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Virtual Escapes: A Pedagogical Strategy for Developing Emotional Competence in Nursing Students

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Abstract

Emotional competence, the ability to manage interpersonal relationships through understanding one's and others' emotions, encompasses two dimensions: cognitive and behavioral. In nursing practice, the combination of these dimensions allows for better performance in highly complex clinical situations. Nursing education does not always emphasize these competences. This pilot study explored the potential of an escape room, a Serious Games (SGs) prototype with virtual reality (VR), as a pedagogical strategy for eliciting emotions in a safe learning environment. Participants' immersion in the game provided an opportunity to identify, manage, and process emotions. Data were gathered by a questionnaire and by observation of performance. The findings revealed that participants felt various emotions (n = 51) while playing the game. The least frequent reported emotions were hope, shame, and contempt. Admiration, pride, satisfaction, and fear were the most frequently reported emotions. These findings suggest that using a SGs prototype with VR as a pedagogical tool holds significant potential in emotion elicitation in a safe learning environment, implying its value as a construct of emotional competence. Further research to verify educational value is recommended.

Keywords

Serious games, virtual reality, pedagogical innovation strategy, emotional competence, nursing students

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Implications for Knowledge Translation

- Serious Games (SGs) with virtual reality (VR) provide opportunities to elicit emotional responses in a safe, controlled, immersive environment, implying that by integrating SGs into nursing programs, emotional competence can be fostered.
- Further research—whereby safe, controlled, immersive environments provided by SGs are replicated and adapted to varied learning contexts—will ensure transferability and scalability of SGs in nursing education.
- Developing and implementing VR-based SGs requires collaboration between educators, game designers, clinicians, and technologists. Therefore, nurse educators must engage in interdisciplinary partnerships to effectively co-create and scale SGs as educational tools.

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Introduction

Current societies demand more from professionals than the technical-scientific skills they develop during higher education (Belchior-Rocha et al., 2022). Higher education programs must meet these demands by planning curricula to develop values and attitudes that assist their students in applying scientific knowledge to social, personal, academic, and professional contexts (Hora et al., 2018). Such values and attitudes complement the theoretical, technical, and scientific knowledge underlying academic training (Devedzic et al., 2018).

Developing Emotional Skills

Given these demands, there has been a growing interest in promoting opportunities for students to develop social and emotional skills (Ireland, 2022), enriching their learning path by developing critical thinking, creativity, and proactive and autonomous behavior (Mok et al., 2016). These personal attributes and abilities are often referred to as soft skills and encompass personality traits, social qualities, communication style, language, personal habits, and interpersonal skills that characterize a person's relationships with others.

Emotional competence is one of these soft skills (Showry & Manasa, 2014). It is closely related to emotional intelligence, which refers to the underlying ability to perceive, understand, and manage emotions. Emotional competence, on the other hand, is the practical application of that ability in real-world interpersonal and professional situations. Emotional competence can be defined as the ability to self-regulate and manage interpersonal relationships through understanding one's own emotions and the emotions of others (McCloughen et al., 2020; Valeeva & Khakimova, 2015). According to this definition, emotional competence encompasses two dimensions: cognitive, related to the understanding of emotions, and behavioral, which refers to the ability to manage those same emotions (Valeeva & Khakimova, 2015). In the case of health sciences students, specifically nursing students for our study, the combination of these dimensions enables them to perform better in highly complex and challenging situations associated with actual and simulated clinical practice (Flynn et al., 2017). However, nursing students' undergraduate education does not always emphasize developing these competencies despite their relevance. A paradigm shift is essential to highlight opportunities for pedagogical innovation directed towards the development of these competencies (Christodoulakis et al., 2024; Min et al., 2022). The pilot study reported in this paper sought to explore the potential relevance and value of using digital games in such innovation.

Using Games

Digital games are a popular activity that combine leisure, entertainment, and learning for users (Rueda-Medina et al., 2024; Yeasmin & Albabtain, 2020). Studies highlight the value of a player's emotional experience during the game in determining engagement and depth of experience with the game (Demircan et al., 2024; Zagalo, 2009). Serious Games (SGs) combine problem-solving and entertainment; using the same communication mechanisms employed in video recreational games, SGs provide opportunities to acquire knowledge about a given topic and to develop skills (Caserman et al., 2020; Johnsen et al., 2018). These types of games may hold significant potential as a teaching and learning modality (Thurairasu, 2022; Bodur et al., 2024; Rueda-Medina et al., 2024). This pilot study explored the potential of SGs as a teaching and learning modality in the context of nurse education.

Technology advancement has allowed the development of different game platforms. One of those platforms is virtual reality (VR). By being active participants in the game and assuming the role of the game characters (Machado et al., 2011; Somarathna et al., 2022; Yeasmin & Albatain, 2020; Zagalo, 2009), VR may allow players to assimilate learning content more effectively than conservative teaching modalities (Somarathna et al., 2022). VR can promote users' immersion, making them feel present in the virtual environment. However, to keep the users motivated and immersed in the game, VR is formulated to stimulate their senses, facilitating, enabling, and promoting their involvement with the three-dimensional space where they are playing (Machado et al., 2011). Therefore, VR has valued potential as a tool for eliciting emotions.

One of the advantages of VR is that the computer-generated environment can be manipulated in real time to place the user in various scenarios. This capability to manipulate an environment is difficult or impossible to achieve in real life, either because it could entail an unreasonable degree of risk to any party, or because it would be too costly (Hamad & Jia, 2022). One situation which is very difficult to create in real life is the elicitation of emotions; hence, the use of VR lends itself well to developing emotional competence (Somarathna et al., 2022). From a different angle, using VR is also advantageous because it allows for a safer experience for the user who is practicing, navigating, or learning in an environment (Hamad & Jia, 2022). In stark difference to a real-life environment, a computer-generated environment can be adjusted, amended, controlled, and manipulated according to the needs and requirements of the person and situation or context, accommodating a better user experience (Demircan et al., 2024; Lyu et al., 2023).

How the player interacts with the game can be changed by manipulating their emotional state. The player encounters various stimuli, activities, and scenarios that may impact their emotions. For instance, a scenario may elicit fear, which in turn influences the level of caution the player subsequently employs. This manipulation can enrich the experience because it profoundly involves the player. Several techniques can be used to elicit different emotional states in a player. For

this, three issues need to be considered: (1) what are the stimuli (2) when they should appear, and (3) how are these stimuli adjusted during the game (Caserman et al., 2020).

The existing typology of games is very diverse. For example, Escape Rooms are a game genre focused on problem-solving activities (e.g., puzzles, riddles, symbols) that challenge the players psychologically. The player's mind-body relationship enhances their perception that they are a part of the scenario, effectively a character in the story they are discovering (Omescapelondon, 2021). The goal of this type of game is to solve all the puzzles and unravel mysteries in order to "escape"—to get out for some reason, be it metaphorical, related to a concept and theme, or literal, where the player is simply trapped. By involving the players in an enclosed space, surrounded by props and puzzles, their brains may think that they need to escape and may go into survival mode. This phenomenon makes the players more attentive and focused on tasks, mainly due to the neurobiological adrenaline response. Escape rooms are the game genre that evokes the strongest emotions in players, primarily negative ones, because it involves a dimension of elements that elicit players' fear, anger, and frustration (Menzies, 2019).

This pilot study aimed to explore the emotions elicited using a SG prototype with two different cohorts: a group of nursing students and a group of academics with a background in digital games. The ultimate intention was to integrate this SG as a pedagogical tool within an educational program designed to enhance emotional competence among nursing students. In this context, understanding the game's ability to elicit emotions and exploring how the gaming experience may facilitate and support the development of emotional competence was the scope of the pilot study. The research question of this study was, "Is a Serious Game using VR effective in eliciting emotions, as a tool for developing emotional competence?". Specifically, the objectives were (1) to explore the ability of a prototype of an Escape Room, a form of SG done in a virtual environment, to elicit emotions in nursing students and academics, and (2) to explore the students' experiences of using the SG as a teaching modality.

Methods

Sample

Guidance regarding sample size for pilot studies remains limited (O'Neill, 2022). The researchers determined that a sample size of 10 participants was adequate. All participants were purposively selected. The purpose of the pilot study was to test the feasibility of the use of the SG which uses VR and its impact on the participants and to identify unforeseen problems (Viechtbauer et al., 2015). Five academics with a background in digital games and five 4th-year undergraduate students from a nursing school in the North of Portugal participated in this pilot study. Two of the academics were female and the rest were male, while the nursing students were all female. The ages of participants ranged from 21 to 42 years old (see Table 1). These data were gathered through the questionnaire distributed to the participants after they completed the SG. Nursing students were invited to participate because the SG which was designed and used in the project specifically targets learning among nursing students. Individuals with a digital games academic background were invited to participate on the assumption that they would be comfortable with the use of technology, and were best placed in comparison to other university students to provide constructive feedback about the SG from a technological and digital learning educational perspective.

The participants were asked to indicate their general gaming experience using a scale from 0 to 5, where 0 meant no gaming experience/does not play, and 5 meant extensive gaming experience/plays constantly. Most of the nursing students ranked themselves at level 3. Only one of the five students reported having used VR.

The academics with gaming experience had different backgrounds. Three had experience in game development. The other two were artists, one a professor in visual arts. They all had a high level of general experience with games. Four of the five had used VR.

Development of Serious Game Using Virtual Reality

The SG prototype was developed following these steps: (1) definition of the game concept, (2) definition of the game narrative, (3) storyboarding, (3) development of mechanics, (4) characters and scenarios, (5) sound design, (5) prototype development, (6) game design, (7) internal testing, and (8) external testing. Rooney's (2012) theoretical framework for SG design and Lameras et al.'s (2017) definition and utilization of game mechanics were used in developing the game. Rooney (2012) emphasized the interplay between pedagogy, play, and fidelity when designing SGs. Pedagogical goals shaped the game's concept and narrative, ensuring learning objectives were central to gameplay. Play informed the development of engaging mechanics to enhance player interaction. Fidelity guided the creation of a realistic scenario (Rooney, 2012). Lameras et al. (2017) proposed a framework that links specific learning attributes, such as reflection and analyzing evidence, to corresponding game mechanics. For example, to promote reflection, the game incorporated feedback systems to encourage players to consider their decisions (Lameras et al., 2017).

The SG prototype of choice developed for this study is a VR Escape Room that combines puzzle-solving with a mystery-driven narrative centered on the characters John and Mary. Players progress linearly through a dark, emotionally immersive environment, uncovering clues such as diary pages and post-it notes that gradually reveal fragments of the story. The open-ended structure encourages individual interpretation, culminating in the discovery that one of the players

Table 1. Sociodemographic Characteristics of the Participants.

Participant	Gender	Age (years)	Area	Gaming experience level	VR experience
1	Female	23	Nursing	2	No
2	Female	30	Nursing	4	Yes
3	Female	21	Nursing	3	No
4	Female	23	Nursing	3	No
5	Female	23	Nursing	3	No
6	Female	25	Game design	5	No
7	Male	42	Artist / professor	5	Yes
8	Male	27	Game developer	5	Yes
9	Female	23	Game developer	4	Yes
10	Male	23	Artist	5	Yes

is, in fact, John, revealed through a final puzzle involving the assembly of diary entries to unlock a cabinet.

Elements that may elicit both positive and negative emotions were designed and integrated into the game, based on Norman's (2002) generic lists of emotions. Positive emotions were limited to the feelings experienced when playing the game (e.g., the player completes a goal, the player progresses in the game, and the feeling of the mechanics). Table 2 lists the elements potentially eliciting positive emotions.

Table 3 shows the elements for which the narrative, the visuals, sound effects, and puzzles were unified and designed to elicit negative emotions.

Table 2. Game Elements for Eliciting Positive Emotions.

Element	Description
Achieving goals	The player manages to complete the objectives after several attempts.
Progressing in the game	The feeling of game progression when completing an objective.
Game mechanics	Because they are simple mechanics to learn and interesting to use.

Data Collection

This pilot study adopted a triangulation process for data collection (Bans-Akutey & Tiimub, 2021) which entailed two types of data gathering: questionnaire and observation of performance. Triangulation was adopted to enable a broader exploration and understanding of what was being studied in this pilot study and to enhance the completeness of the data, rather than to seek confirmation of the different data sets (Fenech Adami & Kiger, 2005; Carter et al., 2014). Participants completed a questionnaire that yielded the data in Table 1. Recordings of the players' performance of playing the game were analyzed. The data collection process took place in 2023.

The different elements of data collection were carried out sequentially. Initially, the participants were allowed the opportunity to play the game. Each participant experienced the game in an appropriate space, observed by two researchers, and was recorded playing the game. The recording was later analyzed by the researchers. Playing time and the gamer's behavior while playing the SG was observed.

After completing the game, each participant went to another room to answer individually a questionnaire constructed purposely for this pilot study. A member of the research team was present in case of any difficulty understanding the questions. There were no queries or difficulties noted. Content validity for the questionnaire was achieved by having five academic experts from the same nursing school in the North of Portugal, review the questionnaire.

The questionnaire had open-response questions seeking to identify the episodes of the game that elicited certain emotions, and closed-response questions asking participants to identify and mark the emotions they felt throughout the game. Descriptive statistics with frequency calculations were conducted using Microsoft Excel. Further statistical analysis was not indicated because this was a pilot study. Pilot studies are inherently limited in statistical analysis, interpretations, and inferences, by the size and nature of the samples.

Rigor

In an effort to ensure rigor, this pilot study was conducted by a group of experienced academic researchers from established universities from different European countries. Such diversity is believed to have helped contain any researcher bias. Furthermore, the reporting of this pilot study was very thorough and allowed for a clear audit trail.

Ethical Considerations

Ethical approval was obtained from the University of Minho, Ethics Committee for Life and Health Sciences Research (CEICVS 151/2021, November 29, 2021). Written consent was obtained from the participants prior to recording their playing performance. In the information letter which was distributed to the participants before the conduct of the study, the participants were told that in the pilot study participation

Table 3. Game Elements for Eliciting Negative Emotions.

Element	Description
Narrative and setting	The game's narrative and environment provide the story of John and Mary, where the players slowly discover what happened. The players have the story open to fill in the gaps with their interpretation.
Easy-to-solve puzzles	Leading the players to think that the puzzle will be complex when it is quite simple.
Toolkit	The players can only take one item in each hand. This limitation forces them to walk around the house more often.
Dark scenario	The game's scenario/setting is gloomy, with entirely dark parts that can only be walked through with a flashlight.
Flashlight	It does not automatically point straight to where the players are looking. The players must handle the controller so the flashlight points where they want it. Also, the players must be careful not to lose the flashlight in the dark.
Cockroaches	The cockroaches show up in the trash, and the players must put their hands among the cockroaches to pick up a key.
Trunk lock	This feature forces the players to bend down and be in a proximate distance to the trunk to rotate the correct dials.
Mary's body and eyes	Mary's body changes position each time the players look away. Mary's eyes follow the players when they move closer to the body.
Sounds	Three whispers from a woman's voice when the players are on the stairs in the dark.
Heights	The players must walk over a narrow plank to overcome a wide gap in the balcony floor.

was voluntary, and they could withdraw at any time without consequences. They were also informed that the SG might elicit strong emotional responses that could feel overwhelming and were provided with suggestions and resources to help them manage and process these reactions effectively.

Results

Game Experience

Only one of the five participating nursing students was able to complete the entire game. The remaining nursing students stopped playing prematurely because they developed cybersickness symptoms, namely nausea. The nausea was relieved shortly after stopping playing the game. All participants felt well within a few minutes of stopping, and none complained of any other symptoms. The duration of the experience varied according to the participants' characteristics. The sole nursing student who successfully completed the game took 1 h 45 min. The nursing students who did not finish the game spent 45 to 55 min playing.

Four of the academics completed the game in 15 to 50 min. One of the participants in the latter group played for 45 min but could not finish the game. The fact that the game was in English impacted the gaming experience of participants. Limitations in the language proficiency of some participants may have slowed their progression through the game. Four participants required assistance from the educators in the rooms, with understanding and interpreting the interactive elements and mechanics using text of the game. The researchers noted that the observation analysis of performance enabled by digital game play pointed strongly to the influence of language proficiency on performance. The qualitative data analysis provided in the questionnaire further revealed these challenges associated with language proficiency and understandability.

Table 4. Frequency of Emotions Felt by the Participants.

Emotion	Nursing students	Academics
Joy	1	3
Admiration	4	3
Pride	2	5
Hope	0	1
Satisfaction	3	4
Fascination	3	3
Desire	2	1
Sadness	2	1
Fear	4	3
Shame	0	1
Contempt	0	1
Frustration	2	4
Upset	0	2
Disgust	0	5

Data Collected

The first part of the after-SG questionnaire asked participants to identify the emotions they felt throughout their gaming experience. The 10 participants reported feeling a total of 51 emotions. The least frequently felt emotions were hope, shame, and contempt, reported by a single player. Admiration, pride, satisfaction, and fear were the most frequently felt emotions, each of which was identified by seven participants. Table 4 shows how many participants in each group felt a specific emotion. For instance, only one participant in the nursing students group felt joy, while three participants in the academics group felt this particular emotion.

The second part of the questionnaire asked the players to associate elements of the game with each emotion they felt. Content analysis of this qualitative data revealed associations between the game elements and the emotions identified by the participants. Excerpts from the qualitative data are presented in Table 5.

Table 5. Elements of the Serious Game and Responses Expressed by Participants.

Emotion	Nursing students	Academics
Joy	Just playing made me feel joy.	…solving the puzzles… …exploring… I felt joyful once I could figure out the game controllers.
Admiration	When I found John's body… ….the fact that the game takes place in a house. I was surprised by the graphics, the arrangement of the objects, how they were scattered around the house. I was surprised to see the cockroaches because I didn't expect them.	…set dressing… Assuming awe as a surprise rather than fascination, I was amazed as soon as I saw the cockroaches and as soon as I saw Mary's eyes following me. The technical elements of VR.
Pride	I felt proud when I could complete the challenges. I felt proud when I could complete the challenges.	…solving the puzzles… …achieving goals… Having managed to do the puzzles after attempts… Being able to complete the puzzles, especially the one with the trunk. I was proud every time I completed a challenge.
Hope	_____	Finding clues…
Satisfaction	Solving the journal and the lab puzzles… I felt satisfied that I was able to complete the challenges; that I was able to get to the last challenge. I was satisfied when I was able to complete the challenges.	…solving the puzzles progression Putting the keys in the locks and making them turn. Completing the challenges and interestingly enough, I also felt satisfied whenever I could open a door completely uninterrupted.
Fascination	The story's plot, the fact that there was a laboratory in an ordinary house, and the two dead bodies. The sequence of the steps always makes you want to look for more clues. I was fascinated by the cockroaches and the corpse. I was fascinated by the mechanics of the game.	The way the game's clues were laid out. Finding out it was John by looking in the mirror. I was fascinated by the movement of Mary's eyes when I approached; I was also fascinated by the mechanism of rotating the numbers on the padlock on the trunk.
Desire	The idea of completing the game… Finding the various pieces of the puzzles. Wishing to open the furniture doors and the gift on the table.	The story provoked a desire to finish the game; I don't know if this is the format of "desire" you are supposed to feel.
Sadness	When I found Mary's body… The fact that I realize how much language is needed in everyday life; not having completed the game.	Mary's story
Fear	When I was going to pick up the diary page on the balcony… Entering the areas without light… The general dark tone and finding the corpses, and the corpse of the woman was following the player with her eyes… I felt scared seeing the cockroaches. I felt anxious whenever I heard the voices close to my ear.	Mostly the visual and sound environment. Passing the board on the porch; it caused Mary's eyes to be uncomfortable as she picked up a page. The dreary sounds made me quite uneasy, but the part that caused me the most fear were the moments when I had to go through the darkest part of the house, the stairs.
Shame	_____	Taking some time to figure out what I had to do to crack the code of the trunk…
Contempt	_____	Maybe the main character, in my interpretation of the story.
Frustration	I was frustrated initially, until I understood how the game played out, the part about using the axe to open the garbage can. Having to go back and get the journal sheets again. I felt frustrated when I dropped the board on the balcony part. I would get frustrated with myself when I couldn't complete the challenges right away.	Trunk event, looking for the pages… Having to go back and forth picking up the journal pages; the trunk puzzle… Each time I put the keys in the wrong door and the key fell to the floor. In the anger, they will talk about frustration and I felt slightly frustrated in the beginning when I was trying to figure out the controllers; I also felt frustrated when I couldn't open the chest (but I admit I was completely distracted)"
Upset	_____	Nothing in particular, although some tasks are a bit of work. Only able to carry two things at a time in my hands…
Disgust	_____	The corpses with their eyes open!

(continued)

Table 5. (continued)

Emotion	Nursing students	Academics
		…green liquid… The cockroaches in the garbage made quite an impression, mainly because of the sound. The cockroaches in the garbage can. Cockroaches… I was disgusted by the cockroaches… Interestingly, the body made no difference to me, but the cockroaches did…

The academics associated more emotions with game content than the nursing students, focusing on aspects related to gameplay. For example, they noted joy, which was experienced upon solving the puzzles, admiration for the technical aspects of VR, and fascination regarding the organization of clues throughout the game. The nursing students associated sadness with learning about the game's story and expressed disgust upon encountering corpses and dealing with cockroaches.

While noting fewer emotions related to gameplay elements, the nursing students expressed joy with having the opportunity to play the game and satisfaction with solving puzzles. From the narrative perspective, nursing students reported fascination with the storyline as the game evolved, and fear by the appearance of the cockroaches and the sound effects (whispers) integrated into the game and widely noted by this group of participants.

To recapitulate, this pilot study sought to explore a SG's potential as an innovative pedagogical strategy for eliciting emotion, to be used in educating nursing students in a safe learning environment. Specifically, the objectives were (1) to explore the ability of a prototype of an Escape Room-like SG in VR to elicit emotions in nursing students and academics, and (2) to explore the students' experiences of using VR as a teaching modality. The results of this study suggest that the use of a SG with VR may have significant potential in providing a learning experience towards developing emotional competence. However, a number of factors of the game design merit attention; the language used to enable interactivity and progress in the game, and users' proficiency and previous experience with VR are two factors this pilot study clearly revealed.

Discussion

The use of VR in the SG may have increased the potentialities of the SG to elicit emotions but this needs to be investigated in future studies which compare the use of VR and omission of VR in the delivery of identical learning content. The literature to date does suggest that when players are trapped in a game's virtual environment, a high sense of immersion is enabled, whereby players feel more strongly stimulated and challenged (Flynn et al., 2017; Hamad & Jia, 2022; Machado et al., 2011).

While recognizing this favorable outcome of the use of VR, that is the increased immersion, it is important to acknowledge the finding that nausea was reported by some participants that may have been related to the depth of immersion in the game. There is growing evidence that greater immersion is associated with a greater likelihood of nausea (Martirosov et al., 2022). Suggestions for mitigating this symptom include limiting session duration and incorporating frequent breaks (Stanney et al., 2020). Additionally, alternative learning options such as desktop simulations provide practical pathways for students who are unable to engage with VR comfortably.

In view of the growing sensitivity and discussion about the possible physical consequences associated with the use of VR, mainly nausea, and the indisputable conviction that consent from participants should always be comprehensively informed, future iterations should strongly and clearly inform participants about all foreseeable potential side effects known at the time of engaging with VR. Informed consent processes are to be evidence-informed. This implies continued search, appraisal and application of the related evidence regarding VR in further iterations of this learning opportunity and in similar initiatives using VR.

Future educational initiatives need to take heed of both findings (the evident value of VR in enabling an immersive experience and the problem of nausea), and implications which follow both are to be discerned and addressed accordingly. At this point, an inference from this pilot study which may be shared with caution is that this pedagogical tool, SG using VR, is best used as an adjunct rather than an exclusive tool for developing emotional competence. This resonates with the advice of Mayne and Green (2020) that VR should not replace conventional educational modalities, but should be used as an adjunct to teaching and learning. It is clear that supportive resources are required for users of this educational tool and moreover, it is imperative that the diversity of the tolerance levels of gaming using VR is to be accounted for and catered for, by educators, accordingly (Hamad & Jia. 2022).

While all participants in this pilot study reported emotions elicited by the SG, the five nursing students, who were all

female, identified fewer emotions than the participants who were not nursing students. It appears that fewer aspects of the game were capable of eliciting emotions in the female participants, because the results from the females in the participants who were academics also exhibited less emotion elicitation. While acknowledging that the number of participants in this pilot was very low (N = 10) and were not equally distributed among the two genders, nonetheless the indication of a possible difference across genders calls for attention. A comprehensive review of literature and evidence, which may guide the development of future initiatives which transcend gender variances, and which may therefore accommodate more equity in learning opportunities using VR across different learner groups. There is a significant and growing body of evidence pertaining to gender-related aspects regarding the use of VR (Blanco-Ruiz et al., 2020). Further work which focuses on gender differences needs to be conducted in a very careful manner in an effort to explore and address diversity among players and learners more effectively.

The use of a SG using VR was investigated in this pilot study because emotional competence is central to optimal nurses' performance. Nurses require autonomy, knowledge, and confidence to respond effectively to the challenges that characterize health-care settings (McCloughen et al., 2020). It is therefore important to provide nursing students with opportunities to develop this competence (Showry & Manasa, 2014). Nursing education is a unique space for providing training that helps students develop emotional competence and the essential skills associated with it (Devedzic et al., 2018; Mok et al., 2016). The work context in which nursing care is delivered is in a constant state of flux and globally the unpredictability of the health-care context has become more evident particularly since the COVID-19 pandemic. Nurse education must continue to evolve and adapt in line with the change and innovations unfolding in the work context. However, the requirement for emotional competence appears to remain constant over time and space.

It is interesting to note that all the nursing students who participated in this pilot study reported difficulty with making decisions when navigating the game. The fact that the game instructions and the whole narrative were in English may explain some of the difficulties reported by these participants. However, this finding can be associated with factors that go beyond language barriers to include the nature of clinical education experiences of nursing students. Typically, health-care internships and/or placement experiences give students early contact with the context of care delivery, but these experiences often draw upon the bureaucratic-rational model characterized by norms, rules, and protocols including the qualified nurse/student nurse supervision model that prevails across internships and placements. This supervision model does not always attend well to some dimensions of personal and professional development of students including independent reflection, discernment of emotions, and decision making, and may jeopardize a program's scope of preparing nursing students as future professionals (Macedo, 2013; Weurlander et al., 2018). Paying attention to these dimensions is essential because when nursing students become professionals, they will need to make decisions, often under pressure, and be able to put their critical thinking into practice. Such critical thinking and decision-making skills are potentially impaired by negative emotions (Fallon et al., 2013). In fact, studies addressing these aspects of health education indicate a positive relationship between emotional intelligence, critical thinking, and academic success (Cleary et al., 2018). An integrative literature review by Cleary et al. (2018) strongly denoted this. The studies analyzed by these authors emphatically suggest that developing soft skills as an integral part of the curricula of higher education nursing programs allows these future professionals to be better prepared for the challenges arising from nursing practice (Cleary et al., 2018).

In summary, the results obtained in this pilot study substantiated available evidence about the potential of using SG and VR as a complementary pedagogical tool in nursing education, especially in the development of soft skills such as critical thinking, taking initiative, and emotional competence. This SG was developed and piloted as part of an ERASMUS + project funded by the European Commission. The consortium authoring this paper are unable to report the specific costs incurred in the design, production, and piloting of the SG because these were not determined during the conduct of the pilot study, but the authors acknowledge that the human resources required, including their respective expertise as game designers, educators, and researchers, entailed a lot of and time costs. The potential risks of selection and response bias associated with the purposive sampling method used in this pilot study should not be overlooked. Future iteration of the educational intervention, which was the focus of this pilot study, should consider that the participants are told about the possibility of nausea with the use of VR. Nonetheless the potential of emotion elicitation in a safe environment through the SG that this pilot study revealed augurs well for further investment in such innovative teaching modalities. The cost incurred in the use of SGs in different contexts needs to be studied to determine cost-benefit analysis. In addition, the pilot study offered valuable insights into the potential of using data from analysis of the game performance in customizing teaching strategies.

Conclusions

Emotional competence plays a significant role in how nursing students deal with the daily challenges that characterize the profession they will embrace in the future (Showry & Manasa, 2014). Therefore, higher education curricula must contemplate teaching strategies that encourage innovative pedagogical practices to develop and promote fundamental skills and competences (Christodoulakis et al., 2024).

SGs using VR are a pedagogical tool with much potential for developing knowledge about emotions. The pilot study revealed that SG using VR provided an apt opportunity for a highly immersive experience and such experience appears to have been an effective elicitor of emotions. This Escape Room will be integrated in a future training program to help nursing students develop emotional competence skills. Nevertheless, the difficulties which the participants of the pilot study experienced indicate that there is scope for more research and innovation to improve the learning outcomes and the overall value of this gaming experience in nursing education.

In sum, the findings of the pilot study point to the potential value of the SG as a pedagogical resource because playing the SG entailed the intended emotion elicitation. In turn, this points to the value of measuring the emotional competence of nursing students, pre- and post- playing the SG. These measurements will shed light on the value of utilizing the SG as a resource for developing emotional competence among students. The findings of this research study offer directions for further research beyond exploring emotional elicitation, to studying the impact of playing the SG on the development of emotional competence.

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Data Availability Statement

The datasets used and/or analyzed during the present study are available from the corresponding author on reasonable request.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by University of Minho, Ethics Committee for Life and Health Sciences Research (CEICVS 151/2021, November 29th, 2021).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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