psychological Safety in Simulation-Based Experiences

Many of the primary sources describing the importance and attributes of PS in SBEs were opinion or narrative review articles from simulation experts in medicine and nursing disciplines. Simulation experts agreed that a psychologically safe environment was supportive, respectful, confidential, non-threatening, and non-punitive (Cheng et al., 2012; de Goes & Jackman, 2020; Fraser et al., 2018; Gum et al., 2011; Kuiper et al., 2008; Palaganas et al., 2016; Zhang et al., 2018; Zinns et al., 2020). Simulation facilitators supported PS by interacting with a relaxed, open, neutral, friendly, and interested demeanor (Rudolph et al., 2006; Cheng, Morse, et al., 2016; Cheng, Rodgers, et al., 2012; Lusk & Fater, 2013). Participants should receive details about what to expect in the simulation and debriefing session (Ko & Choi, 2020; Sawyer & Deering, 2013; de Goes & Jackman, 2020; Cheng, Morse, et al., 2016). Key preparation topics

may include: clarification of roles, expectations, logistics, learning objectives, and confidentiality (INACSL, 2016). Factors perceived by students to affect PS may include uncertainty, feeling unprepared or disrespected, fear of mistakes being exposed or damaging teamwork, and being evaluated (Kang & Min, 2019; Park & Kim, 2021a). Students who felt psychologically safe had improved learning outcomes, satisfaction, and self-confidence (Roh et al., 2020; Turner & Harder, 2018).

Regarding student experiences of PS during SBEs in nursing school, evidence was limited. Current evidence included qualitative and descriptive studies, and most authors evaluated SBEs using high-fidelity patient simulators (i.e., computerized manikins as patients) rather than standardized patients (i.e., individuals trained to act as real patients). Stephen et al. (2020) conducted a qualitative descriptive study using open-ended questions to explore students' experiences of PS in SBE. Five themes were identified during qualitative analysis: faculty presence, learning without fear, working together, setting expectations, and positive conversations (Stephen et al., 2020). A 2020 qualitative study by Ko and Choi found stress and anxiety from simulation interfered with learner memory, and learning was disrupted by performance criticism. Furthermore, evaluation anxiety, fear of being observed can lead to physical and emotional exhaustion and decrease learning satisfaction (Ko & Choi, 2020). Similarly, McMullen et al. conducted a qualitative pilot study in 2016 with first-year anesthesia residents participating in simulation, which found stress and anxiety can interfere with learning from a simulation. Thematic analysis of participants' open-ended responses to survey questions revealed simulation participants experienced a significant level of stress and anxiety during their initial SBE, despite faculty efforts to create a safe learning environment (McMullen et al., 2016). Furthermore, participants experienced increased stress and anxiety as the SBE progressed that

impaired decision-making and team-leading abilities (McMullen et al., 2016). The authors implemented an in-simulation “pause button” which was found to decrease SBE participant anxiety (McMullen et al., 2016).

Measuring PS may help simulation faculty improve the learning environment by supporting learning-oriented behavior and boosting students' clinical competency (Park & Kim, 2021b). However, Ganley and Linnard-Palmer (2012) found that faculty perceptions of their learners' PS were significantly different than the learners' actual feelings of PS. In their 2012 study, Ganley and Linnard-Palmer investigated student and faculty perceptions of academic safety, which encompassed psychological and physical safety, in high-fidelity simulation using a descriptive online survey design. Likert-type data showed a significant difference in students’ feelings of safety compared to faculty perception of the students’ feelings of safety, $F(1, 110) = 2.794$, $p = .097$ (Ganley & Linnard-Palmer, 2012). The authors used an alpha level of .10, citing acceptability of this level for educational research and the risks associated with Type I error not harming participants (Ganley & Linnard-Palmer, 2012). Additionally, qualitative analysis revealed differences in how students’ and faculty described a safe learning environment. The students focused on academic safety from a narrow perspective of personal experiences, while faculty viewed academic safety more broadly (Ganley & Linnard-Palmer, 2012). Students described academic safety as not feeling ridiculed or experiencing debilitating anxiety, and they preferred feeling challenged and supported (Ganley & Linnard-Palmer, 2012). Faculty offered a more holistic view of academic safety, explaining that a safe, positive, nonthreatening environment should apply to everyone and provide a rich learning experience (Ganley & Linnard-Palmer, 2012).

Some studies explored the relationship between academic year and PS. Ganley and Linnard-Palmer's (2012) study revealed a significant difference in academic safety among students in different semesters, $F(7, 89) = 2.419$, $p = .026$. The authors further analyzed this difference by correlation of students' semester level and overall feelings of academic safety. They found a slight negative relationship of $r = -.19$, with a two-tailed significance of $p = .074$, suggesting students in earlier semester experienced higher feelings of academic safety. Ganley and Linnard-Palmer (2012) explained this difference was possibly due to the fact that students in earlier semesters were not graded in simulation, while those in later semesters were. Park and Kim's 2021 study found conflicting results. Using the first valid and reliable tool measuring pre-licensure nursing students' PS, the researchers found a significantly higher PS score in senior students ($t = -2.66$, $p = .008$) when compared with junior students (Park & Kim, 2021b). The PS score was positively correlated with number of simulation experiences the participant had, which was found to be 1.7 times higher in third-year students and 6.6 times higher in final-year students when compared to first-year students (Park & Kim, 2021b).

Theoretical Framework

Maslow's Theory of Motivation and Hierarchy of Needs underpinned this DNP scholarly project. Abraham Maslow's (1943) theory proposed that motivated behavior is a means by which humans meet their needs in a hierarchal manner. He defined the concept of motivation as the extent to which a human yearns for goals, purposes, and ends (Maslow, 1954). Needs are "intrinsic reinforcers" and "unconditioned stimuli" that are desired by all human beings and are necessary to avoid illness and psychopathology (Maslow, 1954 p. xiii). Human needs fall into a five-category hierarchy: *physiological, safety, love and belonging, esteem,* and *self-actualization*

(Maslow, 1943; See Figure 1). As "perpetually wanting animals," humans are motivated to meet foundational physiological needs before moving to higher-level needs (Maslow, 1943, p. 3).

Physiological needs, such as such as food, water, and sleep, keep the human body in homeostasis (Maslow, 1943). *Safety needs* include security, stability, and freedom from fear and anxiety, whereas *love and belonging needs* motivate humans to pursue relationships, friendships, and a place in a group or family (Maslow, 1954). *Esteem needs* explain the desire to have a high evaluation of oneself and to feel useful and needed in the world (Maslow, 1954). *Esteem needs* are satisfied through self-determination to seek achievement, competence, or mastery in one's work or goals (Maslow, 1956). Humans gain self-confidence through the accomplishment of esteem goals (Maslow, 1956). Finally, humans are motivated to meet their full potential through *self-actualization needs* (Maslow, 1943). Maslow (1943, p. 10) described self-actualization as what a human "can be" and "must be." Self-actualization and achievement of one's full potential are only possible after relative satisfaction of physiological, safety, love and belonging, and esteem needs (Maslow, 1943). Figure 1 is a visual depiction of Maslow's Hierarchy of Needs.

Theory Application

Maslow's Hierarchy of Needs and Theory of Motivation framed the concept of PS in pre-licensure nursing simulation in this project. By understanding that students' self-actualization and achievement of full potential will only occur when their foundational needs are met, simulation faculty may foster an environment that supports growth and learning. The pre-briefing session before a SBE is a critical time for faculty to ensure students' needs are satisfied. Attending to logistical details, such as simulation length, location of restrooms and water fountains, and scheduled breaks, addresses physiological needs. Students' safety needs are ensured by a physically safe simulation environment that is free from distractions or harm. PS is

promoted by establishing a supportive and non-threatening learning environment. Belonging needs are promoted through collaboration and communication between student groups in simulation. A statement of a basic assumption supports esteem needs. This assumption, developed by Harvard's Center for Medical Simulation (CMS, 2020), is stated by simulation faculty to acknowledge students' intelligence and capability to learn and improve. Simulation faculty, who recognize and foster a student's physiological, safety, belonging, and esteem needs, promote the student's motivation to pursue self-actualization, which drives students to perform to their full potential as a student learner and future nurse. Nurses who achieve self-actualization experience increased career satisfaction, autonomy, and decision-making ability, and are empowered to lead quality-improvement changes that positively impact patient care and the nursing profesion (Groff-Paris & Terhaar, 2010).

Project Design

This DNP scholarly project utilized a quantitative, cross-sectional, descriptive survey design to examine the level of PS experienced by pre-licensure nursing students while participating in SBEs. The Belmont University Institutional Review Board verified the project as exempt as educational research.

Project Setting

This scholarly project was conducted at a Tennessee university's undergraduate school of nursing simulation program. The simulation center was fully accredited by the Society for Simulation in Healthcare (SSH) and followed the Healthcare Simulation Standards of Best Practice™. The nursing school had over 800 undergraduate students and conducted 278 simulation sessions across the concept-based curriculum during the 2020 – 2021 academic year. Simulation faculty included a Director of Simulation, four simulationists, two simulation lab

assistants, and a simulation technologist. Course faculty and content experts aided in the development and facilitation of SBEs. The simulationists completed comprehensive training, which included simulation pedagogy, operation of high-fidelity patient simulators, debriefing techniques according to Rudolph et al.'s (2006) Debriefing with Good Judgement and Advocacy/Inquiry model, and student evaluation using the Creighton Competency Evaluation Instrument (CCEI). The SBEs examined in this project were facilitated across 6 courses and included medical/surgical, critical care, obstetrics and gynecology, and pediatrics content. Examples of these simulations included elderly sepsis, code blue, heatstroke, post-partum hemorrhage, and pediatric asthma. (See Table 1 for course and simulation details).

Debriefing with Good Judgement and Advocacy/Inquiry

Debriefing with Good Judgement and Advocacy/Inquiry techniques were used by simulation faculty to maintain PS during the delivery of performance feedback to students and throughout debriefing sessions. A central idea of Debriefing with Good Judgement is consideration of participants' internal cognitive frames, also called mental models, schemata, or frames of reference, through which students make sense of external stimuli (Rudolph et al., 2006). The simulation faculty used a conversational technique called advocacy-inquiry to discover the participants' frames that guided simulation decision-making (Rudolph et al., 2006). Through this technique, the faculty may demonstrate respect for the student's perspective. Advocacy involves a statement or observation regarding the participant's actions during the simulation, such as "I noticed you stepped away from the patient as their oxygen saturations were declining. I was thinking there were other alternatives for oxygenating the patient." An inquiry is a question aimed to examine the participant frames that guided the action, such as "So I'm curious, how did you see the situation at that time?" This method of delivering feedback does

not shame the participant for lack of action or wrong decisions during the simulation. It also does not mask the faculty's assessment of the participant's action. Instead, faculty's observation of the participant's action paired with a question prompts the participant to reflect and explore what thought processes and circumstances led to simulation action, which results in a meaningful learning experience.

Project Population

A purposive sampling strategy was used to recruit sophomore, junior, and senior level pre-licensure nursing students who participated in SBEs across a concept-based curriculum. Over 600 students participated in SBEs during the Fall 2021 semester. Students under the age of 18 or freshmen who were not enrolled in courses with SBE were excluded from the study. Participants included traditional first-degree students and accelerated second-degree students. Students were enrolled in experiential courses with simulations that progressed in complexity. The courses ranged from first year health assessment and foundational nursing skills to senior-level critical care courses. Table 1 displays the university's courses and simulations by grade level.

Data Collection Instruments

Data for this project were collected using Park and Kim's (2021b) PS in High Fidelity Simulation tool which was added to the nursing school's post-simulation electronic survey using Qualtrics survey software. This tool, published online in June of 2021, was the first valid and reliable tool to measure PS in pre-licensure nursing students during SBE. The scale consisted of 14 Likert scale responses to measure perceptions of overall PS and four sub-factors of PS: Dealing with Uncertainty, Being Exposed, Being Unsupported, and Interpersonal Risk. Possible scoring ranged from 14 to 70 points, with higher scores associated with higher levels of PS (See Figure 2). The tool was initially developed in Korean and translated to English. The principal

investigator made minor terminology changes with the authors' permission to improve clarity (see Figure 3). The reliability of the survey in Korean was assessed to have a Cronbach's alpha of .91. The alpha of the four sub-factors ranged from .75 to .88. However, even the most subtle changes of terminology may have affected the validity and reliability of the survey used in this project.

Data Collection Process

This project was conducted during student participants' course-required simulation sessions during the Fall 2021 academic semester. After completing a simulation exercise, students participated in a debriefing session, during which they received a laminated letter of invitation describing the project's PS survey. Students were given access to the routine post-simulation survey by scanning a QR code with their personal cell phones. The routine post-simulation survey included an informed consent section for students to opt in or out of the PS survey. Identifying information was not collected as a part of the Qualtrics survey. Age, gender, race, and ethnicity were not included because of the risk to anonymity.

Statistical Analyses

Survey responses from the Qualtrics online survey were exported as raw numerical data into a Microsoft Excel spreadsheet then transferred to Statistical Package for the Social Sciences (SPSS) for statistical analysis. The PS score from Park and Kim's (2021b) PS in High Fidelity Simulation tool and its four subscales, Dealing with Uncertainty, Being Exposed, Being Unsupported, and Interpersonal Risk, served as dependent variables. Course and individual simulation scenarios served as independent variables. Descriptive statistics were calculated for answers to survey questions, PS score and subscales, course, and simulation. One-way analysis of variance (ANOVA) was used to determine statistically significant differences in PS scores and

subscales by course and simulation. An alpha level of $p < .05$ was used as the level of statistical significance.

Results

Sample Characteristics

A total of 545 students ($N = 545$) completed the study's PS survey. A total of 29.9% ($n = 163$) of participants were enrolled in Wellness, Assessment & Health Promotion, 6.2% ($n = 34$) were enrolled in Foundations of Experiential Learning, 19.3% ($n = 105$) were enrolled in Experiential Learning I (EL1), 13.4% ($n = 73$) were enrolled in Experiential Learning II (EL2), 22.2% ($n = 121$) were enrolled in Experiential Learning III (EL3), and 9% ($n = 49$) were enrolled in Experiential Learning IV (EL4) (See Table 2). Of the 545 responses, per simulation, 29.9% ($n = 163$) participated in the Wellness Physical Assessment and Screening Simulation, 6.2% ($n = 34$) participated in the Foundational Skills Simulation, 9.9% ($n = 54$) participated in the EL1 Opioid Withdrawal Simulation, 9.4% ($n = 51$) participated in the EL1 Eating Disorder Simulation, 4.4% ($n = 24$) participated in the EL2 Obstetric Simulation, 7.5% ($n = 41$) participated in the EL2 Heatstroke Simulation, 1.7% ($n = 9$) participated in the EL2 Pediatric Meningitis Simulation, 13.4% ($n = 73$) participated in the EL3 Elderly Infection Simulation, 8.6% ($n = 47$) participated in the EL3 Dementia Simulation, 3.9% ($n = 21$) participated in the EL4 Code Blue Simulation, 2.4% ($n = 13$) participated in the EL4 Postpartum Hemorrhage Simulation and 2.8% ($n = 15$) participated in the EL4 Multi-patient Simulation (See Table 3).

Psychological Safety Score

Table 4 displays participants' survey responses to the 14 tool items. The mean overall PS score for the sample group was 45.4 ($SD = 10.7$).

Differences in Psychological Safety Scores by Course

A one-way ANOVA was conducted to determine statistically significant differences in PS scores between courses. The one-way ANOVA revealed a statistically significant difference in mean PS scores between at least two courses ($F(5, 539) = 6.286$, $p < .001$, $\eta 2 = .06$) (See Table 5). EL4 had the highest mean PS score of 51.6 (*SD* = 10.4) and EL1 had the lowest PS score of 42.4 (*SD* = 9.6). Higher PS scores were noted in the nursing program's earlier courses, Wellness and Foundations. PS scores dropped in EL1 and slowly rose over subsequent EL courses to the highest level of PS in EL4 (See Figure 4).

Differences in Psychological Safety Scores by Simulation

A one-way ANOVA was conducted to analyze differences in mean PS scores between simulations. There was a statistically significant difference in mean PS score between the 12 simulations ($F(11, 533) = 3.706$, $p < .001$, $\eta 2 = .07$) (See Table 6). PS scores by simulation appeared to follow similar trends as PS by course with lower scores in simulations conducted earlier in the program and higher scores in simulations conducted in the program's final course (See Figure 5). The lowest PS score was 41.8 (*SD* = 10.2) in EL1 Eating Disorder simulation and highest was 54.4 (*SD* = 6.8) in EL4 Code Blue simulation.

Psychological Safety Subscales

The first two subscales of Park and Kim's (2021b) tool, Dealing with Uncertainty and Being Exposed have a possible score of 20. The third and fourth scales, Being Unsupported and Interpersonal Risk have a possible score of 15. Higher levels on these subscales indicate higher levels of psychological safety in those specific areas. The overall means of the four subscales were as follows: Dealing with Uncertainty 12.4 (*SD* = 3.4), Being Exposed 12.2 (*SD* = 4.1), Being Unsupported 10.1 (*SD* = 3.4), and Interpersonal Risk 10.5 (*SD* = 2.3). All four subscales appeared to follow a similar trend with higher scores noted in earlier courses, Wellness and

Foundations. Subscale scores dropped in EL1 and slowly rose over subsequent EL courses to the highest level of PS in EL4 (See Figure 6).

Discussion

Overall Psychological Safety

This DNP project explored the level of PS experienced by pre-licensure nursing students participating in simulation at a private Christian university located in Tennessee. The overall PS score was 45.4 on a scale ranging from 14-70, with higher scores indicating higher PS. In Park and Kim's (2021) work, higher PS scores were found in senior-level students (39.75, *SD* = 10.2) and students who participated in six or more simulations before the study (39.95, *SD* = 10.4). The results of this project support Park and Kim's findings, as senior-level EL4 students who completed nine simulations before participating in this project had the highest level of PS (51.6, *SD* = 10.4). Of note, the results of this project revealed higher levels of PS with students in Wellness and Foundations courses. Although these courses were at the beginning of the curriculum, students reported higher levels of PS compared to students in EL1 and EL2 courses, which were in the middle of the curriculum.

This project also explored the difference in PS between various simulations. The highest levels of PS were found in the Code Blue Simulation (54.4, *SD* = 6.8). The EL4 Multi-patient Simulation had much lower levels of PS (45.9, *SD* = 12.8). The lowest levels of PS were found in the EL1 Opioid Withdrawal Simulation (42.3, *SD* = 9.6) and EL2 Pediatric Simulation (42.4, *SD* = 10.0). Higher levels of PS were noted in the Wellness (46.4, *SD* = 10.1) and Foundations (47.0, *SD* = 11.7) simulations at the beginning of the curriculum.

Further investigation by the university is needed to determine why the Opioid Withdrawal and Pediatric simulations have lower levels of PS than the Wellness and

Foundations simulations conducted earlier in the curriculum with students who have less experience in simulation. Simulation faculty at the university postulated that the lower levels of PS in the Opioid Withdrawal and Pediatric simulation could be related to the intensity of caring for these types of patients compared to the lower acuity and less emotionally charged patient scenarios in the Wellness and Foundations simulations. Simulation literature acknowledged that SBEs can trigger distressing emotions and such scenarios should be facilitated by faculty experienced in handling such emotions (Calhoun et al., 2013; Gaba, 2013; Janzen et al., 2016; Truog & Meyer, 2013). Some students may not outwardly exhibit signs of such emotions, thus leaving the simulation faculty unaware of psychological distress (Truog & Meyer, 2013). It is vital that simulation faculty disclose potentially emotionally triggering aspects of the SBE during the prebriefing session (Gaba, 2013; Truog & Meyer, 2013). Capp and Williams (2012) found that being informed of potentially stressful situations can improve the students' management of stress and emotion. Another potential explanation for these scores is that EL1 students are beginning inpatient, acute care clinical experiences, which may impact cognitive load and performance in simulation. Jimenez et al. (2009) conducted cross-sectional research of 371 nursing students to identify differences in novice and experienced nursing students' reports of stress. This study identified three types of stressors experienced by nursing students, categorized as clinical, academic, and external, which are manifested in physical and psychological symptoms. Students reported the most intense stress from clinical stressors, such as witnessing pain and suffering of patients and their loved ones, feeling incapable of accurately answering patients', instructor's, and doctor's questions, and not knowing how to help patients with physical and psychological problems (Jimenez et al., 2009). Psychological manifestations of student stress included anxiety, cognitive symptoms, and depressive symptoms. Jimenez et al.

(2009) also found that second year nursing students had the highest stress from academic workload. The results of the Jimenez et al. (2009) study may help explain the drop in PS in second-year students in EL1 and EL2 SBEs. Simulation faculty should acknowledge these increasing stressors as students progress in the nursing program, monitor for signs of psychological distress, and provide appropriate support and referrals to university health and counseling services.

Students at the project site received grades for their performances in almost all simulations, which was calculated using the CCEI. The Code Blue simulation, which had the highest levels of PS, is not graded by performance. The students received credit for participation and formative feedback from faculty who also participated in the simulation as code team leaders. Cordeau (2010) studied the lived experience of nursing students during a graded simulation. Phenomenological analysis revealed that students felt SBE was beneficial in preparation for clinical practice, but the summative evaluation of SBE may have contributed in increased anxiety (Cordeau, 2010). In contrast, Reising et al. (2018) conducted a retrospective, comparative study of baccalaureate nursing students and found the assignment of a numerical grade did not affect individual and team performance in a high-fidelity simulation experience. Ganley and Linnard-Palmer (2012) found nursing students in earlier semester experienced higher feelings of academic safety potentially due to the fact that these simulations were ungraded. Further research on the impact of grading simulation and its effects on PS is needed.

A marked decline in PS was noted in the EL4 Multi-patient simulation, which is the final simulation of the curriculum where participants work in pairs to care for three simulated patients. Simulation and EL4 course faculty discussed these findings and agreed that the decline in PS for this simulation could be multi-factorial. The students are graded using the CCEI for this

simulation, and this is the only simulation during which students are required to care for more than one patient at a time. Additionally, two of the patients in the simulation become acutely ill, and students must simultaneously navigate the management of a declining septic patient while responding to a patient with an acute myocardial infarction. In response to this project's findings, faculty revised aspects of this simulation to increase PS, such as having the septic patient less acutely hypotensive. Simulation faculty may find difficulty in balancing a psychologically safe SBE environment with adequately preparing students for realities of stress that they will face as bedside nurses in clinical practice. Janzen et al. (2016) recommend normalizing students' experiences of stress and assisting students in understanding that nursing is a stressful profession. Henricksen and van Stralen (2021) suggested that SBEs can help participants learn how to deal with stress in appropriate ways or use it to their advantage. They emphasized the importance of the CMS's Basic Assumption in acknowledging students' capabilities to perform in the SBE and willingness to improve, which will allow them to practice in a psychologically safe environment (Henricksen & van Stralen, 2021). SBE exposes students to incremental doses of stress in which they can learn to reason under stress and practice neuromodulation which can help improve their capacity to improve stress (Henricksen & van Stralen, 2021).

Psychological Safety Sub-scales

Park and Kim's (2021b) PS tool included four subscales to further examine PS in simulation. In this scholarly project, the subscale results mirrored overall PS trends. Dealing with Uncertainty addresses the student's fear of making mistakes, inability to predict the responses of high-fidelity patient simulators, and uncertain outcomes of participation in the simulation (Park & Kim, 2021b). It may be possible to improve SBEs with lower Dealing with Uncertainty scores by reviewing the prebriefing process and ensuring all INACSL standards are being followed,

such as addressing the key preparation topics: clarification of roles, expectations, logistics, learning objectives, and confidentiality (INACSL, 2016).

Being Exposed is related to the observation, evaluation, and recording of the simulation performance. Evaluation and feedback on student performance are necessary in simulation-based learning, but it may also place psychological pressure on participants (Park & Kim, 2021b). Fear of being judged can hinder simulation performance and lead to an overall negative experience for participants (Park & Kim, 2021b). Further investigation is warranted to determine if Being Exposed contributed to the EL2 Pediatric Simulation having overall lower levels of PS. Being Exposed scores could be improved by ensuring that students understand the grading process and confidentiality of any recording simulations.

Being Unsupported involves faculty and their role in establishing and maintaining a psychologically safe learning environment through respectful feedback delivery (Park & Kim, 2021b). This item reflects the students' perceived psychological state and pertains to the fear and anxiety of receiving negative feedback (Park & Kim, 2021b). The lower levels of PS in the Being Unsupported subscale in senior-level courses highlight a need for closer evaluation of these simulations. Being Unsupported deals with the delivery of simulation performance feedback to students. Post-simulation student evaluations could be reviewed to determine if students reported harsh or unprofessional feedback delivery by faculty. This university utilized many adjunct clinical faculty that also practice as bedside nurses, evaluators, and content experts in simulation. Growing student enrollment and clinical faculty turnover have increased the number of new adjunct clinical instructors participating in the simulation. Adjunct faculty received basic training on simulation methodology, debriefing, and feedback using Debriefing with Good Judgement and Advocacy/Inquiry. However, this training was not as extensive as the

simulation faculty's training on debriefing and feedback. Simulationists were evaluated annually on debriefing skills by the Director of Simulation and received formative feedback to improve their debriefings. While the simulationists were responsible for debriefing each simulation, adjunct clinical faculty evaluated student performances and delivered feedback to students. Further investigation is warranted, and additional training may be needed for adjunct faculty members that provide feedback to students following simulation.

The fourth subscale, Interpersonal Risk, deals with one's PS while working as a team. Simulation participants with higher scores in the category feel safe to take interpersonal risks within the team and simulation and to speak honestly without fear of judgment or retribution (Edmondson, 2019; Park & Kim, 2021b). Since this subscale deals with the participants' comfort in speaking up and taking risks within a team, these scores could be improved by emphasizing professionalism and respect for team members during the prebriefing session. Students in this program generally work through a simulation in groups of two or three and are graded together as a team. Grading students together could lead to conflict within these teams if one member's performance is not up to par with the other team members.

Limitations

This DNP project measured students' overall level of PS when participating in SBEs. It examined PS by course and simulation type using Park and Kim's (2021b) Psychological Safety in High Fidelity Simulation tool. This tool was the first valid and reliable measure of PS in pre-licensure nursing simulation. At the time of completion of this project, no further studies had been published using the tool. Additionally, benchmarks describing PS scores in terms of high, medium, and low PS were unknown. Because the project used the tool with slightly modified terminology in simulations using high-fidelity patient simulators and standardized participants,

the validity and reliability of the project tool may be affected. Demographic data were not obtained in an effort to protect participant anonymity, which may limit generalizability of these findings to other nursing programs. Further research is warranted with diverse student populations, and simulation modalities are needed to establish benchmarks for high, medium, and low levels of PS.

Conclusion

The results of this project yielded valuable data for the simulation center. This project was the first of its kind at the simulation center to measure the PS level experienced by simulation participants objectively. The project revealed an overall baseline PS score for the simulation center and identified simulations and courses with lower levels of PS. The results of this project also supported Park and Kim's findings of higher levels of PS in senior-level students. The project's findings will be used to springboard quality improvement for PS in these courses and simulations, and this PS tool will be added to future evaluation surveys for the simulation center. The next steps include meeting with course faculty to further discuss PS in their courses and simulations and make changes to enhance PS scores. This project highlighted the need to examine grading and faculty training in SBE at this simulation center. Evaluation and feedback on student performance are necessary in simulation-based learning, but it also may place psychological pressure on participants. Summative assessments in simulation should be carefully designed using valid and reliable evaluation instruments and ensure interrater reliability training for all evaluating faculty (Oermann et al., 2015). Simulation faculty should support the PS of students by creating a supportive, respectful, confidential, non-threatening, and non-punitive learning environment.

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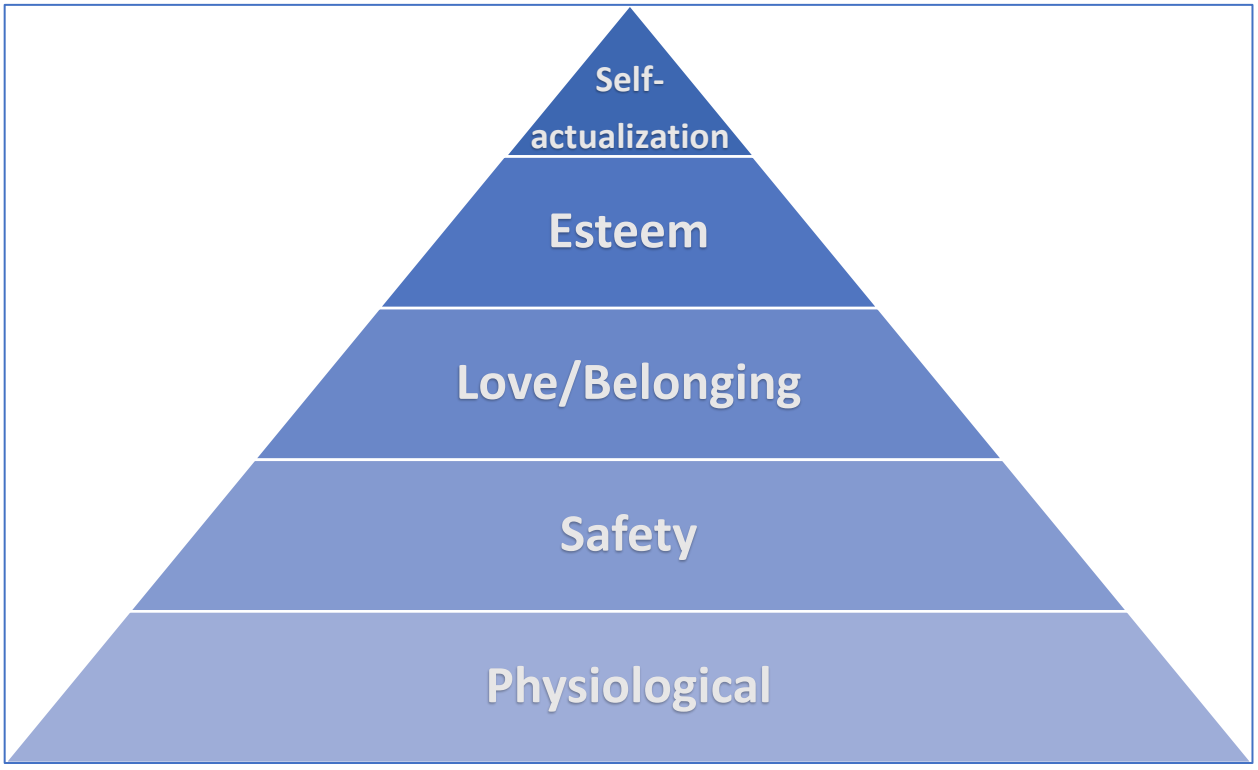
Figures

Figure 1



Note: Maslow's Hierarchy of Needs – This conceptual model portrays how foundational needs build upon each other to provide sufficient support for self-actualization.

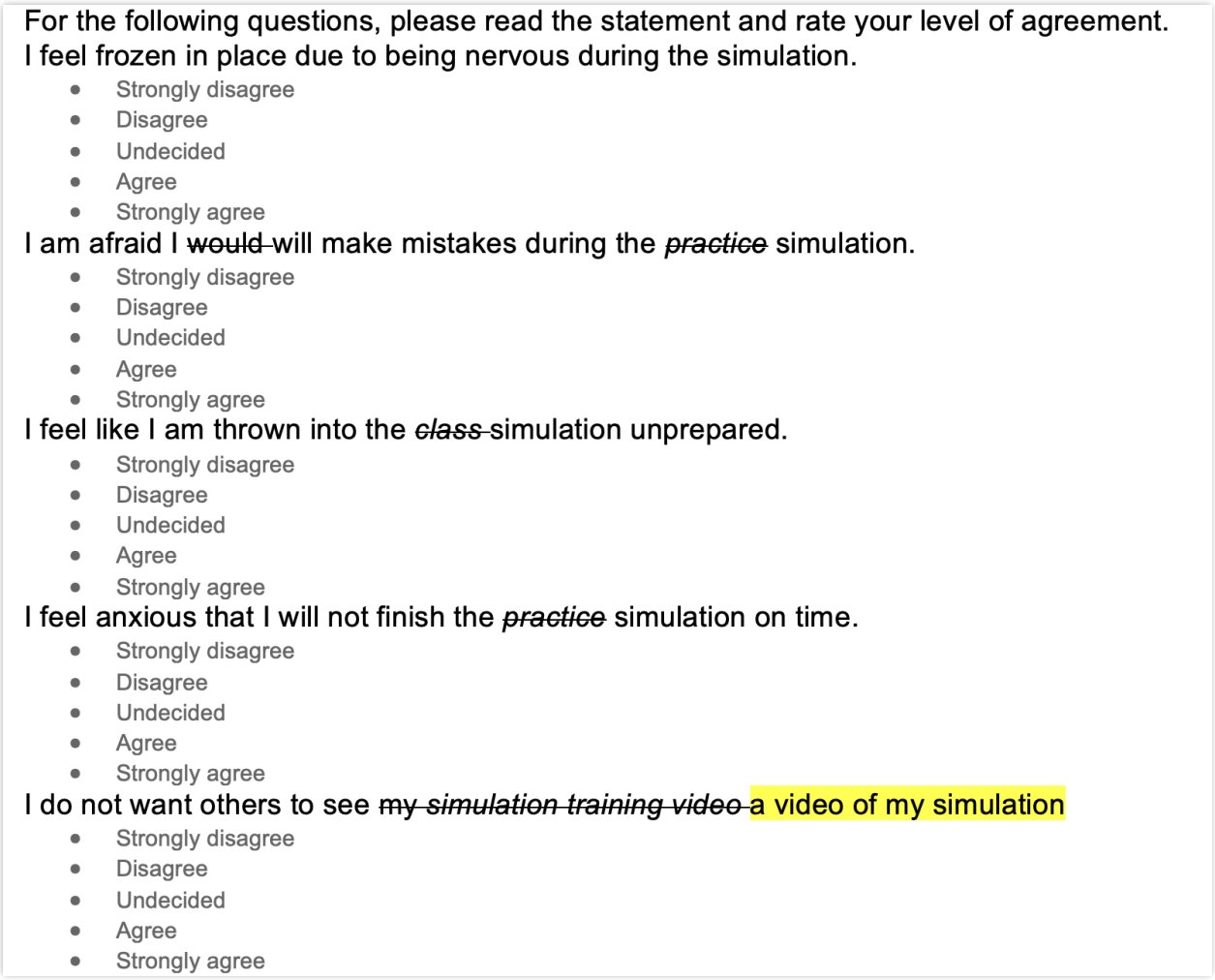
Figure 2

PS in High Fidelity Simulation for nursing students (Park & Kim, 2021b)

No.	Items	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	I feel frozen in place due to being nervous during the simulation.					
2	I am afraid I would make mistakes during the practice simulation.					
3	I feel like I am thrown into the class unprepared.					
4	I feel anxious that I will not finish the practice on time.					
5	I do not want others to see my simulation training video.					
6	I feel anxious that my peers see my nursing performance.					
7	I lose focus often due to the idea of being evaluated.					
8	I feel cornered when my peers evaluate me.					
9	I fear what the professor will say when (s)he gives me feedback on my performance.					
10	I feel worried that the professor will point out my mistake.					
11	I feel anxious that I will be criticized by the professor for my mistakes.					
12	My peers will not criticize me for my mistakes.					
13	I do not feel ashamed of showing my peers my mistakes.					
14	I feel worried that my peers will tell each other my mistakes after the simulation-based learning is over.					

Figure 3

Terminology Changes to Original Tool



For the following questions, please read the statement and rate your level of agreement.

I feel frozen in place due to being nervous during the simulation.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I am afraid I ~~would~~ will make mistakes during the ~~*practice*~~ simulation.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I feel like I am thrown into the ~~*class*~~ simulation unprepared.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I feel anxious that I will not finish the ~~*practice*~~ simulation on time.

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

I do not want others to see ~~my *simulation training video*~~ a video of my simulation

- Strongly disagree
- Disagree
- Undecided
- Agree
- Strongly agree

Figure 4

Psychological Safety Score by Course

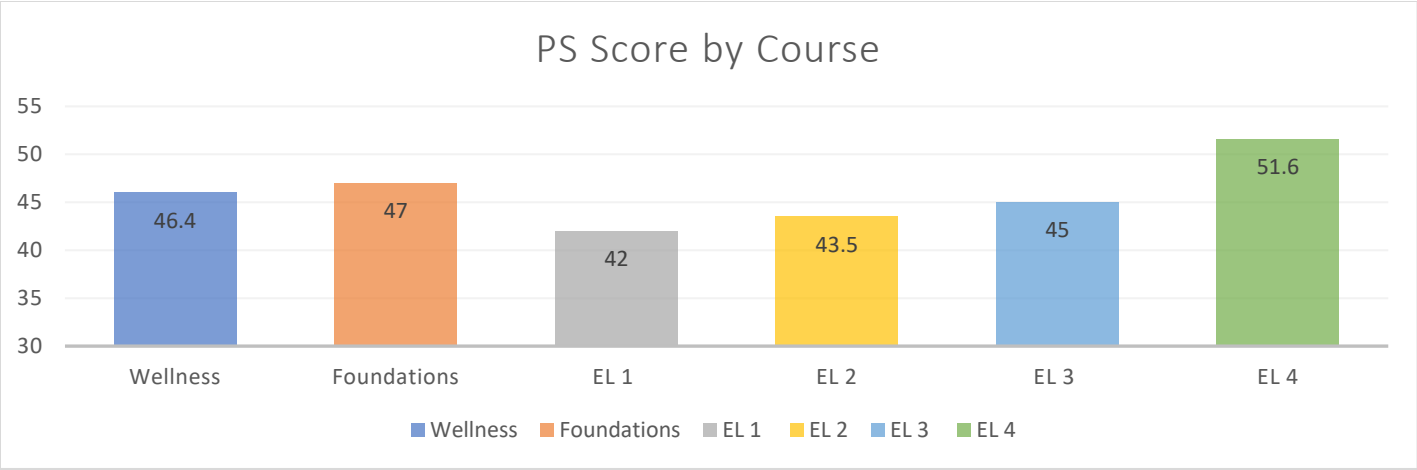


Figure 5

Psychological Safety Score by Simulation

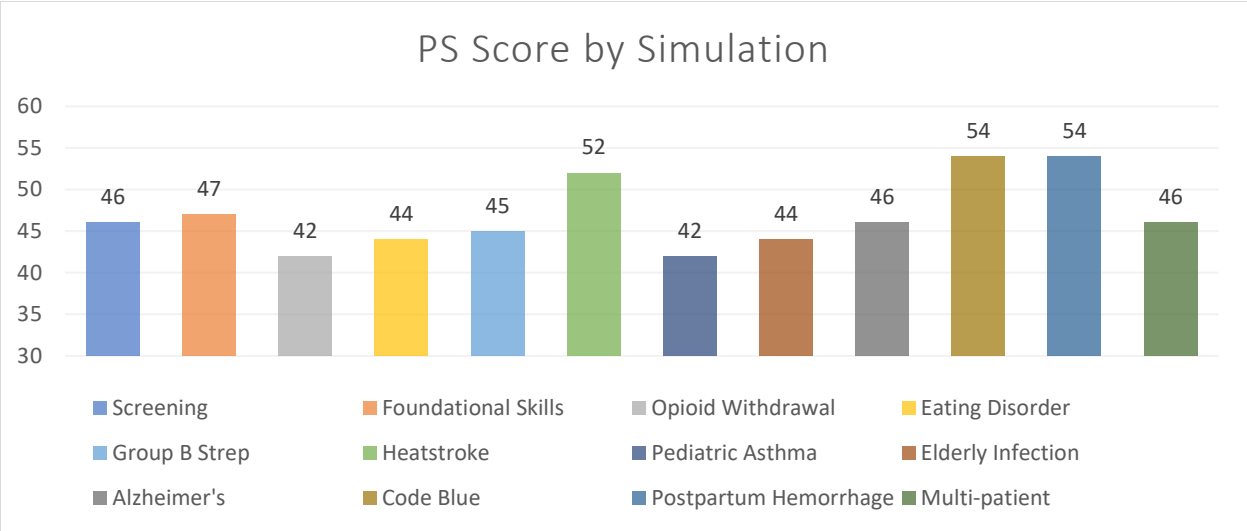
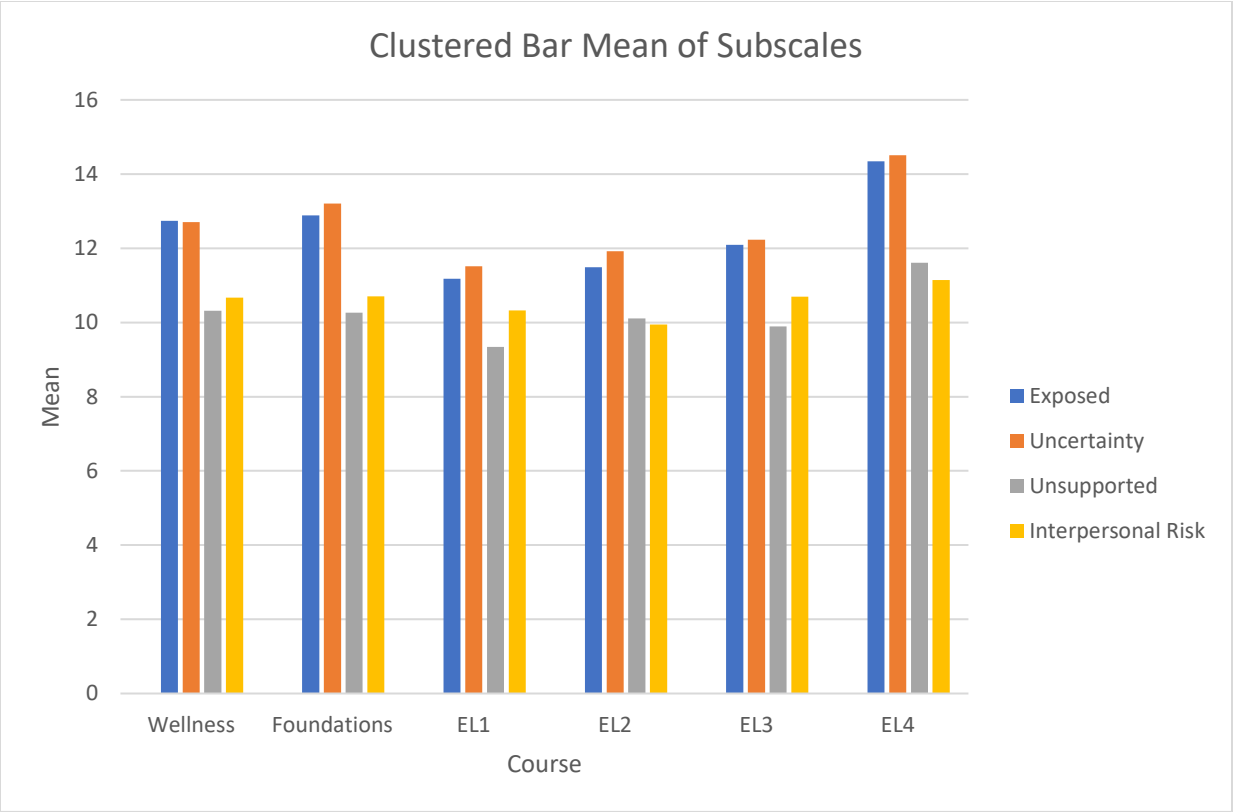


Figure 6

Clustered Bar Mean of Psychological Safety Subscales by Course



Tables

Table 1

Student Courses and Simulations by Grade Level

	Sophomore		Junior		Senior	
Course	Wellness, Health Assessment & Health Promotion	Foundations of Experiential Learning	Experiential Learning I	Experiential Learning II	Experiential Learning III	Experiential Learning IV
Simulation	Health screening tool simulation	Foundational skills simulation	Opiate-abuse simulation	Pediatric Asthma Simulation	Elderly patient with Alzheimer's simulation	Code blue simulation
			Eating disorder simulation	Heatstroke	Elderly patient with sepsis simulation	End of Life Simulation*
				OB Simulation		Postpartum hemorrhage simulation
						Multi-patient simulation

*End of Life Simulation not included in data collection

Table 2

Participant Characteristics by Course

Course	Course Description	*n*	%
Total Respondents		545	100
Wellness, Assessment & Health Promotion	Wellness and health promotion across the lifespan and development of comprehensive health assessment skills	163	29.9
Foundations of Experiential Learning	Application of the nursing process to promote the well-being of individuals across the lifespan	34	6.2
Experiential Learning I	Care of patients with acute and chronic physiological or cognitive health alterations	105	19.3
Experiential Learning II	Care of pediatric, maternal-child and medical-surgical patients	73	13.4
Experiential Learning III	Care of patients across diverse populations with chronic disease and aging adults	121	22.2
Experiential Learning IV	Care of complex patients with acute and chronic physiological and psychosocial health alterations	49	9

Table 3

Participant Characteristics by Simulation

Simulation	Modality	*n*	%
Total Respondents		545	100
Wellness Screening	SP	163	29.9
Foundational Skills	SP	34	6.2
EL1 Opioid Withdrawal	SP	54	9.9
EL1 Eating Disorder	SP	51	9.4
EL2 OB	SP	24	4.4
EL2 Heatstroke	HFPS	41	7.5
EL2 Pediatric Meningitis	SP/HFPS	9	1.7
EL3 Elderly Infection	SP/HFPS	73	13.4
EL3 Dementia	SP	47	8.6
EL4 Code Blue	HFPS	21	3.9
EL4 Postpartum Hemorrhage	SP/HFPS	13	2.4
EL4 Multi-patient	SP/HFPS	15	2.8

Note. SP = Standardized Participant; HFPS = High-fidelity patient simulator.
SP/HFPS = Utilized both standardized participants and high-fidelity patient simulators

Table 4

Survey Responses

	Strongly Agree		Agree		Undecided		Disagree		Strongly disagree	
Questions	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
1) I feel frozen in place due to being nervous during the simulation	33	6.1	135	24.8	68	12.5	220	40.4	89	16.3
2) I am afraid I would make mistakes during the simulation	102	18.7	271	49.7	44	8.1	91	16.7	37	6.8
3) I feel like I am thrown into the simulation unprepared	23	4.2	83	15.2	102	18.7	247	45.3	90	16.5
4) I feel anxious that I will not finish the simulation on time	43	7.9	184	33.8	54	9.9	193	35.4	71	13
5) I do not want others to see a video of my simulation	88	16.1	180	33	82	15	133	24.4	62	11.4
6) I feel anxious that my peers see my simulation performance	47	8.6	165	30.3	74	13.6	185	33.9	74	13.6
7) I lose focus often due to the idea of being evaluated.	56	10.3	182	33.4	77	14.1	175	32.1	55	10.1
8) I feel cornered when my peers evaluate me.	36	6.6	122	22.4	80	14.7	233	42.8	74	13.6
9) I fear what the professor will say when (s)he gives me feedback on my performance.	46	8.4	147	27.0	55	10.1	216	39.6	81	14.9
10) I feel worried that the professor will point out my mistake.	40	7.3	103	18.9	55	10.1	252	46.2	95	17.4
11) I feel anxious that I will be criticized by the professor for my mistakes.	52	9.5	114	20.9	39	7.2	250	45.9	90	16.5
12) My peers will not criticize me for my mistakes.	89	16.3	250	45.9	91	16.7	87	16	28	5.1
13) I do not feel ashamed of showing my peers my mistakes.	101	18.5	247	45.3	85	15.6	86	15.8	26	4.8
14) I feel worried that my peers will tell each other my mistakes after the simulation-based learning is over	30	5.5	117	21.5	72	13.2	223	40.9	103	18.9

Table 5

One-Way ANOVA for PS Scores by Course

PS Score	$F(5, 539) = 6.286$, $p < .001$, $\eta 2 = .06$	
	M	*SD*
Wellness	46.4	10.1
Foundations	47.0	11.7
EL1	42.3	9.6
EL2	43.5	10.6
EL3	44.9	11.1
EL4	51.6	10.4

Table 6

One-Way ANOVA for PS Scores by Simulation

PS Score	$F(11, 533) = 3.706$, $p < .001$, $\eta 2 = .07$	
	M	*SD*
Wellness Screening	46.4	10.1
Foundations Final	47.0	11.7
EL 1 Opioid Withdrawal	42.3	9.6
EL 1 Eating Disorder	43.5	10.6
EL 2 GBS	44.9	11.1
EL 2 Heatstroke	51.6	10.4
EL 2 Peds	42.4	10.0
EL 3 Elderly Infection	44.1	10.4
EL3 Alzheimer's	45.8	11.9
EL 4 Code	54.4	6.8
EL 4 Postpartum Hemorrhage	53.6	10.4
EL 4 Multi-patient Simulation	45.9	12.8