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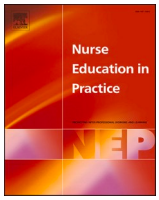

Health professional students' self-reported emotions during simulation-based education: An interpretive descriptive study

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ABSTRACT

Aim: This study aimed to explore active students' experiences of emotions during simulation-based education (SBE) sequences when a simulation was performed as a part of formal curriculum in natural educational settings and to consider the practical educational implications of the findings.
Background: An SBE approach is used widely in nursing education. Emotions are necessary for learning to take place and some of these can prevent or promote learning. This is an active and affective learning activity that can trigger various emotions. Previous research in SBE has studied student anxiety, which has been frequently measured quantitatively. An understanding of students' emotions can give valuable insight into the learning process and improve nursing educational practice.
Methods: The study took place in four Norwegian universities. It was guided by interpretive descriptions, which involve qualitative methodology. This study was approved by the Norwegian Centre for Research Data (No: 59059). Data were collected using an interpersonal process interview with eight healthcare professional students after participating in SBE.
Results: The results show that students experienced coexisting and changing emotions during the shifting academic scenes in the simulations. During briefing, scenario and debriefing, students experienced being activated and had coexisting pleasant and unpleasant emotions. Unpleasant emotions were found to decrease during the simulation. Numerous identified emotions were found to be valuable for learning.
Conclusion: The insight into students' experience of arousal, negative emotions and the potential for SBE to trigger students' comprehensive academic emotions have implications for nurse educators when planning and facilitating simulations.

1. Introduction

Simulation-based education (SBE) is a complex learning method widely used in healthcare education (Cant and Cooper, 2017). Students actively participate in artificially created scenarios in a simulation laboratory or situated in practice, using real equipment to practise solving difficult real-world problems in a safe environment (Adamson and Rodgers, 2016). SBE builds on cognitive, social constructivist and experiential learning theories, which assume that students learn when they perceive, think, interact, collaborate, reflect and construct the meaning of the simulated experience and normally call for the inclusion of complex learning tasks and reflection. SBE usually follows three main sequences: briefing, setting a scenario and then debriefing (Jeffries, 2020). The simulation is normally led by a facilitator who prepares students for SBE by establishing a safe learning environment, maintaining the progress of the scenario and asking reflective questions during debriefing (Jeffries, 2020). Nursing students participating in SBE are expected to plan, act, solve problems, make decisions, reflect on their actions and answer follow-up questions. Successful experiential learning activities are based on students' deep emotional, cognitive and physical involvement and such involvement appears to play a central role in positively contributing to learning outcomes (Finch et al., 2015; Taylor, 2014). Experiential learning situations are particularly suitable for stimulating emotions (Finch et al., 2015) because of students' social interactions and bodily engagement. In addition, SBE is found to engage students' emotions (Al-Ghareeb and Cooper, 2016).

Emotion theories remain a topic of debate; however, researchers agree that emotions are phenomena that involve psychological

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processes, are based on past experiences and reactions to current experiences, are shaped by evolution and social context and are expressed in various ways (e.g. physiological reactions and subjective feelings through language) (Shuman & Scherer, 2014). Emotions are a part of a cementing and driving force for learning (Illeris, 2018; Tyng et al., 2017). Numerous neuroscience and pedagogical studies have reported that emotions influence learning by having a impact on the motivation to learn, perceptions, attention and memory, as well as by influencing reasoning, understanding, decision-making, problem-solving and the ability to collaborate and form self-concepts as a learner (Immordino-Yang, 2015; LeBlanc et al., 2015; Pekrun and Linnenbrink-Garcia, 2014; Tyng et al., 2017).

Emotions are rarely stable during complex learning activities. Because emotions occur in social interactions and are individual experiences in various academic settings students can experience pleasant and unpleasant, activating and deactivating emotions to an equal extent during learning activities (Pekrun and Linnenbrink-Garcia, 2014). Emotions can be structured in a circumplex model where they are categorized as two-dimensional axes of activity and valence. This model shows that emotions can range from being highly activating (e.g. anxiety) to weakly activating (e.g. boredom), according to valence spanning from unpleasant (e.g. sad) to pleasant (e.g. excited)(Russell & Hogan, 1980).

Pekrun and Linnenbrink-Garcia (2014) explained how valence and arousal together can inform the impact of emotions on learning. Pleasant activating emotions can have an impact on nursing students' learning through eliciting enjoyment, interest and motivation and rewarding their efforts in gaining knowledge and understanding. Pleasant deactivating emotions can lead to reduced learning efforts (Fredrickson, 2001; Pekrun et al., 2014). On the other hand, unpleasant but highly activating emotions can motivate students' learning and enable directing attention into the learning task, while unpleasant weakly arousing emotions, such as boredom, are found to reduce the cognitive resources that are available to solve learning tasks (Zeidner, 2014). Limited attention has been paid to the role of emotions in educational settings, except for anxiety, which is explored frequently. Anxiety, which is defined as a temporary reaction to a stressful situation, is often studied as a stable emotion during a task and is characterized by subjective feelings of tension, worry and nervousness (Zeidner, 2014). Anxiety can affect multiple parts of the learning process, disturbing information encoding, organization, storage and retrieval (Zeidner, 2014). However, positive emotions in an academic setting enable students to become more creative and flexible (Pekrun et al., 2002).

SBE research highlights nursing and medical students' experience of stress and anxiety and is mainly concerned with how negative, stable emotions of stress and anxiety influence learning (Cato, 2013; Demaria et al., 2016; Fraser, 2018; Groot et al., 2020; Yockey and Henry, 2019). A review identified nursing studentens as reporting moderate to high stress related to SBE (Cantrell et al., 2017), but they also rated SBE as a valuable learning method. Being assigned a leading role in SBE is demanding and associated with a high level of anxiety. Anxiety and stress increase when nursing students experience SBE as an unknown and unfamiliar situation, experience a lack of competence, fear critique from peers and faculty and have anxiety about making mistakes or harming simulated patients (Shearer, 2016). However, findings on how stress and anxiety affect learning in SBE have been inconsistent (Al-Ghareeb et al., 2017). Demaria et al. (2016) used a cardiopulmonary arrest situation that was specifically created to stress medical students and the increased stress was found to improve student performance. Al-Ghareeb et al. (2016) found that a low level of anxiety led to optimal health professional students' performance. Recent studies have reported that stress can convert SBE into a positive and motivating experience (Groot et al., 2020).

Others have reported that the emotions nursing students have experienced in SBE include enjoyment, nervousness, excitement and relief (Holt, 2017; Najjar et al., 2015). Evidence regarding emotions experienced during specific parts of SBE is fragmentary, however; Walton et al. (2011) found that nursing students felt anxious when entering the simulation. After the simulation, the students expressed being disappointed, devastated and fearful. Keskitalo and Ruokamo (2021) found that positive emotions were triggered before and that negative emotions decreased during SBE among medical students.

The number of studies reporting on emotions experienced during the different SBE sequences (briefing, scenario-setting and debriefing) is limited. Anxiety is a widely studied emotion in SBE research and is mostly evaluated using quantitative methods. Considering that emotions are rarely stable during academic tasks and that different emotions have an impact on learning in various ways, it becomes necessary to explore students' experience of emotions during SBE.

For nurse educators to create and manage pedagogical SBE activities an understanding of learning in SBE should include knowledge regarding the students' emotional experiences. There has been a call for more studies of emotions in experiential learning (LeBlanc et al., 2015). Gaining insight into students' emotions in SBE can guide nurse educators in managing students' emotions and optimize SBE as a learning situation.

This study aimed to explore active students' experiences of emotions during simulation-based education (SBE) sequences when a simulation was performed as a part of formal curriculum in natural educational settings and to consider the practical educational implications of the findings.

2. Methods

2.1. Study design

The study was guided by interpretive description (ID), as described by Thorne (2016). ID is a qualitative and inductive methodological approach inspired by phenomenology, ethnography and grounded theory, which is suitable for exploring educational experiences in relation to the context of the practical field (Thompson et al., 2021). Studies using ID aims to explore applied practice and gain insight into practical fields by challenging existing knowledge to develop applicable knowledge (Thorne, 2016). ID strategies recommend that methods should adapt to the specific research task instead of following rigorous methodological approaches. Recent SBE research has used quantitative exploration of predefined students' anxiety and stress. Therefore, qualitative research strategies that challenge existing knowledge of students' stress and anxiety during SBE can generate new insight into nursing education practice.

How emotions are triggered or constructed has been debated, spanning theories of physiological, evolutionary, neurological, cognitive and constructed emotions (Izard, 2013). Regardless of what causes emotions to emerge, the approach in this study was based on the principle that emotions are represented in the mind, experienced and are then expressed through language (Pekrun and Bühner, 2014). The advantage of self-reported emotions is that they can be used to explore the richness and broad range of experiences. However, research on concurrent self-reported emotions requires that participants are provided with the possibility to articulate their experiences without interruptions to their learning process (Pekrun and Bühner, 2014).

The interpersonal process recall (IPR) method is considered suitable for exploring emotional phenomena. IPR is a qualitative method where in-depth interviews are performed together with using viderecorded material (Larsen et al., 2008). Students and researchers watch a video of the situation that is the subject of exploration. Students are free to stop the video when they recognize emotions. The video assists the students in recalling the situation and in explaining and exploring moments in depth. In a traditional interview, participants are asked to recollect situations by recalling them; usually, only selective or powerful moments from the situation are remembered. Therefore, self-reported experiences rely on each participant's memory and can suffer from bias

because of the retrospective assessment. Using videorecordings helps students to recall and explore their actually experienced emotions in depth without interrupting their learning processes (Larsen et al., 2008).

2.2. Recruitment of participants

This study was conducted in four nursing educational institutions in the north, west, south and east of Norway from November 2018 to June 2019 and the analysis was completed in June 2020.

SBE was a mandatory part of the formal curriculum. The four universities had standardized scenarios with similar learning objectives which included training on using the Airways, Breathing, Circulation, Disability, Exposure (ABCDE) approach and the Introduction, Situation, Background, Assessment, Recommendation (ISBAR) communication framework when handling acute critically ill patients in simulated hospital settings. Scenario topics were handling patients' situations which included postoperative bleeding, chest pain, pneumonia, pneumothorax and cardiac arrest (see example scenario provided in appendix 1). Two scenarios were performed using high-technology manikins, while six scenarios were set wherein students portrayed the patient role. Students that used high-technology manikins had been given training in managing the manikins before simulation. Student numbers from four to twelve in each group. The facilitators leading the simulations were either registered nurses (6) or physicians (2). The nurses were employed at the universities and the physicians were employed in clinical practice. All were formally trained as facilitators. They had attended various national facilitator courses, offered by universities and commercial enterprises. All simulations followed the recommendations for simulation described in the standards for best simulation practice (Lioce et al., 2015), with briefing, scenario-setting and debriefing and were guided by principles from the Promoting Excellence and Reflective Learning in Simulation framework (Cheng et al., 2016). In debriefing, students' reactions were verbalized immediately, followed by a description of the simulated situation and self-assessment wherein they analysed the situation against learning objectives. The simulation sequences lasted between 45 min and 1 h.

Eight health professional students were recruited from these four Norwegian universities. Students with active roles in SBE were asked specifically by their educators to participate in the study. Eight students voluntarily signed up. Because the SBE sequences were videorecorded, all the other participants in SBE were also asked to participate in the study. The sample of the active and interviewed students reflected some diversity in age, sex and education. Ages ranged from 21 to 55 years. Three students were men and five were women. One student was a final-year medical student, two were first-year nursing students, four were second-year nursing students and one was a third-year nursing student.

Teachers from the respective universities recruited the participants at the authors' request. All contacted students agreed to participate. The inclusion criteria were that they were nursing or medical students and participated with an active role in a simulation.

2.3. Data collection

The first author (AM) recorded information by first observing the simulation sections at the respective universities. Simulations were videorecorded.

After the simulation ended, each active student and the first author watched and commented on parts of the recorded simulation session. Students watched the videorecording of their SBE performance in the interviews, which took place within 30–60 min after the simulation ended. Interviews were conducted in silent rooms connected to the simulation centres and audiotaped. The author asked intuitively about events in the video material rather than follow interview guides. The video recording was played on a computer, allowing both the students and author to stop it when something important was recalled. While watching the video, the author and student were sitting next to each other and the tone was informal.

In addition to the comments on the videorecording, interviews of the students enabled us to identify and explore emotional moments that students did not comment on while watching the material. Each interview lasted between 38 and 65 min.

Data collection was completed when we determined that any further data would not contribute significantly to our understanding of how the students experienced emotions in the SBE.

2.4. Data analysis

The analytical approach was performed following recommendations described in ID (Thorne, 2016). i) researchers becoming familiar with the data in the transcripts (immersion), ii) coding and developing themes in the transcript, iii) comparing and contrasting themes within interviews and iv) comparing and contrasting themes between interviews. Following this approach, we attempted to understand how events occurred by scrutinizing students' experiences of the complex process of the simulation task and intellectually analysing the data. Thorne (2016) describes benefits when researchers with practical experiences from the practical field investigated can understand complex experiential phenomena when linking participants' statements together with researchers' experiences. Researchers then use their experience to analyse the data in a way that no data programs could manage. All authors (AM, HSS, MØ and KR) have deep experience as lecturers, are registered nurses and facilitators and have facilitated numerous nursing simulations at the bachelor's and master's levels.

The data were gathered, transcribed and analysed concurrently. After each interview, the interview was transcribed verbatim by the first author. All authors read the transcript for immersion into the data. All authors participated in the following analysis and analysed the data individually.The co-authors verbally reflected after each data collection and during analysis, allowing the research team to discuss informally what the data meant. Reflections with co-authors was a part of the ongoing analytical reasoning. To ensure a common understanding and credibility and obtain consensus regarding the interpretation, all authors met to compare analyses. Key significant units of student meaning were then coded in the text. Codes that matched closely with the language inherent in the data were selected. Codes were then sorted into thematically related groups. Finally, by applying a constant comparison method (Thorne, 2016), interviews were clustered, compared and contrasted. During this synthesis, similarities and differences in students' emotional experiences became evident. The final themes in the dataset were identified when we analysed the findings using the circumplex model, which helped us categorize students' emotional unpleasant or pleasant valences and high or low activated experiences during the different parts of the SBE.

2.5. Ethical considerations

This study was approved by the Norwegian Centre for Research Data (No: 59059). Data collection was performed at universities where the researchers were not involved in education. Therefore, the student participants and researchers had no dependency relationships. All participants in the simulations signed an informed consent form, providing their approval to be observed and audiotaped during the simulation and were informed that they could withdraw from the study at any time. They signed the informed consent form before entering the SBE sequence. Students who participated in in-depth interviews after the simulation also signed a separate consent form. Video material was deleted immediately after ending the interviews. Audiotapes with the individual interviews were stored in a secure data system that only the four authors had permission to access.

3. Results

During the simulation, students described numerous emotions and how their feelings had changed through different stages of the experience. The main topics in the interviews were: (i) emotional experiences before, during and after the simulation; and (ii) the experience of reasons why specific feelings were experienced. Notably, students experienced emotions connected to expectations and evaluations of their performance in SBE. Table 1 shows an overview of the findings.

3.1. Emotions during the briefing: activated and mixed pleasant and unpleasant

Students' emotions before entering the simulation were related to their personal exposure. Those who had a sense of being well prepared experienced fewer negative emotions than did those who entered feeling unprepared. Regardless of the simulation context of high or low fidelity, students entering the simulation experienced being in a highly activated state and feeling excited, engaged, eager and derailed. Students frequently described how they had been looking forward to the simulation and were excited because they had heard from previous students about how useful and enjoyable it was.

Some students described feeling anxious, stressed, nervous and filled with dread. Fear was related to performance pressure and the desire to complete the simulation. One student stated: '*Maybe I will not be able to show what I actually can do*.' (Nursing student 3). Tension appeared to escalate when the equipment was unfamiliar. The students described dread arising from the pressure to manage technical equipment, such as monitoring equipment. The students invested resources in managing their dread: '*I tried to calm down by thinking that I will manage and remember to breathe.* '(Nursing student 2).

Students shared the experience of feeling frustrated because of not being as well prepared as they had hoped. Moreover, the supervising faculty had high expectations regarding knowledge and the procedures were confusing. Students experienced that they had to read a lot of theoretical literature as well as train in practical procedures to be able to manage the scenario. Some students had not been able to read all of the recommended literature or to rehearse the practical procedures. This experience of unpreparedness left students uncertain and frustrated. Frustration was also connected to the uncertainty of what would happen during the scenario. Students often entered the simulation feeling unprepared, uncertain and frustrated.

3.2. Emotions during the scenario: activated and unpleasant

While watching the video of themselves, most students had problems articulating the emotions that they had experienced during the scenario. One student clearly expressed a lack of time and space: '*Everything went so fast, I couldn't manage thinking or feeling, there was no room for emotions, I don't remember.*' (Nursing student 5). Being active in the scenario was an intense and demanding experience, leaving no space for thinking and feeling. In addition, focusing was difficult for the students because of new terms, many simultaneous events, unfamiliar fellow students, the expectation to recall actions and the demand for professional and introspective reflections.

Students who could describe their emotions during the scenario recalled it as being stressful. For example, one student described it as such because of the new and unfamiliar context requiring her to combine knowledge in new ways. Previously, she had performed procedures separately, but in the simulation, she was expected to handle a series of procedures and these demands overwhelmed her: '*I can't remember what I thought, everything became a mess, so many thoughts at the same time.* ' (Nursing student 3). These comments provided evidence that students were in a highly activated state during the scenario but felt chaotic and disorganized.

However, students also described how stress could benefit learning because they experienced it as a moderator for concentration and sharpened attention and one student expressed it as '*Other thoughts disappear, I forgot other persons in the room, I was so focused on the situation.*' (Nursing student 8).

Table 1
Overview of findings regarding the different parts of the simulation.

	Briefing	Scenario	Debriefing	After SBE
Arousal	Activated	Activated	Activated	Deactivated
Valence	Unpleasant Pleasant	Unpleasant	Unpleasant Pleasant	Unpleasant Pleasant
Emotions	Engaged Excited Derailed Fearful Anxious Stressed Nervous Frustrated Uncertain	Lack of emotions Losing sense and time Stressed Chaotic Disorganized Focused	Proud Excited Embarrassed Curious Interested	Exhausted Tired Overwhelmed Proud Uncertain

3.3. Emotions during the debriefing: activated and mixed pleasant and unpleasant

The analysis also showed how students experience emotions triggered by self-evaluating their performance and knowledge. After the scenario, but before entering the debriefing sequence, students described uncertainty and doubt regarding their performance. One student asked: '*Did I do the right thing?, I am so unsure*.' (Nursing student 7). Most students had the feeling that they had performed well and expressed pride in their performance and their completion of the scenario. However, some students felt that the scenario had progressed badly and were embarrassed; '*I actually cried there… I was so embarrassed with regard to the other students*' (Nursing student number 3). The experience of embarrassment occurred when students believed that their peers had observed them performing poorly. Regardless of how students evaluated their performance, they were all excited about receiving feedback from peers and facilitators. During the debriefing, students described being interested and curious, mostly regarding the feedback.

3.4. Emotions after the simulation: deactivated and mixed pleasant and unpleasant

Not surprisingly, the extensive inputs during the simulation left the students feeling tired, exhausted and overwhelmed. One student stated: '*Oh, God, how much I have to learn and now I'm so tired.*' (Nursing student 4). Some mentioned that they were proud of themselves and had a good feeling after the simulation because they had managed to handle the situation. Two students were allowed to simulate the same scenario again after the debriefing to address errors. Both of them described being proud of their performance. Some students expressed uncertainty because there were still unsolved questions and words that they had not understood, even after the debriefing had ended. One student clearly expressed the uncertainty: '*I am still not sure if I am allowed to insert a chest tube.*' (Medical student 1).

4. Discussion

In this study, we aimed to explore students' experiences of emotions while being active participants in SBE. The emotional landscape that we identified is more nuanced than that suggested by previous research. Our findings clearly show that simulation is an affective learning situation. These findings have several implications for nursing educators using SBE.

The main finding was how the students' emotions coexisted and changed during the short period of SBE. Previous research has mainly investigated stress and anxiety as continuous states during SBE (Shearer,

2016). However, students in this study reported that fear and anxiety occurred mainly during the first part of SBE. Therefore, anxiety might not be a pervasive feeling throughout the SBE experience.

Moreover, these findings were consistent with other studies of complex learning activities. For example, student emotions have been found to coexist and change according to changes in academic demands and mastery during a complex mathematics lesson (Roth and Walshaw, 2019). In SBE, the scene and academic demands also change. The briefing sequence is instructional and orienting in nature, wherein nursing students receive information about the setting and scenario and can become familiar with the equipment (Jeffries, 2020). Students in our study entered into this part of SBE feeling exposed and anxious. In the scenario, the simulation scene becomes an authentic environment where students act as professional health workers. They collaborate with peers and interact with simulated patients. The academic demands in the scenario are related to observing and analysing situations, handling the patient, managing procedures and initiating actions. In addition, students handle the patient situations in front of observers. Students mainly experienced this part of SBE as being chaotic. In the debriefing, the simulation scene changed again to a reflective group discussion. Students were expected to reflect on their actions and new knowledge connections, identify knowledge gaps and abstract new knowledge gained for use in practical settings (Jeffries, 2020). In the debriefing, students in this study experienced emotions related to self-evaluation of their performance, such as pride and embarrassment. Because of the changing scene and different academic demands, students experienced SBE as provoking many strong and shifting emotions. However, students did not tend to report experiencing fear or anxiety in parts of SBE other than the beginning. This finding is supported by those of Keskitalo and Ruokamo (2021) who observed that negative emotions decreased during SBE. The lack of fear and anxiety during other parts of SBE can indicate that the facilitators managed to establish a psychologically safe learning environment during the introduction and continued to support the students psychologically through the SBE sequence.

When entering the simulation, students experienced mostly negative emotions, such as being anxious, nervous, filled with dread, fearful and frustrated. Students experienced this discomfort mainly because they felt a lack of structure in the scenario and that the demands were unclear. The students also emphasized their lack of preparedness, followed by feeling unable to manage the situation and being fearful of damaging their reputation. This finding is consistent with previous reports showing that nursing students feel anxious during SBE (Groot et al., 2020; Kang and Min, 2019; Shearer, 2016; Walton et al., 2011). Negative emotions hamper learning by interrupting motivation, impairing cognition and reducing performance. Highly active students are less able to solve complex tasks, process information and examine alternative solutions (Oades-Sese et al., 2014; Zeidner, 2014). The establishment of a safe learning environment at the beginning of SBE has been highlighted in research (Edmondson et al., 2016; Jeffries, 2020; Kolbe et al., 2020) because an informative, safe and less anxious simulation environment allows students to perform better in the scenario and improves reflection in debriefing (Kolbe et al., 2020). Evidence shows that when nursing students feel safe in a learning environment, they speak up and ask for help and are comfortable in risking exposure of their knowledge gaps. When a safe space for learning is established, students are more able to participate in reflective discussions that benefit learning (Kolbe et al., 2020). Given that the students in the present study experienced anxiety related to feeling unprepared for SBE because of too much information and recommended background reading, faculty members should consider improvements related to fewer directions and clearer expectations. One recommendation is to prepare through more pre-simulation activities to establish a safe learning environment and reduce anxiety (Jeffries, 2020). Furthermore, the benefit of feeling some anxiety is highlighted in the simulation framework and Jeffries (2020) claimed that some anxiety can increase motivation to be prepared appropriately for simulation, for example, by working on the relevant topics in advance.

Students particularly expressed that the scenario part of SBE was chaotic, with no space for thinking or feeling. This finding indicates that students experienced emotional and cognitive overload during the scenario. Van Merrienboer (2005) emphasized that humans have limited capacity for processing information and many emotional reactions in a short time can overload working memory. An overloaded working memory interrupts information intake and processing, disturbs cognition and influences concentration (Zeidner, 2014). Cognitively overloaded nursing students are less able to solve problems in complex tasks such as SBE. The experience of overload has been previously reported in simulation studies (Fraser, 2018; Groot et al., 2020; Haji et al., 2016) showing that students experienced hampered learning and impeded cognition. However, Demaria et al. (2010) found that added emotional stressors in a simulated cardiopulmonary arrest situation improved student performance. That finding is in contrast with our present findings. None of the scenarios in our study had added emotional stressors, yet students experienced chaos that prevented cognition. A focus on simulation objectives when creating and performing simulations is recommended to establish clear expectations and guidelines without creating extraneous chaos (Lioce et al., 2015).

The experience of chaos shows the importance of debriefing. In debriefing, cognition and reflection become possible in a less activating environment. These students conveyed emotions such as pride and embarrassment in the debriefing settings. The main focus in debriefing is to establish student reflections on their actions to enhance learning (Dreifuerst et al., 2020). The reported emotions of pride and embarrassment indicate that students evaluated and reflected on actions and experienced emotions related to their self-evaluation. Students who experienced satisfaction regarding their performance described feeling pride after the scenario had ended. By contrast, students who evaluated their performance poorly described an unpleasant feeling of embarrassment. However, a student's strategy for avoiding embarrassment is to be well prepared for tasks (Oades-Sese et al., 2014). By achieving theoretical and practical knowledge, students can increase their control over the situation. In being well prepared, they can reduce the risk of being revealed as ignorant and thus decrease the possibility of experiencing individual negative and discomforting emotions. Simulation learning builds on already gained knowledge and preparedness is a fundamental success factor for learning in SBE.

Students in this study experienced uncertainty, particularly in the beginning and at the end of the SBE. Keskitalo and Ruokamo (2021) also found students' uncertainty to decrease during SBE. Our findings can extend the understanding of uncertainty because students explained that uncertainty before SBE was related to their lack of preparation and an absence of predictability. Nevertheless, the current finding of uncertainty indicates that students did not always receive comprehensive feedback and that problems and questions are not always solved during debriefing. Uncertainty may decrease during SBE, but students' rationale for experiencing uncertainty provides a valuable insight into the reasons for their emotional experience. Facilitators should be aware of students' uncertainty after SBE has ended and ensure that understanding is accomplished.

Debriefing proved to be a less emotional and exposed situation than the scenario. Debriefing frameworks highlight the importance of reflection, exploring and solving problems (Jeffries, 2020). In addition to the reduced academic demands, debriefing is an important stage for metacognition and reflection. Reduced arousal increases creativity and flexibility, which are important for reflection (Pekrun and Linnenbrink-Garcia, 2014). Reflection on action is a key concept for learning in SBE (Dreifuerst et al., 2020). The students' reporting of fewer emotional experiences and reduced demands during debriefing indicate that this part of SBE is ideal for cognition, reflection and discovery. However, the active students were exhausted and overwhelmed after SBE. Thus, fatigue should be considered when planning SBE scenarios. Students should not be put consecutively in an active role in multiple

simulations.

4.1. Practical importance to the educational field

Nursing educators should be aware of the varied emotional spectrum students experience during SBE and consider to elicit emotions that can benefit learning and limit emotions that can hamper learning when creating and performing SBE. Given that SBEs provoke multiple, activated, deactivated and varied emotions of pleasure and unpleasure, educators should be aware that some students may need follow-up support. According to these findings of multiple emotions that led to chaos in the scenario, nurse educators must consider reducing impressions when creating and performing SBE.

The insight in students' multiple emotional experiences and lack of cognition during scenarios support debriefing as necessary to metacognition and learning. Our findings support the importance of the debriefing phase according to recognizing students' feelings experienced during the scenario, solving uncertainty and metacognitive reflections (Jeffries et al., 2015) in a part of SBE where students are less activated.

4.2. Strengths and limitations

This study had the following strengths. To our knowledge, this was the first qualitative study to explore the emotions of students in an active role during a simulation task. Using the IPR method, we have captured emotions that have not been described in association with a simulation experience. In addition, we acquired information regarding these self-explored emotions in close temporal proximity to the learning process without interrupting the task itself.

This study also had some limitations. Emotional processes can be demanding and time-consuming for participants to address (Izard, 2013). Emotions are personal experiences and students in this study might not have shared all of their personal experiences with a researcher unfamiliar to them.

5. Conclusion

Findings from this study show that students who were active in SBE experienced multiple and shifting emotions. These findings add to previous research on students' emotional experiences in SBE. Learning in simulation is an emotional process and must be considered when nursing educators plan and implement SBE. Despite the focus on students' anxiety and psychological safety (Kang and Min, 2019; Kolbe et al., 2020; Lioce et al., 2015; Rudolph et al, 2014), students still expressed fear at the beginning of SBE. However, the lack of fear in other SBE sequences indicates that students can experience a feeling of safety in such parts. Moreover, the chaos during the scenario supports recommendations for SBE, where the goals set for structuring scenarios should be few, clear and comprehensive. Debriefing stands out as an ideal situation for reflection. Students felt less exposed in debriefing and the findings of emotions occurring when evaluating one's performance indicate that the students reflected on own actions. This finding supports the importance of good debriefing practices, which are instrumental to effective SBE.

A key area for future research is how different emotional states in simulation can influence learning outcomes. Specifically, is it possible to create scenarios that trigger specific emotions to affect these outcomes?

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Conflict of interest

The authors declare they have no conflict of interest.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.nepr.2022.103353.

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