ESCAPE ROOMS AS A CLINICAL EVALUATION METHOD FOR NURSING STUDENTS

Abstract

Background: There are currently no studies available about the possible use of gamification in the evaluation of nursing students' clinical skills. The purpose of this study was to understand the gameful experience and satisfaction of nursing students in the evaluation of their clinical skills using an escape room.

Methods: A quasi-experimental study was carried out. The participants were divided into an experimental group (escape room) and a control group.

Results: The experimental group had higher than average scores in all dimensions of the Gameful Experience Scale, except in the dimension of negative effects.

Conclusions: Escape rooms are a useful tool for the evaluation of nursing students versus using the objective structured clinical evaluation.

Keywords: escape room; nursing students; clinical evaluation; clinical skills; gamification.

Key Points

- The evaluation of nursing students' clinical skills is one of the most important parts of their studies and professional training.
- Nurse educators are incorporating new strategies for learning and evaluation into their classrooms.
- To guarantee the success of evaluation methods and maximize learning outcomes, it is important to take students' feelings and attitudes into consideration.

Nursing students must learn numerous essential clinical skills, such as communication skills, cognitive skills, and technological skills, among others, before entering the workforce as nursing professionals. On the other hand, the objective structured clinical examination (OSCE) is a widely-accepted evaluation method for measuring the competencies of nursing students (Beckham, 2013; East, Peters, Halcomb, Raymond, & Salamonson, 2014; Johnston et al., 2017; Muldoon, Biesty, & Smith, 2014). The OSCE is a standardized test that measures clinical skills, knowledge, and attitudes of nursing students in an objective and fair way, in a simulated situation (Nulty, Mitchell, Jeffrey, Henderson, & Grovest, 2011; O´Connor, King, Malone, & Guerandel, 2014). However, the OSCE does not evaluate essential aspects of clinical practice such as interprofessional communication or teamwork, as it is done individually (Johnston et al., 2017). As a result, nurse educators are incorporating new strategies for learning and evaluation into their classrooms (Royse & Newton, 2007) with the aim of improving student involvement while meeting educational needs (Johnsen, Fossum, Vivekananda-Schmidt, Fruhling, & Slettebø, 2018). More specifically, various educational methods are being used, such as active learning, simulation, concept mapping, reflective learning, flipped classrooms and educational games (Chicca & Shellenbarger, 2018; Shatto et al., 2019). The implementation of educational games helps to increase participation and knowledge among students (Clarke et al., 2017; Morrell & Ball, 2019), in addition to evaluating practical applications of theoretical content, interprofessional communication, teamwork and nursing practice skills (Clarke et al., 2017; Friedrich, Teaford, Taubenheim, Boland, & Sick, 2018; Morrell & Eukel, 2020).

Background

Several studies have shown that stress, anxiety, nervousness or feeling

intimidated can impact the results of any evaluation method, including the OSCE. These feelings and symptoms may have a negative effect on learning and evaluation and may cause negative attitudes toward this evaluation method (Muldoon et al., 2014; Selim, Ramadan, & El-Gueneidy, 2012). In addition, various studies have shown that prior preparation for the OSCE is important for nursing students, as well as the environment and the way the evaluator interacts and communicates with them (Jo & An, 2014; Johnston et al., 2017). Having a welcoming and relaxed environment helps to minimize anxiety, improving nursing students' performance on the OSCE (Jo & An, 2014; Johnston et al., 2017; Small, Pretorius, Walters, Ackerman, & Tshifugula, 2013).

In the last few years, there has been increased interest in gamification in both the educational and research fields (Brull & Finlayson, 2016). Gamification is defined as the integration of game mechanics in day-to-day processes; in other words, game design elements are used in non-game settings to achieve gameful experiences (Huotari & Hamari 2012). The creation of gameful experiences (ludic experiences) based on game elements is understood as producing psychological consequences or emotions due to the fact that the activity has gamification qualities. In other words, gamification determines the gameful experience (Deterding, Dan, Rilla, & Lennart, 2011; Huotari & Hamari 2012).

Implementing gamification in an educational setting has proved to have many positive outcomes on nursing students. In this context, it has been shown to be a more effective learning method than other traditional ones, improving knowledge retention, motivation, and meaningful learning (Brull, Finlayson, Kostelec, MacDonald, & Krenzischeck, 2017; Castro & Gonçalves, 2018), encouraging critical thinking (Brull et al., 2017; Gagnon, Gagnon, Desmartis, & Njoya, 2013), decision-making skills (Mullins & Sabherwal, 2018) and academic performance (Roche et al., 2018). The activities that

have been used with nursing students include serious games (Fonseca et al., 2015; Johnsen, Fossum, Vivekananda-Schmidt, Fruhling, & Slettebø, 2016; Johnsen et al., 2018), card games (Milner & Cosme, 2017) and more recently, escape rooms (Adams, Burger, Crawford, & Setter, 2018; Connelly, Burbach, Kennedy, & Walters, 2018; Gómez-Urquiza et al., 2019; Morrell & Ball 2019).

The escape room, used as a learning tool, is a team-based activity in which participants are closed in a room and given a scenario in which they must solve puzzles. (Kinio, Dufresne, Brandys, & Jetty, 2018). This type of game uses the latest technology in learning, and combines knowledge-based problems, clinical skills application, communication skills, teamwork (Friedrich et al., 2018; Kinio et al., 2018) and critical thinking (Nicholson, 2018). These aspects are essential to nursing students' training, which currently is centered around the use of simulation and technology in order to create safe environments to practice clinical skills (Connelly et al., 2018). Additionally, escape rooms can help incorporate simulation into students' learning using the game setting (Guo & Goh, 2016).

The studies that have explored the concept of using escape rooms with nursing students are still quite scarce, but nonetheless, escape rooms are considered to be a useful learning tool (Brown, Darby, & Coronel, 2019; Gómez-Urquiza et al., 2019). Moreover, students have reported feeling satisfied, having fun, and feeling motivated after using escape rooms as a way of learning (Adams et al., 2018; Connelly et al., 2018; Gómez-Urquiza et al., 2019; Morrell & Ball 2019). However, the studies that have been conducted have been focused on gamification and escape rooms as a learning method, not as an evaluation method. For that reason, the objective of this study was to understand the gameful experience and satisfaction of nursing students in the evaluation of their clinical skills using an escape room as compared to the traditional method of

objective structured clinical evaluation.

Methods

Design and Sample

A quasi-experimental study was carried out with an experimental group (EG) and a control group (CG). The participants were drawn from a convenience sample. A total of 237 students enrolled in the nursing degree program took part (Fig. 1). Inclusion criteria included a) being over 18 years of age; b) not being an exchange student. Because they did not possess a sufficient level of the native language used in the study. Students were randomly assigned to each group.

Instruments

Firstly, the participants' demographic characteristics were collected, including their gender, age and academic year.

Gameful Experience Scale

In order to evaluate the students' gameful experience, the Gameful Experience Scale (GAMEX) (Eppmann, Bekk, & Klein, 2018) was used. It is made up of 27 questions rated on a Likert-type scale, from 1 (never) to 5 (always). This questionnaire was adapted to a Spanish context and validated in Spanish by Márquez-Hernández et al. (2019). The questions are divided into 6 dimensions: enjoyment, absorption, creative thinking, activation (excitement, nervousness, thrill), absence of negative effects, and dominance (control over the situation). More information about the dimensions can be found in Table 2. Cronbach's alpha value (Cronbach & Shavelson, 2004) in this study was 0.83.

Satisfaction with the game

In order to measure students' level of satisfaction with the game as an evaluation tool, an ad hoc scale was designed. To create the scale, the existing literature on the topic was reviewed and a first proposal was drafted. Subsequently, the items in on scale were reviewed by a panel of experts made up of 8 nursing professors who had previously applied gamification elements in their teaching. The scale was made up of 13 questions divided into 3 dimensions: organization, the learning activity, and overall assessment (Table 3). The responses were scored on a Likert-type scale from 1 (not at all) to 4 (a lot). The total score was reached by adding up the scores for each question, giving a range of possible total scores between 13 and 52, with higher scores indicating a higher level of satisfaction with the evaluation method. Cronbach's α for the scale was 0.895.

Final evaluation

In the nursing degree program, at the end of the clinical practicum class, the students have to take a final exam. This evaluation consists of a practical exam of their clinical skills. For this study, the two groups were either evaluated using an escape room (EG), or using the OSCE (CG). An evaluation worksheet was used with 10 questions for each procedure. Each question could be evaluated with 0, 0.25, 0.5 or 1 point. Table 4 shows an example of the clinical skills evaluation.

Procedure

Prior to data collection, the study was approved by the University Institutional Review Board, and the nursing students were informed about the objective of the study, as well as the confidentiality of their data. Once the consent forms were signed, the evaluations began. The students were evaluated in a simulation laboratory.

Control Group

The CG was evaluated using the traditional OSCE, on an individual basis, each by two

146 examiners.

147 *Experimental Group*

148 In the EG, the students were evaluated in a 5-member team, by 2 examiners, in the
149 setting of an escape room. The students were evaluated in order to give students the
150 opportunity to practice delegating tasks to other students, assuming leadership roles,
151 working as a team and managing their time, as they would need to do in real nursing
152 situations (Brown et al., 2019). During the escape room scenarios, the participants had
153 to continuously solve puzzles related to the content learned during their nursing degree
154 in order to get out of the escape room within the time limit of 30 minutes. The scenarios
155 were designed around six topics or themes: wound healing, clinical safety, evidence-
156 based nursing, basic life support, advanced life support, and assistance in a multi-victim
157 accident. The students were evaluated using the ad hoc checklist described in the
158 instruments section. For each scenario, a specific evaluation sheet was used; for
159 example, for the evaluation of intervention during cardiac arrest, a scenario on advanced
160 life support was prepared (Table 4).

161 Upon concluding each evaluation, the participants were given the results of their
162 evaluation and were debriefed, which was done in a group of 5 members. The scores
163 were obtained by the group as a whole, and the students who received lower scores were
164 able to know in detail what mistakes they made. During the debriefing, each participant
165 was asked individually about the experience. Finally, the participants filled out
166 questionnaires about their game experience and their satisfaction with the game. The
167 questionnaires were completed in approximately 15 minutes, and then were deposited in
168 a box in the corner of the room in order to guarantee the anonymity of their responses.

169 Prior to the intervention, the researchers were trained to examine in the escape room

scenario. This training was carried out by a business that organizes escape rooms, which provided the material resources needed to perform the exercise properly. Those responsible for examining and completing the participants' evaluation sheets were department faculty. To avoid having any influence on the results, the examiners were in a control room. The examiners independently evaluated the nursing students to conduct a triangulation with the data obtained (inter-reliability), in order to provide reliable data. Data collection took place between January and February 2019.

Data Analysis

For data analysis, the statistical software SPSS version 25 was used. Firstly, a descriptive analysis of the results was carried out. For the quantitative variables, measures of central tendency and dispersion were calculated, while for the categorical variables, the frequency and percentage were analyzed. The non-parametric Mann Whitney U test was performed for two independent samples, while on the other hand, Spearman's correlation test was used to measure the strength of the association between variables. A value of $p<0.05$ was considered significant.

Results

Sociodemographic characteristics of the participants

The sample was made up of 237 students, of which 49.3% (n=117) belonged to the EG, and 50.6% (n=120) belonged to the CG. Regarding gender, in the EG, 72.6% (n=85) were female, and 27.4% (n=32) were male, with an average age of 23.18±5.22. On the other hand, in the GC, 75% (n=90) were female and 25% (n=27) were male, with an average age of 23.39±4.13.

Gameful Experience Scale

The results obtained on the Gameful Experience Scale are as follows: enjoyment 27.60±3.02 (range of 6-30); absorption 22.74±4.88 (range of 6-30); creative thinking 15.55±3.23 (range of 4-20); activation 16.09±2.98 (range of 4-20); absence of negative effects 4.66±2.32 (range of 3-15); and dominance 13.52±3.12 (range of 4-20).

Statistically significant differences were found between males and females in all the dimensions except that of absence of negative effects (Table 1). There was a low negative correlation between age and the activation dimension (r_s=-0.188; p=0.004), as older participants reported lower scores in the activation dimension. The mean and standard deviation of each of the responses can be found in Table 2.

Satisfaction with the Escape Room

Regarding satisfaction with the gamification activity, all the participants reported above average scores (Table 3). The highest scores were found in the questions about the activity duration (3.51±0.66), the organizers' attentiveness to the students (3.60±0.61), and the applicability of the content to their training (3.50±0.58). The total average score was 3.66±0.54.

Final Evaluation

In the EG, the average final score was 9.59±0.36, whereas in the CG it was 7.46±1.36. Statistically significant differences were found between groups on the final scores. (U=759.500; Z=-11.878; $p<0.05$).

Discussion

The objective of this study was to understand the gameful experience and satisfaction of nursing students in the evaluation of their clinical skills using an escape room as compared to the traditional method of OSCE. In relation to gamification, the nursing students gave the highest scores in enjoyment, absorption, creative thinking, activation

and dominance. In addition, the participants reported very few negative effects of the gaming experience, which is consistent with data reported in other studies (Eppmann et al., 2018; Morrell & Ball 2019; Mullins & Sabherwal, 2018). Several studies have shown that nursing students have a good time, retain information better, use critical thinking skills and improve their clinical skills with the use of gamification practices (Brull et al., 2017; Roche et al., 2018; Wingo et al., 2019). Incidentally, there were statistically significant differences found between genders, as males reported higher average scores in positive emotions towards the game than females. However, the original authors of the scale did not find differences with regards to gender (Eppmann et al., 2018). It was found that the higher the age, the lower the activation scores, which may be due to the fact that millennials seem to be the ones that most enjoy serious games (Olszewki & Wolbrink, 2017; White & Shellenbarger, 2018).

As far as satisfaction with the use of the escape room, in the experimental group, participants showed high levels of satisfaction with the escape room. Several studies have indicated that students feel satisfied with the use of escape rooms in an educational setting (Gallegos, Tesar, Connor, & Martz, 2017; Gómez-Urquiza et al., 2019; Kinio et al., 2019). Moreover, gaming activities have a positive effect, not only on satisfaction, but also on motivation and learning (Davidson & Candy, 2016; Gallegos et al., 2017; Gómez-Urquiza et al., 2019).

The nursing students from EG also positively evaluated the activity duration, the organizers' attentiveness and the applicability of the content to their training. Along the same lines, several studies also report that nursing students positively evaluate aspects of their training, such as teamwork, real-life settings, ease of communication, duration of the escape room and organization (Brown et al., 2019; Friedrich et al., 2018; Gómez-Urquiza et al., 2019).

Although several studies have shown that the OSCE (Beckham, 2013; East et al., 2014) is an effective evaluation method, in this study, clinical evaluation using an escape room demonstrated improved student performance when compared to the group the OSCE. This may be due to the fact that the OSCE may cause additional stress and increase anxiety levels among nursing students (Johnston et al., 2017; Muldoon et al., 2014; Selim et al., 2012). Modifications to the OSCE in recent years include use of peer-to-peer evaluation starting from the beginning of nurses' training in order to obtain better results. These results include decreased stress levels, a perceived decreased level of assessor discrepancy and better time utilization (Wikander & Bouchoucha, 2018). Furthermore, in the escape room, the students worked as a team under a strict time limit. Adding these elements to the evaluation forces students to react under pressure, coordinate tasks and communicate in an effective way (Brown et al., 2019; Gomez-Urquiza et al., 2019). These skills are of utmost importance for nursing professionals (Babiker et al., 2014).

On the other hand, those who took part in the escape room method of evaluation reported having a good time (Brown et al., 2019; Connelly et al., 2018; Gómez Urquiza et al., 2019), which could have caused them to forget that they were being evaluated. However, there are no prior studies that have used an escape room as an evaluation method in nursing students; rather, they have only been explored as an innovative tool for learning. Nonetheless, implementing an escape room for simulation seems to be effective in the development of essential skills for nursing, such as teamwork, delegating tasks related to patient care, cooperation, communication and time management (Brown et al., 2019).

Limitations

The results of this study should be considered in the context of several limitations. First of all, the sample was selected by convenience, which could potentially limit the generalization of the results. Secondly, literature on the use of escape rooms as an evaluation methodology is non-existent to our knowledge, which hinders the discussion of our results. In addition, data was not gathered about participants' previous experience in escape rooms or with gamification, which would have enriched the discussion of the results. Lastly, the degree of satisfaction and usefulness for any teaching staff involved in the activity was not measured, which would have allowed us to get an even deeper understanding of their level of satisfaction with this type of evaluation. Likewise, the degree of student satisfaction with the OSCE was not measured, which would have allowed us to make a greater comparison between the results obtained and both methodologies. Further research must be performed to measure the impact of planning and creating escape rooms with the aim of evaluating students on institutional and human resources.

Conclusion

Escape rooms are a useful tool in the evaluation of nursing students. Satisfaction levels with this type of method are high, with little to no negative effects during the gamification experience. Escape rooms offer high levels of enjoyment, absorption, creative thinking, activation and dominance, which leads to better learning and evaluation. Escape rooms, as a method of clinical evaluation, show better results than the OSCE, which could indicate that they may become a new means of evaluation to accompany those that are typically used in this field.

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444 Table 1. Mean and standard deviation of each GAMEX dimension by sex

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Dimension	Men		Women		p
	M*	SD**	M*	SD**	
Enjoyment	26.35	3.61	28.07	2.65	**0.011**
Absorption	20.96	4.89	23.41	4.73	**0.013**
Creative Thinking	14.43	3.35	15.97	3.10	**0.013**
Activation	14.90	3.27	16.54	2.76	**0.015**
Absence of Negative Effects	5.06	2.56	4.51	2.22	0.339
Dominance	12.00	3.22	14.09	2.90	**0.001**

446 *Mean
447 **Standard Deviation
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466 Table 2. Mean and Standard Deviation for each item of GAMEX

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Items	M*	SD**
1. Playing the game was fun.	4.65	0.56
2. I liked playing the game.	4.69	0.56
3. I enjoyed playing the game very much.	4.46	0.78
4. My game experience was pleasurable.	4.55	0.59
5. I think playing the game is very entertaining.	4.78	0.47
6. I would play this game for its own sake, not only when being asked to.	4.44	0.81
7. Playing the game made me forget where I am.	4.04	0.98
8. I forgot about my immediate surroundings while I played the game.	3.75	1.09
9. After playing the game, I felt like coming back to the "real world" after a journey.	3.36	1.09
10. Playing the game "got me away from it all."	3.56	1.09
11. While playing the game, I was completely oblivious to everything around me.	3.67	1.07
12. While playing the game, I lost track of time.	4.37	0.94
13. Playing the game sparked my imagination.	4.08	0.83
14. While playing the game, I felt creative.	3.73	0.97
15. While playing the game, I felt that I could explore things.	3.87	0.95
16. While playing the game, I felt adventurous.	3.86	0.95
17. While playing the game, I felt activated.	4.63	0.63
18. While playing the game, I felt jittery.	3.72	1.18
19. While playing the game, I felt frenzied.	3.62	1.18
20. While playing the game, I felt excited.	4.13	0.97
21. While playing the game, I felt upset.	1.51	0.90
22. While playing the game, I felt hostile.	1.36	0.70
23. While playing the game, I felt frustrated.	1.79	1.07
24. While playing the game, I felt dominant/I had the feeling of being in charge.	2.99	1.01

25. While playing the game, I felt influential.	3.48	0.88
26. While playing the game, I felt autonomous.	3.36	1.02
27. While playing the game, I felt confident.	3.69	0.93

*Mean
**Standard Deviation

Table 3. Average scores of satisfaction with the Escape Room.

Item	M*	SD*	Range
Activity organization	3.27	0.76	1-5
Room conditions for learning	3.16	0.79	1-5
Activity duration	3.51	0.66	1-5
Activity timetable	3.34	0.85	1-5
Organizers' attentiveness to students	3.60	0.61	1-5
Knowledge gained	3.31	0.32	1-5
Methodology used for the desired objectives	3.34	0.68	1-5
Teaching methods	3.26	0.71	1-5
Educational materials	3.15	0.74	1-5
Teaching support materials (computer, board, etc.)	3.35	0.70	1-5
Fulfillment of the activity's goal	3.48	0.56	1-5
Applicability of content to training	3.50	0.58	1-5
Overall opinion of the activity	3.66	0.54	1-5

*Mean
**Standard Deviation

508 **Table 4. Example of an evaluation in a cardiac arrest case.**

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Cardiac Arrest	Score			
	0	**0.25**	**0.5**	**1**
Items				
1. Recognizes the situation of cardiac arrest.				
2. Places the bed in supine position.				
3. Removes the pillow and moves behind the patient to access airways.				
4. Places hands in the correct area to begin chest compressions.				
5. Monitors as soon as possible and identifies the pulse.				
6. Inserts a cannula and then an endotracheal tube.				
7. Perfoms 30 chest compressions and 2 rescue breaths.				
8. They do not synchronize when the patient is intubated and the student ventilates every 6 seconds with the AMBU®				
9. Correctly places an intravenous catheter				
10. Correctly identifies the drug to be administered				

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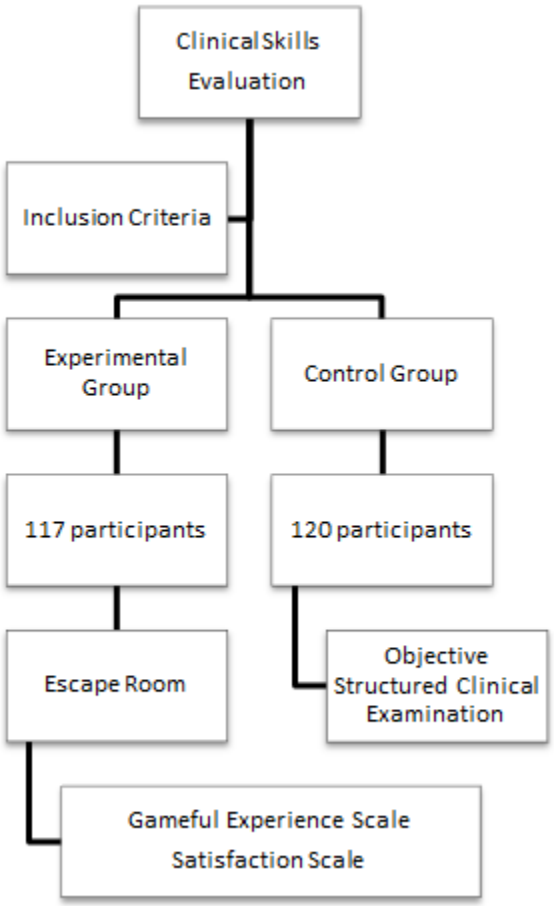

Figure 1. Flow diagram of participants