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Research

Nursing students' opinion on the use of Escape ZOOM[®] as a learning strategy: Observational studyMariana L.R. Cunha^{1*}, Humberto Dellê², Ellen C. Bergamasco¹, Thomaz A.A. Rocha e Silva¹¹ Faculdade Israelita de Ciências da Saúde Albert Einstein, Hospital Israelita Albert Einstein, SP, Brazil² Postgraduate Program in Medicine, Universidade Nove de Julho (UNINOVE), São Paulo, Brazil

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ABSTRACT

The teaching–learning process has gone through major changes due to the COVID-19 pandemics and it has been left to professors to adapt the teaching process and find ways to keep students engaged. There has been a need to establish collaborative and active strategies for working in the online environment. The development of a game for both teaching and evaluating de interdisciplinary learning content on an online platform may create a gameful experience and stimulating environment that makes complex learning goals achievable. To analyze how nursing students feel in relation to their participation and learning in an Escape Room activity taking place in an online environment. This is a descriptive and exploratory cross-sectional cohort study. The study was carried out in a higher education institution. The sample consisted of 73 students. After implementation of Escape Zoom[®] in the first semester of 2021, adapted questionnaires to assess students' satisfaction and perception of learning were applied. In the Educational Practices Questionnaire, all statements obtained greater than 70% agreement, which revealed students' satisfaction, especially with learning with colleagues. As for learning, 93.2% of students' statements expressed that the Escape Zoom[®] favors teamwork and 91.8% of student's statements agreed that the activity is effective for learning and would recommend it to other colleagues. The Escape Zoom[®] is an effective teaching strategy, perceived with satisfaction by students as a form of learning with colleagues, in a game-oriented way. It also has the potential to promote the development of soft skills.

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Introduction

The statement by the World Health Organization (WHO) (World Health Organization, 2020) announced in March 2020 of a pandemics caused by SARS-CoV-2 (the virus that causes COVID-19) determined, among other actions, social distancing as a measure to reduce new cases of the disease and mortality rates. This action has led educational institutions to apply major and emergency changes in the way teaching models were provided, seeking alternatives that could maintain the teaching–learning process.

Nevertheless, formal education has undergone important transformations in the last decade due to changes in the professional environment, expansion of globalization, intensification of the use of technologies and diversity of students' learning styles, which has demanded the re-elaboration of academic projects in universities (Lopes et al., 2018). Online technology has had a more prominent role during the pandemics as a way to maintain school activities, despite social distance.

In higher education, technology integrates various spaces and times, in which professors need to maintain face-to-face communication in the midst of the digital domain. On the other hand, technology allows the proposition of more innovative methods such as games and challenges of active and collaborative learning, allowing each student to develop autonomy, sense of competence and relatedness (Mekler et al., 2017).

Active methods are those that strengthen student autonomy by turning them into the center of the learning process, while the professor is the mediator of the process (Farias et al., 2015). Collaborative learning is a set of pedagogical approaches in which students and instructors develop group activities; it implies mediated interaction to achieve a shared objective based on negotiation and shared construction of knowledge, making use of the many particular skills participants have (Lopes et al., 2018; Zamora & Nunez, 2017).

Background

Collaborative work and teamwork are characteristics of health services and therefore, are skills expected professionals to have. These skills need to be developed since graduation, especially in Nursing

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school (Earnest et al., 2017). In addition, nurses work in complex environments that require clinical reasoning and decision-making (Anguas-Gracia et al., 2021) so that high-quality and safe care can be provided to patients. However, part of the teaching methodologies adopted in nursing school is traditional and does not promote or limit students to activities that are more active or that value a collaborative.

For active teaching methods, gamification, in which there is the introduction of design elements and game experiences in the learning process, stands out (Dichev & Dichev, 2017). The use of games in education has the potential to motivate students, improve student engagement, and promote behavioral changes, friendly competition, collaboration, teamwork, real-world problem-solving skills (Dichev & Dichev, 2017; McCoy et al., 2016; Putz et al., 2020) and knowledge retention, regardless of age or gender; it also encourages the development of practical and social skills. The Escape Room®, or escape rooms, is based on knowledge constructed as it makes sense for the individual to develop life experiences and learning styles in groups (Morrell & Eukel, 2020). The pedagogical challenges provided by the Escape Room model have been disseminated to nursing courses in different countries, promoting the acquisition of skills in situational contexts. Some examples are intensive care learning (Morrell & Ball, 2020), care for patients of intermediate level of complexity, students in the initial years of training (Roman et al., 2020), cardiac patient care (Morrell & Eukel, 2020), among others. The student's perception of Escape as a learning strategy was described as positive, mainly concerning team work and communication skills (Roman et al., 2020).

However, the social distancing required during the COVID-19 pandemic prompted lecturers to plan an activity based on the Escape Room® principles of active and collaborative learning and interdisciplinarity but this time using Zoom®, one of the most popular digital videoconferencing platforms. This technology-mediated project was called Escape Zoom®.

Escape Zoom® is an innovative strategy and its limits, advantages and disadvantages still need to be elucidated through specific studies. The intention of this study was to analyze the opinion of nursing students in relation to their participation in, and learning with, the Escape Zoom®. It is expected that the implementation of an interdisciplinary learning protocol in a virtual scenario based on the Escape Room experience can corroborate with the engagement and with more effective learning results among nursing students during the pandemics. The objective was to verify if the Escape Zoom® strategy was effective for students learning and evaluation.

Method

This is a descriptive and exploratory cross-sectional cohort study that applied a quantitative approach. This report is according to the Protocol Strengthening the Reporting of Observational Studies in Epidemiology guidelines (Observational cohort).

The study sample consisted of 73 students from three classes, taking the third semester of nursing school who underwent the Escape activity. The choice for working with students taking the third semester of nursing school is due to the fact that these students normally participate in interdisciplinary activities while taking Semiology, Health and Disease II and Pharmacology, which are subjects comprising the curriculum of the third semester. Each subject is taught by a specific lecturer. All students that performed the activity were included, but those who did not agree to answer the participant's experience questionnaire (described ahead) were excluded. The size of the sample was defined as the number of students regularly enrolled on third semester.

This study was carried out in a Higher Education Institution in health care located in the city of São Paulo, Brazil. The institution has approximately 20,000 students enrolled in *lato* and *stricto* sensu graduate courses. The nursing school has been strong in adopting

active teaching methodologies such as team-based learning, collaborative learning, and simulation, among others.

Description of the Escape Zoom® Game

The game was developed using a specific clinical case (a patient with acute myocardial infarction [AMI]) and aimed at achieving the following learning objectives:

- Learn to apply the pathophysiological process of AMI
- Learn how to consider the risk and injury factors
- Learn to work (action, dosage) with the drugs for the treatment of High Blood Pressure.
- Learn to treat dyslipidemia and AMI
- Learn how to choose the best course of care to be performed to the patient after an AMI event (physical examination, medication, and general care).

The activity consisted of eight sequential tasks that addressed the following issues: Risk factors for AMI, pharmacology related to the topic, medication calculation, anamnesis, physical examination, and interpretation of exams.

Escape Zoom® used two digital platforms: Zoom® and Google Forms® in order to apply crossword tasks, graph interpretation, puzzle, and problem-solving tasks. The Zoom® platform was used to virtually connect the professor and student groups. Each class was divided into four groups of approximately eight students, and each group was assisted by one professor.

The activity was hosted by the course coordinator. When starting, the host divided the groups—including the professors—into breakout rooms, a tool that creates independent, and private rooms that operate simultaneously in the virtual meeting. The clinical case used in the activity was informed by the host that provided a link to Google Forms®, which had the first task to be done by students. A summary of the clinical history, history of patient's habits, and test results were provided to students. Based on previous information, each team should discuss what the possible risk factors the patient presented for an AMI and should formulate an answer. The correct answer generated a password. Only after students had provided the correct answer (password), the next task was made available, and so on and until the eighth (last) task was available. The last task generated a code that let students exit the Escape Zoom®, establishing that students had finished the activity.

This activity was adopted as an evaluation method that lecturers used to assess student learning outcomes.

Data Collection

Data were collected after implementation of the Escape Zoom® activity in the first half of 2021, in two independent sessions with 47 and 26 students each. Immediately after the activity, students were invited to fill a form with the following parameters. We initially collected demographic data such as gender and age. The participants' experience was evaluated at the end of the activity through two instruments: Educational Practices Questionnaire, adapted to the Portuguese language by Almeida et al. (2016) with 12 items, subdivided into four dimensions, namely: active learning, collaboration, different ways of learning, and high expectations. The other instrument was the Perception Scale adapted from the work of Eukel et al. (2017), with 11 items subdivided into three dimensions: support for learning, learning activity, and collaborative learning. The instruments were adapted by the authors specifically for the present work. The questions applied are shown in Table 1.

The answers were presented as scales that were defined as: I strongly agree with the statement; I agree with the statement; I

Table 1
Instruments used to evaluate participants experience.

Educational Practices Questionnaire [adapted from Almeida et al., 2016]	
Q1 - During the activity I had the opportunity to discuss with other students the ideas and concepts taught in the course	
Q2 - I actively participated in the discussions during the activity	
Q3 - I had the opportunity to think further about my knowledge	
Q4 - I learned from the comments made by colleagues during the activities	
Q5 - I had the opportunity to discuss the objectives of the activity with my professor	
Q6 - Participating in the activity turned my learning time more productive	
Q7 - I had the opportunity to work with my colleagues during the activity	
Q8 - During the activity, my colleagues and I had to work on the clinical case together	
Q9 - The activity offered several ways to learn the content of the course	
Q10 - This activity offered a variety of ways to assess my learning	
Q11 - The activities goals were clear and easy to understand	
Q12 - My professor communicated the goals and expectations to be achieved during the activity	
Perception Scale [adapted from Eukel et al., 2017]	
Q1 - The virtual escape room encouraged me to think about the material in a new way	
Q2 - I would recommend this activity to other students	
Q3 - I learned from my colleagues during the virtual room	
Q4 - The virtual room is an effective way to review the topic of AMI, Nursing care and drugs used to treat patients with this condition	
Q5 - The virtual escape room is an effective way to learn information related to the clinical conditions of AMI patients	
Q6 - I learn better with the game format than the lecture	
Q7 - I feel that I was able to engage with my teammates to learn the material	
Q8 - It was difficult for me to focus on learning because I was feeling stressed or overwhelmed	
Q9 - Non-educational parts (e.g. crossword puzzles) distracted me from learning about clinical conditions of AMI patients	
Q10 - I prefer to gather information from multiple sources for my learning	
Q11 - In general, I enjoy playing games (e.g. video games, board games, social media games)	

neither agree nor disagree with the statement; I disagree with the statement; I strongly disagree with the statement. For data interpretation, responses were grouped as agreement (strongly agree and agree), and non-agreement (neither agree nor disagree, strongly disagree, or disagree). Still, there were questions in which the last two answers were also gathered into a group called disagreement.

Data Analysis

To evaluate the quantitative data, we assigned a numerical value to the answers, as follows: 1—I strongly disagree; 2—I disagree; 3—neither agree nor disagree; 4—agree; 5—I strongly agree. Thus, a statistical analysis of the questions grouped in the variables of each scale was performed. Also, for the combined analysis of the scales, the variables were respectively grouped according to the dimensions addressed. The groupings of dimensions are shown in Table 2.

When applicable, data are presented as mean \pm SD and correlation was determined by Spearman's test with $p < 0.05$ considered significant.

Ethical Considerations

The study was conducted in accordance with Brazilian legislation and was approved by the Institutional Board Review of the study institution under number 4,533,395.

Results

The sample consisted of 73 students who consented to participate in a survey for which answers were provided online. Most students were women (93.1%). The mean age was 22.1 years ($SD = 5.0$). The survey responses are shown in Fig. 1.

The answers provided to the Educational Practices Questionnaire had greater than 70% agreement. It is noteworthy that the questions addressing active learning and teamwork had 97.2% agreement (Q1 and Q8) while learning from colleagues' comments (Q4) had 95.8% agreement.

The statements with the lowest agreement (80.8 and 83.6%) were those related to the communication of the activity goals and expectations by the lecturer and the statement that the activity made the learning time more productive (Q5 and Q6). Those were also the questions with highest levels of non-agreement rates and grouped as "strongly disagree," and as "disagree" and "neither agree or disagree," with 19.2% and 16.4%, respectively.

The Perception Scale also produced high agreement rates, but in 3 of the 11 items answers varied greatly. The most agreed topic was on teamwork, with 93.2% (Q3), followed by the recommendation of the activity to other students, with 91.8% (Q2) and effectiveness and encouragement of learning using the virtual room (Q4 and Q5), with 91.8% and 90.4% agreement, respectively. The statements with the lowest agreement rates were the preference for various sources of information for learning, with a non-agreement rate of 41.1% (Q10), and better learning in game format compared to lectures, with 27.4% of non-agreement rate (Q6). Q10 was one of the three questions that generated the most varied answers.

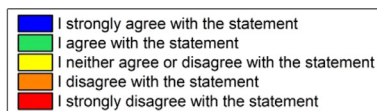
Two statements of the perception instrument express a negative perception toward the methods and thus a disagreement with these statements represent, in turn, a positive position toward the method. These statements are Q8—It was difficult for me to focus on learning because I was stressed or overwhelmed and Q9—Non-educational parts (e.g., crossword puzzles) distracted me from learning about the clinical conditions in AMI patients. Either statement had "strong agreement" of 31.5% rate and "agreement" of 11% and 8.2% rates, respectively, these being the highest rate of negative opinions in relation to ESCAPE. The general disagreement was 45.2% for Q8 and 50.7% for Q9.

The counting resulting from each dimension (Table 3) shows that for the most part of participants were satisfied with the activity, with accumulated points being above 4.0 (80%), on average. The highlight is the average collaboration dimension in the Educational Practices Questionnaire with 4.8 ($SD \pm 0.6$) points, showing a strong teamwork character of the Escape Zoom® activity. On the other hand, the learning dimension in the Perception Scale was the only one lower

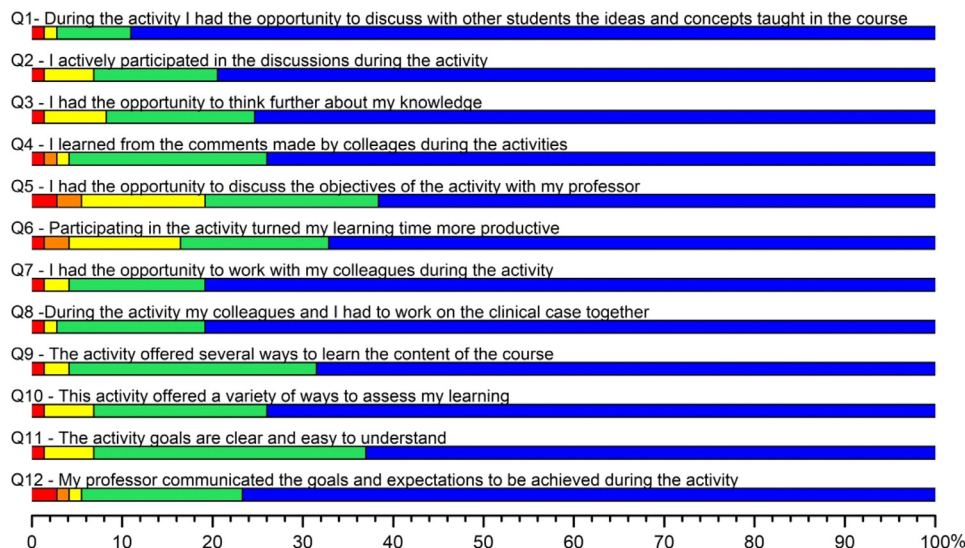
Table 2
Representative questions for each of the dimensions addressed in the scales used.

Educational practices		Perception		Grouping
Dimension	Questions	Dimension	Questions	Grouped variable
Active learning	Q1 to Q6	Support for learning	Q1. Q3. Q4. Q5. Q6 and Q10	Learning
Collaboration	Q7 to Q8	Collaborative learning	Q7	Group learning
Different ways to learn	Q9 and Q10	Learning activity	Q2. Q8. Q9 and Q11	Activity
High expectations	Q11 and Q12	---	---	Expectation

Q, question.



EDUCATIONAL PRACTICES



PERCEPTION

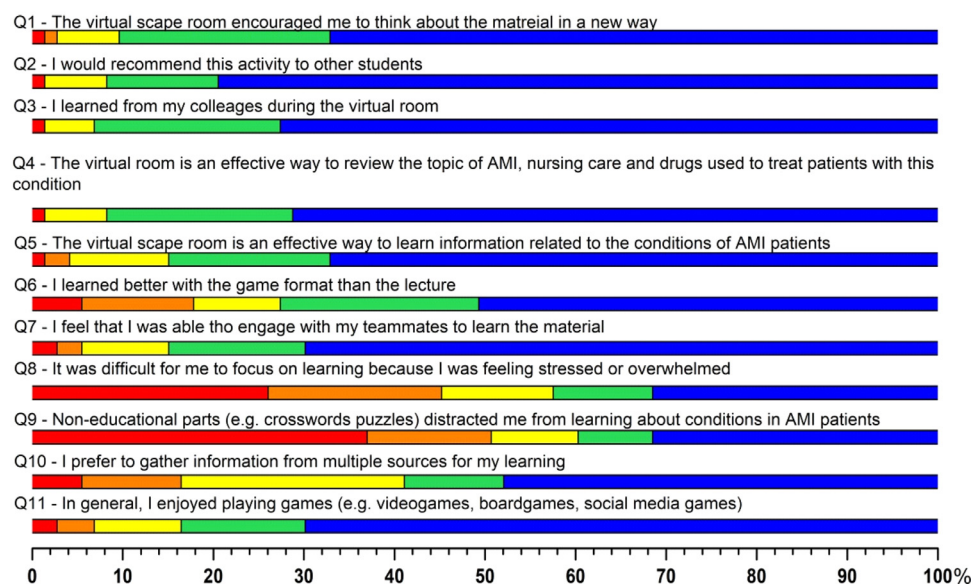


Fig. 1. Students' answers provided to the survey "Educational Practices Questionnaire" and "Perception Scale."

Table 3

Average of points and rates of responses to each dimension of the scales according to the grouping of questions.

Educational practice	Average (SD)	I strongly disagree (%)	I disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
Active learning	4.6 (0.8)	1.6	1.1	6.8	16.0	74.4
Collaboration	4.8 (0.6)	1.4	0.0	2.1	15.8	80.8
Different learning methods	4.6 (0.7)	1.4	0.0	4.1	23.3	71.2
High expectations	4.6 (0.8)	2.1	0.7	3.4	24.0	69.9
Perception						
Support for learning	4.4 (1.0)	2.7	4.6	10.7	19.2	62.8
Collaborative learning	4.5 (1.0)	2.7	2.7	9.6	15.1	69.9
Learning activities	3.8 (1.5)	16.8	5.8	9.6	14.7	53.1

SD, standard deviation.

Table 4

Average of point value and percentage rates of answers obtained with both surveys, for each grouped dimension.

Variable	Average (SD)	I strongly disagree (%)	I disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly agree (%)
Learning	4.5 (0.9)	2.2	2.9	8.8	17.6	68.6
Group learning	4.7 (0.8)	1.8	0.9	4.6	15.5	77.2
Activity	4.1 (1.4)	11.6	3.9	7.8	17.6	59.1
Expectation	4.6 (0.8)	2.1	0.7	3.4	24.0	69.9

SD, standard deviation.

than 4.0 points on average, probably because the two of the questions were negative, that is, the answer with greater satisfaction gives a lower score.

By grouping the variables of each scale in four dimensions, the mean scores were all greater than 4.0 (80%) and the emphasis was on group learning (4.7; SD +/- 0.8) reinforcing the collaborative nature of Escape Zoom® (Table 4).

The grouping of dimensions allowed us to perform a Spearman correlation analysis that revealed a positive relationship between most dimensions, as shown in Table 3: Group Learning and Learning (r 0.697, $p < 0.05$); Group Learning and Activity (r 0.291, $p < 0.05$); Group Learning and Expectation (r 0.595, $p < 0.05$); Learning and Expectation (r 0.705, $p < 0.05$).

Table 5 shows that most dimensions correlate positively, except between Learning and Activity and between Activity and Expectation.

As for students age, there was no correlation with the dimensions of the scales, demonstrating that there is no influence from the point of view of the participants. Nonetheless, in only one question of the scales this correlation was presented. By setting an age cutoff at 23 years, we observed that question 9 of the Perception Scale [Q9–Non-educational parts (e.g., crossword puzzles) distracted me from learning about clinical conditions of AMI patients] which scored second lowest in this work, was inversely correlated with age. In other words, the dissatisfaction of participants over 23 was significantly lower than that of younger participants. This correlation is illustrated in Fig. 2.

Discussion

This study presented an analysis of the perception of students at nursing school on participation in and learning from a teaching–learning proposal using the Escape Zoom® modality. The proposal is innovative in promoting, amid the context of the pandemic and social isolation, an activity on a virtual platform that favors active and collaborative learning. It is noteworthy that no other educational program has yet adopted the strategy, as far as we know.

The students' perception favored the adoption of the Escape Zoom® as a teaching and learning program, and recommended its adoption in other disciplines. Previous studies using the Escape Room showed similar results (Anguas-Gracia et al., 2021; Gómez-Urquiza et al., 2019; Nadelson & Nadelson, 2020).

Active teaching methods facilitate learning by promoting student engagement in teams, being able to promote positive emotions and

self-efficacy, despite the fact of being an online activity (Jeong et al., 2019), as our study has shown. After some time doing online activities during the pandemic, students have shown lack of interest and motivation to engage in teaching strategies (Sessions et al., 2022) in which interactivity among students is not perceived, which in this case aligns with the positive perception of Escape Room online.

Group case discussion, the absorption of knowledge resulting from the interaction with colleagues and the resolution of team activities were highly regarded and expressed in the high rate of agreement among students. These results corroborate the findings of previous studies and confirm the escape method as a powerful strategy to facilitate learning among students in the nursing school. This is true not only for the learning of theoretical content, but also for the development of soft skills such as decision making, teamwork, and negotiation (Anguas-Gracia et al., 2021).

There were lower agreement rates when students were asked about the clarity of the activity's goals and whether they understood what the professors' expectations were regarding their role in Escape Zoom; this finding reveals opportunities for improvement next time the Escape Zoom is adopted and should be considered by lecturers when proposing activities in the form of games (San Martín-Rodríguez et al., 2020), especially in online environments. This can be explained by the novelty in the use of Escape and less familiarity with this teaching strategy in places where the study was carried out.

The Escape as an educational strategy stimulates the sense of adventure as a means of engagement for learning (Nadelson & Nadelson, 2020), and in our study, we show that this perception remains regardless of the student's age. The results also reveal that the use of gameful activities such as crosswords and puzzles was not seen as sources of distraction but rather strategies that helped with learning. Interestingly, students aged 24 or over were more satisfied with these strategies than younger students.

Another important fact was the emphasis given to the method as something that does not stress or overwhelm students with learning, despite the fact that the activity was used as a way to evaluate students. This finding opposes others from a recent study in which escaping was not exempt from generating negative perceptions in students who identified the method as something that induces a high level of stress in students (Anguas-Gracia et al., 2021). On the other hand, a different study highlighted the importance of nursing students learning to work under pressure as a preparation for the complex health environment they are likely to face in their professional future (Gómez-Urquiza et al., 2019).

Our results corroborate the findings of previous studies by identifying that this activity has interesting characteristics for the training of health professionals, such as the potential for developing problem-solving skills, clinical reasoning, teamwork, demonstration of theoretical knowledge in practice (Morrel & Ball, 2020), promoting student engagement, keeping students motivated and competitive (Roman, 2020), facilitating retrieval of content developed in the classroom (Gómez-Urquiza et al., 2019), encouraging real-life clinical problem solving, and practice stress management on a time scale as if it were real life (Anguas-Gracia et al., 2021).

Our initiative to plan a virtual Escape Room met the interests of a generation of future nurses who are quite accustomed to interacting

Table 5

Correlation analysis (Spearman) between the learning dimensions, group learning, activity, and expectation.

	Learning	Group learning	Activity	Expectation
Learning	-	0.697*	0.123..	0.705*
Group learning	0.697*	-	0.291*	0.595*
Activity	0.123..	0.291*	-	0.228..
Expectation	0.705*	0.595*	0.228..	-

* $p < 0.05$.

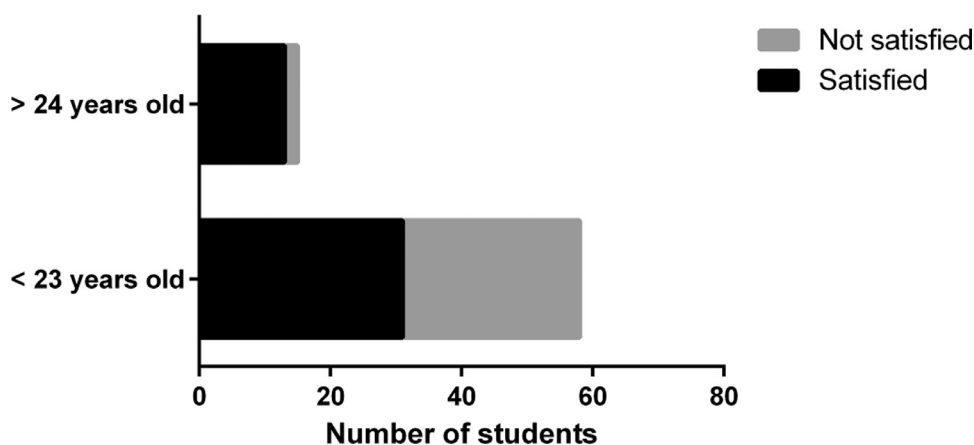


Fig. 2. Satisfaction rates related to Q9 of the Perception Scale, with participants divided into two age groups. There was a correlation between older age and lower distraction related to non-educational activities (crosses, riddles, etc.).

with games and sources of information on websites and digital platforms, which possibly potentiated interest and engagement in the method. It should be noted that the proposition of activities based on technology has other benefits that need to be addressed in nursing education, which is digital education and literacy (Martín-Rodríguez et al., 2020).

The application of the Escape method in a virtual platform proved to be a low-cost activity. Nonetheless, it demanded a lot of time investment on the part of the lecturers who conceived and put the game into practice.

Lastly, the Escape also served as a tool to evaluate the learning strategy, aligned to higher levels of Bloom's Taxonomy. It is noteworthy that there are several teaching methodologies used to teach students, but quite often evaluative processes address the lower level of learning, as knowledge and understanding, limiting the development of logical skills (Anees, 2017). Historically, individual student's performance in interdisciplinary activity through traditional summative assessment has been less effective, besides the fact of being more stressful.

Limitations and Further Studies

Although we obtained results that show student satisfaction with the use of Escape Zoom, we know that the strategy has limitations, mainly related to its novelty. In addition, the sample selected for convenience may limit the generalization of our results.

Another important limitation was the need to adapt instruments that are used to evaluate the simulation. It should be noted that this adaptation was made freely by the authors and no methodological study was carried out for this purpose.

As a suggestion for future studies, we highlight the need to compare student performance using the Escape Zoom strategy and other teaching–learning methods.

Conclusions

Regarding the analysis of Escape Zoom® as an educational method, the high level of agreement expressed by students indicates that this strategy was perceived as positive, mainly due to the possibility of collaborative learning, and for promoting a different way of learning and being evaluated.

We also observed that the perception was very positive in terms of the activity that promotes teamwork and the fact that students recommended its adoption by other disciplines and its effectiveness for learning and reviewing the specific topic, which in this case was acute myocardial infarction. Altogether, our study shows that the

Escape Zoom® strategy can be used for the teaching–learning process in nursing school.

Nurse Educator Implications

The experience acquired with this proposal allows us to list some points that must be considered for the proper execution of the activity. Are they:

- The game proposition must be aligned with the learning objectives designed for the level of students. This is the starting point, because, sequentially, the selection of previous material, content and tasks will be consistent with what is expected to be achieved.
- The time estimation for each phase of the activity must be well done and, if possible, tested in advance with volunteer students who will not pass the real test.
- The case report must be formatted so that the information is clear and easy to identify.
- The degree of technical difficulty of the exercises can interfere in the performance of the students, that is, very complex exercises can take away the focus that is the application of the content in the resolution of the problems.
- It is important that the teacher only manifests himself when requested (for tips);
- The teacher should note possible weaknesses of the exercises, in order to improve them for the next applications.
- It is important that all students test their devices (audio and camera) before starting the activity.

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Declaration of Competing Interest

To whom it may concern, the authors declare no conflicts of interests in the article.

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