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Featured Article

Simulation Anxiety across the Curriculum

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KEYWORDS
anxiety;
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simulation performance

Abstract

Background: Undergraduate nursing students experience anxiety during simulation. Excessive anxiety can impair learning and performance.

Method: Nursing students ($N = 96$) from first and final semesters of a program participated in an exploratory, sequential, mixed-methods study to identify and rank anxiety sources from simulation components occurring in preparation, prebrief, implementation, and debriefing.

Results: Participants experienced high normal levels of anxiety that did not change across the curriculum. Having the title or role of primary nurse caused the highest level of anxiety, followed by concern about making a mistake.

Conclusion: Results provide understanding of sources of anxiety during simulation and support use of the INACSL Standards of Best Practice: Simulation[SM] (2016). Recommendations to mitigate anxiety are identified, which may lead to enhanced learning in this setting.

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Background

Reports of stress and anxiety among undergraduate nursing students in clinical learning environments date back to the 1970s (Moscaritolo, 2009). Although stress and anxiety are sometimes used interchangeably, there is a difference in the two experiences. Stress results from a perceived external pressure (Lazarus & Folkman, 1984). Anxiety is a subjective feeling of uneasiness or fear regarding an undefined future threat (Spielberger, 1979) and occurs from an internal or cognitive pressure (Beck, Emery, & Greenberg, 1985; Lazarus & Folkman, 1984). Anxiety is closely linked to memory and learning (Al-Ghareeb, Cooper, & McKenna, 2017) and can lead to cognitive interference from negative self-talk that negatively impacts learning and problem-solving abilities (Sarason, 1988). Learners may have adequate ability, but poor performance and information recall due to their anxiety level (Harvey, Bandiera, Nathens, & LeBlanc, 2012).

Simulation has become widely integrated into educational settings over the past two decades (Al-Ghareeb & Cooper, 2016; Motolo, Devine, Chung, Sullivan, & Issenberg, 2013) as a learning modality that can help develop essential competencies. Built around a patient scenario, the purpose of simulation is to provide an experiential learning experience resembling authentic clinical situations (INACSL Standards

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Committee[SM], 2016). The experience typically requires a student to recognize a clinical event, make clinical judgments, intervene, and evaluate patient outcomes while concurrently being evaluated on their performance.

Sources of simulation anxiety previously identified include being observed, role, preparation, experience, making mistakes, receiving feedback, use of video, and psychological safety (Burbach, et al., 2016; Cato, 2013; Ganley & Linnard-Palmer, 2012; Gantt, 2013; Lasater, 2007; Najjar, Lyman, & Miehl, 2015; Nielsen & Harder, 2013). A major potential outcome of excessive simulation anxiety may be decreased learning and performance, (Beischel, 2013; Schlairet, Schlairet, Sauls, & Bellflowers, 2015), a special concern if simulation evaluation is summative.

Key points

- The amount of simulation anxiety is unchanged between first and final semester students.
- The title and role of primary nurse and concern about making a mistake cause the highest anxiety.
- Implementation of INACSL standards may help mitigate anxiety.

It is unknown if the sources or experiences of anxiety during simulation are the same throughout a program of study (Shearer, 2016). To better understand the complexity of anxiety experienced by nursing students during simulation learning environments, the purpose of this exploratory, sequential, mixed-methods study was to explore perceived anxiety sources in nursing students and to ascertain if the sources and level of anxiety in simulation remain the same across the curriculum. This study addresses two research questions: 1) Does the amount of student anxiety associated with simulation change from the first to final semester of a nursing program? and 2) Do the causes of anxiety differ for students in the first semester of the program compared to final semester students within a nursing program? Identifying specific sources of student anxiety at different points in a nursing program presents opportunities for nursing faculty to develop simulation experiences and strategies to mitigate anxiety to maximize learning.

Theoretical Framework

Cognitive Interference Theory (CIT) is the major theoretical framework for this study and helps explain how anxiety can affect learning and performance in simulation experiences. Sarason, Pierce, and Sarason (1996) developed the CIT to explain the association between evaluative anxiety and reduced cognitive performance. Evaluation is an integral feature of simulation, critical for assessment of performance and feedback.

CIT describes how negative self-talk interferes with performance by distracting an individual from completing an expected task. Based on the ''Working Memory'' work of Baddeley (1992), the theory proposes that a central executive function of memory acts as an attention-controlling system that processes demanding tasks. Furthermore, the theory proposes that when faced with evaluation or possible failure, a person may become anxious with accompanying negative self-statements (Northern, 2010). Working memory is depleted as mental resources are used to process relevant versus irrelevant thoughts that apply to the situation. This results in less processing available to deal with completion of simulation tasks and increasing anxiety (Sarason, et al., 1996).

Materials and Methods

Simulation was used as a formative learning strategy in the study population. Evaluation included ''satisfactory'' or ''needs improvement'' designations for student performance. Simulation facilitators were trained and evaluated for competency by certified simulation faculty. Simulations were developed and administered in alignment with the INACSL (2016) standards, which includes strategies to mitigate simulation anxiety.

Sample

A convenience, purposive sample of Baccalaureate nursing students, aged 18 years and older, enrolled in either the first ($N = 100$) or final ($N = 175$) semester of a Midwest university nursing program were recruited to participate. First semester students had completed a minimum of four semesters of undergraduate education and were in the first of four semesters needed to complete the program; final semester students were due to graduate from the nursing program at the completion of the semester. All participants had completed simulation experiences as designated by course curricula, including preparation and debriefing activities.

Simulation activities are used as 13% of overall program clinical hours, with required student participation. After completing an assigned preparation activity, students arrive at the simulation center where role assignments are randomly assigned. Roles typically include a primary and secondary nurse, a recorder, a family member, and observers. Medium- or high-fidelity mannequins are used for all simulations in these two semesters. Trained faculty facilitate simulation. Before implementation of this study, institutional review board approval was obtained at an exempt level.

Design and Instrumentation

An exploratory, sequential, mixed-methods design was used to explore sources of anxiety throughout a nursing program. Both qualitative and quantitative data were

obtained (Morse & Niehaus, 2009) in two phases to understand sources of anxiety. Phase 1 consisted of focus group discussions, facilitated by a research assistant, asking participants about a memorable simulation experiences and causes of anxiety related to simulation. Based on the literature review and qualitative data results, phase 2 included the development and administration of the Elements of Simulation Survey Tool (ESST) to assess sources of anxiety, demographic survey for participant characteristics, and the Westside Simulation Anxiety Scale (WSAS) to assess the amount or severity of anxiety the participants experienced during a simulation. Data were compared for the two participant pools as well as aggregated into an overall measure of anxiety sources. For the second phase of the study, it was determined that to achieve power of 0.80 and a medium effect size, a sample size of 90 participants was required (Faul, Erdfelder, Buchner, & Lang, 2009).

Demographic Survey

Demographic data from this study included semester in nursing program, race, gender, amount and type of health care experience, and age.

Westside Simulation Anxiety Scale

The WSAS quantified the amount of anxiety experienced during simulation experiences (Driscoll, 2007). Initially developed for cognitive examinations, permission to modify the WSAS to reflect reactions to simulation by substituting the word ''test'' with ''simulation'' was granted by the developer (R. Driscoll, email correspondence, April 9, 2014). The WSAS is a ten-item scale with a five-item Likert scale focusing on performance and cognition impairment related to anxiety rather than somatic symptoms. Items on the WSAS included, ''During important simulations, I think that I am doing awful or that I may fail'' and ''I lose focus in important simulations, and I cannot remember material that I knew before the simulation.'' The ranked score from each item was summed and averaged to reflect an overall anxiety score. Anxiety scores could range from 1.0 (low anxiety) to 5.0 (Extremely high anxiety) (Driscoll). Validation studies for the WSAS were conducted using college-age and elementary-age subjects with an average correlation of $r = 0.44$ (Driscoll, 2007). The Westside scale has previously been reviewed for nursing students (Evans, Ramsey, & Driscoll, 2010; Shapiro, 2014).

Elements of Simulation Survey Tool

The ESST was developed for this study through integration of sources of anxiety identified from the focus group content analysis and review of the literature. A pilot of the developed tool was conducted with student volunteers ($n = 8$) from the second semester of the program to validate functionality and clarity (Johnson & Christensen, 2012). The completed tool consisted of 24 items prompting participants to rank the amount of anxiety associated with each item on a five-point Likert scale, 1 = no anxiety to 5 = extreme anxiety. The survey included a free text box that provided participants an opportunity to describe sources of simulation-related anxiety that were not listed on the tool. Reliability and validity for the ESST items came from the literature review, focus group data, and piloting of the tool.

Data Analysis

Qualitative data were analyzed with directed content analysis methods (Hsieh-Fang & Shannon, 2005). Text obtained from the focus group responses was coded to capture key thoughts, which were then sorted into themes demonstrating student experiences of anxiety that either added to or supported existing literature. Quantitative data from the survey responses were downloaded into MS Excel and SPSS v 22 for analysis. Data were described with mean (M), standard deviation (SD), and percentages. Independent t-tests were used to compare the sources and amount of anxiety between participants in the first and final semesters in their program of study.

Results

Phase 1: Focus Groups

The focus groups' participant ($N = 23$) characteristics included 73.9% female and 26.1% male participants. All participants had participated in six formative, small group simulation experiences in their respective semesters. Focus group participants readily shared examples of anxiety-causing events related to simulation. Four themes of simulation anxiety arose from the focus groups: being observed, performance expectations, knowing what to do, and student role. These themes align with anxiety-provoking experiences identified previously in the literature. Anxiety sources related to being observed included having the instructor in the room, being watched, and feeling like they were being judged. Not knowing what was expected and uncertainty about how to prepare were sources related to knowing what to do and performance during simulation. Being assigned to a primary nurse role and not feeling adequately prepared caused feelings of anxiety in both groups. Appendix A identifies causes of anxiety grouped by theme.

Being assigned the title of primary nurse was not previously found in the literature and was identified by students as a separate source of anxiety than being assigned the role of primary nurse. This delineation was added to the ESST survey used for the second phase of the study. Additional survey items of recognizing changes in patient condition, recognizing significance of diagnostic/laboratory results, and ''knowing what to do'' were also added based on focus group data.

Phase 2: Surveys

Most participants ($N = 96$) in phase 2 of the study self-identified their race as "white" (97.9%) and gender as female (100%). A mean age of 24.3 (SD = 7.22) years was reported, and 79.2% reported some amount of health care experience. Ninety-six completed surveys were analyzed for phase 2 of the study: first semester students (n = 58) and final semester students (n = 38). Sixteen surveys were removed from analysis because of incomplete data. The mean score on the WSAS was 2.98 ($N = 96$; SD = 0.81) for both groups combined, which correlates to a high normal overall level of anxiety (Driscoll, 2007). Comparison of the two cohorts did not show significance in the overall level of simulation anxiety (first semester M = 2.99, SD = 0.86; final semester M = 2.91, SD = 0.71; $p = .655$) and demonstrates that both groups experienced high-normal levels of anxiety at both time points in the program. Cronbach's alpha for this survey tool was 0.907 in this study.

The 24-item ESST identified potential sources of anxiety for students during simulation learning experiences. Participants ranked the level of anxiety for each item on a scale from 1 = no anxiety to 5 = extreme anxiety. An overall mean of anxiety was not computed for this scale as each factor stands alone as a potential cause of anxiety. The items were subsequently ranked highest anxiety item to lowest by the groups combined and then by the mean of each individual cohort group. Appendix B identifies ranked order of anxiety.

Being the primary nurse by title (M = 4.05, SD = 0.960) or actual role (M = 4.02, SD = 0.798) was ranked as the highest anxiety items overall, followed by the possibility of making a mistake (M = 3.82, SD = 1.053). Items that ranked in the midlevel of causing anxiety had mean scores of 3.58 to 3.10 and included being observed, video and timing issues, receiving feedback, performing skills, and recognizing priority assessment data. Items ranked as causing lower amounts of anxiety (M = 2.80-1.29) included knowledge of the scenario, preparation, debriefing factors, and fidelity issues.

Five items, presence of cameras ($p = .024$), observer role ($p = .001$), performing skills during scenario ($p = .001$), possibility of making a mistake ($p = .012$), and observing other students ($p = .002$) showed significant difference between the two cohorts, generating more anxiety for first semester participants than for final semester participants. When given the opportunity to identify how helpful simulation is in preparing to become a professional nurse on a scale of 0 being not at all helpful to 10 being very helpful, the mean value for the two cohorts was 7.98 (SD = 2.05, $p = .19$), suggesting that the learning strategy is perceived as helpful despite any anxiety generated by the process.

The free text comments for sources of anxiety added descriptive data to the study. Comments included not being sure of what to do ("When you are not sure of the next step, but you know you should"), interactions with fellow students ("… If they start to make things more difficult for me during simulation when they are supposed to be helping i [sic] dont [sic] really know how to respond"), making mistakes ("I get upset with myself if I make a mistake and I catch it in the middle of the simulation"), forgetting something ("… just making sure i [sic] dont [sic] forget something that would cause harm to patients …"), and actions of the observers ("observers talking and laughing").

Discussion

The purpose of this exploratory, sequential, mixed-methods study was to explore perceived anxiety sources in nursing students related to simulation and to ascertain if the causes and level of anxiety remain the same in the first and final semesters of their program. Identifying specific sources of student anxiety at different points in a nursing program presents opportunities for nursing faculty to develop simulation experiences and strategies to mitigate anxiety to maximize learning. Several sources of anxiety appear in the literature (Beischel, 2013; Cato, 2013; Gore, Hunt, Parker, & Raines, 2011; Harder, Ross, & Paul, 2013; Lasater, 2007; Megel, et al., 2012; Moscaritolo, 2009). The results of this study add to the simulation knowledge base by identifying additional sources and amounts of simulation-related anxiety at differing time points in nursing curriculum. A focus on the top three sources of anxiety identified in this study is discussed.

Title and role of primary nurse and the possibility of making a mistake rank at the extremely high anxiety level for both participant groups. These findings support comments from the focus groups that included, "As soon as you hear that you are the primary nurse your anxiety jumps sky high," and "Just being called the primary nurse makes me want to cry on the spot." Despite having other students assigned in a secondary nurse role to assist students in the primary nurse role, final semester students identified feelings of "being thrown under the bus as you are all alone," and "you feel like you have to do everything" when functioning in the primary nurse role. It is noted that just being assigned the title of primary nurse was ranked as the number one cause of anxiety overall, with the role of secondary nurse ranked at number 11 and role of observer ranked at number 24 overall for all participants.

The high anxiety experienced in the role of primary nurse validates the results reported by Lasater (2007), where participants noted that while learning in the debriefing period of simulation does occur, more learning occurred when the student was not functioning in the primary nurse role, and that students did not like performing as the primary nurse. Similarly, Ullom, Hayes, Fluharty, and Hacker (2014) reported that students were reluctant to

play the role of the nurse and that poor performance was attributed to performance anxiety rather than a lack of understanding for the scenario concepts. Given that the "possibility of making a mistake" ranked as the third highest item overall, it was somewhat surprising that a knowledge level of the simulation focus ranked 18 overall (M = 2.8, SD = 0.97) and preparing for simulation ranked as item 21 (M = 2.29, SD = 1.11). It could be that completion of a preparation activity helps students feel prepared but does not address the possibility of being unable to prevent mistakes in the fluid environment of simulation.

Components of simulation align with the features of Sarason's CIT (1996). Not knowing what their assigned role may be, a student may arrive at the designated simulation activity worried about the potential for being observed while performing timed tasks (anticipatory worry of evaluation). This alone may cause negative self-talk which the central executive function must process. More mental distraction from irrelevant thoughts may arise from additional stressors of receiving a role assignment that assures the need to be evaluated in front of observers (primary nurse role). These thoughts may result in less working memory available to deal with simulation tasks and the student may perform poorly in the scenario or debriefing although performance without the associated anxiety may have been adequate to complete the tasks (such as in practice sessions). Indeed, decreased performance has been shown to be evident when additional stressors were added to a clinical site orientation (Cheung & Au, 2011) and to trauma simulations (Harvey et al., 2012).

Additional studies continue to show the impact fear of the unknown, making mistakes, and knowledge gaps play in generating anxiety in students (Shearer, 2016) and that anxiety in simulation can impair learning and application of knowledge (Nielsen & Harder, 2013). Debriefing during simulation often includes discussion of errors with video evidence of errors. This dual trigger may exacerbate the anxiety associated with the simulation experience. Students may feel uncertain about performing skills, adding to anticipatory anxiety associated with potentially making a mistake. More time in the educational process did little to reduce the concern over the possibility of making a mistake, indicating that students did not reach a state of comfort with performance expectations. Information gleaned from focus groups imply that first semester student concerns center on "doing" functions of being a nurse while final semester students are concerned with the "thinking" associated with being a nurse. Recommendations follow describing how faculty may positively impact student anxiety in simulation.

Recommendations

Simulation is a common learning strategy in nursing that also creates anxiety in students. This anxiety can lead to cognitive interference that can then inhibit learning. Based on the top anxiety sources identified in this study, recommendations to lessen simulation anxiety include the following:

Student Role

- Base expectations on simulation objectives and not outside of student abilities (Ex: physician) (Harder et al., 2013);
- Verify students understand faculty and student roles;
- Limit the number of observers;
- Allow private review of simulation video for personal reflection (Cato, 2013);
- Consider discussion of anticipated plan of care as part of prebriefing;
- Create an expectation of positive peer support and engagement (Cato, 2013);
- Remediate in private.

Fear of Making a Mistake

- Provide faculty training for facilitation skills and delivery of timely, meaningful feedback (INACSL, 2016; Lasater, 2007);
- Focus feedback on preventing future errors;
- Allow practice of expected skills, including a "practice simulation" (Cato, 2013);
- Create a safe learning environment (Turner & Harder, 2018);
- Include a clinical reasoning aspect in simulation preparation to allow reflection on possible unknown client situations;
- Link simulation objectives to theory concepts and clinical activities;
- Have observers in separate area of scenario performance;
- Support performance expectations and establish trusting relationships (Janzen, et al., 2016; Page-Cutrara, 2015).

Several of the aforementioned recommendations to decrease anxiety would require little in resource allocation beyond faculty training. It is unlikely, and undesirable, to structure a learning environment devoid of all anxiety. It is desirable, though, to engage in deliberate planning in the structure of simulation to address the sources of student anxiety. Having measures in place to control obvious sources of anxiety can improve opportunities to assess outcomes without the limitations associated with excessive anxiety.

Limitations

The use of a convenience, purposive sample may not represent the general population of nursing students and limits the ability to generalize to students in other nursing education programs. Participants self-selected to complete

the study, creating a potential personal bias for choosing to participate based on the topic. Including students in the beginning and end of their educational program may have missed any variations that could occur in the middle of the educational process.

Additional Research

Owing to the ongoing level of anxiety that occurs from simulation activities, specific interventions could be explored for effectiveness at various stages of the educational process to determine if decreasing anxiety earlier in an educational program leads to a subsequent decreased anxiety level in more complex simulation and practice settings. If managing anxiety creates less cognitive interference, it may be that improved problem solving will also occur. Neither the overall level of anxiety nor the primary sources of anxiety identified by participants in this study changed over time in the educational program. These findings contradict previous research reporting that simulation anxiety decreases with ongoing practice (Rossignol, 2017; Walton, Chute, & Ball, 2011). There are also contradictory reports of the impact of anxiety on performance, with reports showing anxiety may inhibit, improve, or not change performance (Al-Ghareeb, et al., 2017). The simulation setting is ideal to explore variables related to anxiety that cannot be controlled in the practice setting to better explore these contradictions. Specific research topics might include the following:

- Identifying the amount of anxiety that fosters learning without becoming overwhelming can direct the amount of complexity to include in simulation scenarios.
- Identifying interventions that help student better manage anxiety during simulation.
- Explore when anxiety occurs and the impact on learning.
- Explore if anxiety sources in simulation are similar to sources in practice settings.

Conclusion

Poor performance in simulation may be caused by inadequate knowledge, poor preparation, or performance impacted by anxiety. This study and analysis adds increased understanding of the sources and amount of anxiety experienced in simulation at two time points in the curriculum. An understanding of cognitive interferences offers a potential explanation for how anxiety impacts learning and performance. Specific recommendations describe actions that may mitigate student anxiety. Simulation is a resource-intensive learning modality that requires significant space, faculty time, and equipment. As faculty and programs have increasing accountability from accrediting bodies and regulatory boards for the outcomes and efficacy of this modality, it becomes more imperative that best practices be developed to maximize this educational strategy. This mixed-methods study provides insight on perceived levels and sources of anxiety experienced by students and encourages additional research on interventions to mitigate student anxiety.

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Appendix A Causes of Anxiety Related to Simulation

Anxiety Theme	Examples Given by Focus Group Participants	Semester of Participant	
		First	Final
Being observed	"Especially having the instructor in the same room was stressful"	X	
	"Everybody was watching"	X	
	"I like not having the teacher in the room"		X
	"I feel like everyone is judging me"		X
	"Having [observers] in the room was stressful"		X
Performance expectations	"I didn't know what to do"	X	
	"The first group was just 'thrown under the bus'—the second group felt like they knew what was coming."	X	
	"I hadn't had this experience before, it was brand new so there was a fear of the unknown"	X	
	"I know how to study for a test, but for simulation, what do I do?"	X	
	"We don't know how to prioritize as a first year student."		X
	"It was "overwhelming." I wanted to have a box of Xanax waiting for us in the first semester."		X
	"I am worried that if you make a mistake you will get a bad grade."		X
	"More complex cases are stressful—you keep thinking maybe he will crash."		X
Knowing what to do	"I need to know better how to execute simulation"	X	
	"We had learned how to take VS, assess pain, and assess tissue integrity but not how to put it all together"	X	
	"We only had a one-minute orientation to the laboratory this time and that was very stressful"		X
	"We need to have a lot of prep this year because there is higher stakes with the order of things."		X
Student role	When we draw sticks for a role we have to be more prepared but it also creates more anxiety."	X	
	"We rotated roles so I couldn't relax until I knew what was coming."	X	
	"Drawing sticks for a role is still stressful."		X
	"The titles are really stressful having a 'primary nurse' and 'secondary nurse' is hard. When you are the primary nurse you feel like … as you are all alone, and you feel like you have to do everything."		X

Appendix B Rank Order of Anxiety Sources by Cohort

Sources of Anxiety	Overall Rank ($N = 96$)	M	First-Year Rank (n = 58)	Second-Year Rank (n = 38)
Assigned title of primary nurse	1	4.05	2	2
Role in simulation: primary nurse	2	4.02	3	1
Possibility of making a mistake	3	3.82	1	4 (tied)
Being observed by faculty	4	3.58	6	4 (tied)
Knowing what to do	5	3.54	8 (tied)	3
Cameras present or being recorded	6 (tied)	3.51	4	9 (tied)
Being observed by peers	6 (tied)	3.51	8 (tied)	4 (tied)
Performing in front of others	8	3.50	7	7
Unfamiliar clinical situation	9	3.48	5	8
Being timed during simulation	10	3.22	8 (tied)	17
Role in simulation: secondary nurse	11	3.18	13 (tied)	11 (tied)
Receiving feedback from faculty in front of peers	12	3.16	12	13 (tied)
Performing skills during scenario	13 (tied)	3.15	13 (tied)	13 (tied)
Prioritizing nursing actions	13 (tied)	3.15	13 (tied)	13 (tied)
Receiving feedback from peers in front of others	15	3.14	11	16
Ability to recognize changes in patient condition	16	3.10	16	9 (tied)
Recognizing significance of diagnostic/laboratory results	17	3.05	17	11 (tied)
Knowledge level of simulation focus	18	2.80	18	19
Administering medications in timely manner	19	2.79	19	18
Determining what is real and what is simulated	20	2.67	20	20
Preparing for simulation	21	2.29	21	21
Simulation debriefing	22	2.10	22	22
Observing other students' performances	23	1.55	23	23
Role in simulation: observer	24	1.29	24	24