

## Realistic simulation and gamification in first aid for the Physiotherapy course

## Simulação realística e gamificação em primeiros socorros para o curso de Fisioterapia

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**ABSTRACT | INTRODUCTION:** First aid is the initial procedures and measures provided to victims suffering from a sudden or traumatic illness from the location of the event until the arrival of the specialized emergency service. One of the ways to learn first aid is through teaching based on realistic simulation. **OBJECTIVE:** To describe simulation-based training and gamification used during first aid classes with second semester physiotherapy students. **METHODOLOGY:** This is a descriptive study with a qualitative approach. Theoretical-practical activities were developed in the classroom and the simulation laboratory with physiotherapy students. In the classroom, the teacher presented and discussed the concepts of different situations in which first aid is applied. For practical classes, clinical cases were proposed in which students had to carry out appropriate actions on mannequins or themselves, depending on the situation simulated. To measure the perception of these students, they were asked to respond to a validated questionnaire called the Satisfaction with Simulated Clinical Experiences Scale. **RESULTS:** The present work showed that students were generally satisfied with the simulated practical classes, despite three items in the questionnaire having obtained lower percentage marks. **CONCLUSION:** Simulation-based teaching should be encouraged in undergraduate physiotherapy courses due to the potential benefits described in this work, according to the academics' responses to the questionnaire items.

**KEYWORDS:** Simulated Training. Teaching. First Aid.

**RESUMO | INTRODUÇÃO:** Primeiros socorros são os procedimentos e medidas iniciais prestados às vítimas acometidas por mal súbito ou traumático, desde o local do evento até a chegada do serviço de socorro especializado. Uma das formas de aprendizagem de primeiros socorros é por meio do ensino baseado em simulação realística. **OBJETIVO:** Descrever o treinamento baseado em simulação, bem como a *gamificação* utilizada durante as aulas de primeiros socorros com acadêmicos do segundo semestre de Fisioterapia. **METODOLOGIA:** Trata-se de um estudo descritivo com abordagem qualitativa. As atividades teórico-práticas foram desenvolvidas em sala de aula e no laboratório de simulação com acadêmicos de Fisioterapia. Em sala de aula, a docente apresentou e discutiu os conceitos sobre diversas situações em que os primeiros socorros são aplicados. Para as aulas práticas foram propostos casos clínicos nos quais os estudantes tiveram que realizar as condutas adequadas nos manequins ou neles próprios, de acordo com a situação simulada. A fim de mensurar a percepção desses acadêmicos, foi solicitado que respondessem a um questionário validado denominado Escala de Satisfação com as Experiências Clínicas Simuladas. **RESULTADOS:** O presente trabalho mostrou que, de forma geral, os acadêmicos ficaram satisfeitos com as aulas práticas simuladas, apesar de três itens do questionário terem obtido percentuais de notas mais baixas. **CONCLUSÃO:** O ensino baseado em simulação deve ser incentivado nos cursos de graduação em Fisioterapia, devido aos potenciais benefícios descritos neste trabalho, segundo as respostas dos acadêmicos obtidas nos itens do questionário.

**PALAVRAS-CHAVE:** Treinamento Simulado. Ensino. Primeiros Socorros.

## 1. Introduction

First aid is the initial procedures and measures provided to victims suffering from a sudden or traumatic illness from the location of the event until the arrival of the specialized emergency service. When performed correctly, these procedures interfere with the victim's prognosis and survival<sup>1-3</sup> because the objectives of first aid consist of preserving life, relieving suffering, preventing new illnesses or injuries, and recovering the victim.<sup>4</sup>

Therefore, first aid classes must be able to present first aid procedures adequately and efficiently so that students and future professionals know how to apply the procedures in the most diverse first aid situations and save the life of the victim.<sup>5</sup>

One of the ways of learning first aid, already widespread, is through teaching based on realistic simulation, an active methodology that uses a controlled environment and mannequins. In this way, hypothetical situations from reality are reproduced, allowing the student to repeat the procedures with the possibility of errors, feedback, evaluation, and reflection to develop skills to perform the procedures without the risk of causing harm to the patient.<sup>6-8</sup>

Simulation-based teaching consists of a methodological sequence: introduction to the environment, briefing (information about the simulated scenario), simulation practice, and debriefing (interactive and reflective discussion about the simulated practice). In simulation-based teaching, debriefing is considered the most crucial moment because it allows students to reflect on the simulated scenarios and the behaviors carried out, with the teacher as a facilitator of knowledge.<sup>9</sup>

According to Alves et al.<sup>10</sup> and Rourke<sup>11</sup>, realistic simulation is an experiential learning methodology that allows the student to participate in an event close to the real thing, providing excellent knowledge retention, autonomy, security, leadership skills, teamwork, and critical thinking to participants in the simulated situation. Therefore, realistic simulation is one of the teaching methodologies that can offer an additional benefit to traditional training.

However, despite these advantages, in Brazil, realistic simulation is still little used, and the main barriers to this are organizational, including teaching staff training, high initial costs for setting up laboratories, and the continuous demand for resources, such as equipment, environments, and personnel. Furthermore, there is a need for engagement and training of teaching staff because there is an increase in the workload required to prepare scenarios and simulated situations, as well as the ratio of the number of students per teacher.<sup>10</sup>

Given the facts presented, the present study aims to describe the training based on simulation and the gamification used during first aid classes with students in the second semester of physiotherapy and disseminate the results obtained through these strategies.

## 2. Methodology

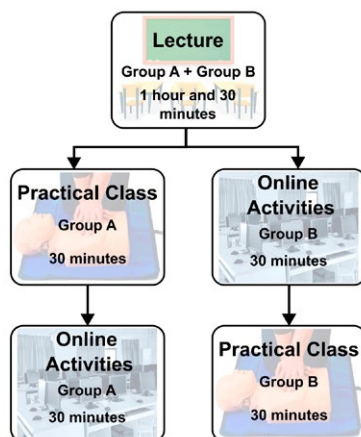
The present work is a descriptive study with a qualitative approach, carried out during the theoretical-practical teaching of the first aid discipline of the bachelor's degree in Physiotherapy, taught at a Higher Education Institution (HEI) in Vale do Itajaí (SC), with 25 academics who agreed to participate by previously signing the Free and Informed Consent (IC) and authorization by the HEI Ethics and Research Committee, opinion nº 6.190.922.

The pedagogical activities took place between July and October 2022. They were developed in the classroom and the simulation laboratory through expository and practical classes supervised by the teacher responsible for the discipline. In the classroom, the teacher presented, discussed, and demonstrated the concepts and techniques used in the different situations in which first aid is applied, such as initial approaches to the victim, vertigo, fainting, convulsions, cardiorespiratory arrest (CRA), cardiopulmonary resuscitation (CPR), foreign-body airway obstruction (FBAO), sprains, dislocations, fractures, injuries, hemorrhages, burns, and heatstroke.

The scenarios for the realistic simulation were prepared in the IES simulation laboratory, with an appropriate structure for each station. As physical resources, medium and high-fidelity mannequins, and support materials for emergency care, such as gauze, cotton, bandages, adhesive tapes, and compresses, were used.

The first two class periods were expository using a multimedia projector. In the last two class periods, simulated practical classes were held. As the class was made up of 34 students, it was divided into groups A and B, so for one week, group A was the first to practice in the realistic simulation laboratory. In contrast, group B carried out online activities in the classroom. The following week, this order was reversed, and so on. Figure 1 shows a flowchart of this division.

Figure 1. Layout of classes and class divisions



Source: the authors (2023).

The proposed online activities consisted of a Google Forms questionnaire with questions about the subject covered in the lecture. For some of the content covered, videos that showed situations in which first aid procedures were not applied correctly were also used. From there, students needed to determine which first aid procedures would be correct for the situations shown in the videos and also sent these answers via Google Forms.

The teacher used a gamification strategy so that students who had already completed the simulated practice (the first group) returned to the classroom and carried out online activities. The online questionnaire had to be answered and sent by the end of the class (at 10 pm). This submission, in addition to attendance in the four classes, gave the student a “heart” (representing “life”), which was obtained in all classes if the students complied with this rule. By the date of the first test, the students had managed to accumulate three hearts. Those who obtained this total chose one of the seven multiple-choice questions from the theoretical test and asked the teacher to say which of the five alternatives in the question was incorrect. In other words, they had help with the test. In the second test, the same dynamics were performed.

The “lives” panel was available in the Virtual Environment so that students could monitor the number of lives accumulated until the tests. During the tests, the teacher controlled the students who could request help. Box 1 exemplifies the lives panel, which, according to this panel, only Student A would have the right to request the teacher's help in the test.

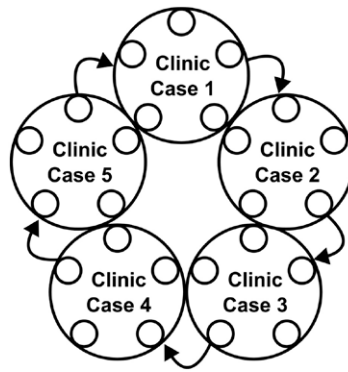
**Box 1.** Example of the lives panel

Name	Class 1	Class 2	Class 3
Student A	♡	♡	♡
Student B	♡		♡
Student C	♡	♡	
Student D	♡		

Source: the authors (2023).

The simulation laboratory also divided the class into subgroups of three or four members. The students needed to act appropriately based on the clinical case available in each laboratory bed. The subject teacher gave each group around five minutes to discuss and carry out the actions. After this time, the teacher went to each group and asked them to explain what had been done and why. In cases where there were errors in decision-making, the teacher corrected and explained, providing feedback right there at the bedside. The groups then rotated clockwise to another scenario to carry out all the situations proposed in the simulation laboratory, as shown in Figure 2.

**Figure 2.** Subdivision of classes in the simulated scenarios



Source: the authors (2023).

An example of a clinical case for seizures: "You are a physiotherapist and treat Mr. Sérgio, aged 48, who suffered a serious car accident five years ago. On one day of treatment, Sérgio lost his level of consciousness, with his entire body stiffening, muscle spasms, and sudden movements throughout his body, which led him to fall to the floor. Then he started to clench his teeth, and it was possible to observe sialorrhea. What is the conduct for this situation?"

At the beginning of the following classes, the questionnaires from previous classes were corrected, and the practice was debriefed with discussion and reflection on the simulated cases seen in the practical course.

To measure the perception of these students regarding the simulated practical classes, on the last day of class (in October 2022), students were asked to respond to a validated questionnaire called the Satisfaction Scale with Simulated Clinical Experiences (SSSCE)<sup>12</sup>, which is composed initially of 17 multiple-choice items with a 10-point scale, with one corresponding to the worst grade and ten the best grade. Three other items were added to this questionnaire, two related to gender and age group, to outline a sociodemographic profile of these students. The last item of the questionnaire was an open question so that students could make any further comments or suggestions for the First Aid discipline. The SSSCE<sup>12</sup> was transcribed into Google Forms and was answered by academics by providing a link.

The variables obtained in this work are categorical, the data obtained through SSSCE<sup>12</sup> responses were stored using LibreOffice Calc, and absolute frequencies and percentages were calculated. Due to the open question, the answers were transcribed to contribute to analyzing the pedagogical practice adopted.

### 3. Results and discussion

Thirty-four students from the Physiotherapy course at an HEI in Vale do Itajaí were invited to participate in this study. However, only 25 students signed the IC and responded to the SSSCE<sup>12</sup> Questionnaire. Of these 25 students, 21 (84%) were female, and 4 (16%) were male, with an average age of 19 years ( $\pm 0.93$ ).

The data obtained from the responses to the 17 SSSCE<sup>12</sup> items were tabulated, and the absolute number and percentage of responses in each can be seen in Table 1. The SSSCE<sup>12</sup> questionnaire asks the evaluator to give a score from 0 to 10. There were no responses with grades 0, 2, and 3, and they were not displayed in the table.

**Table 1.** Responses obtained in SSSCE (n=25)

Item	Grade 10	Grade 9	Grade 8	Grade 7	Grade 6	Grade 5	Grade 4	Grade 1
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
1. Overall satisfaction with practical classes.	13 (52)	6 (24)	2 (8)	3 (12)	1 (4)	0	0	0
2. The learning achieved.	12 (48)	5 (20)	4 (16)	3 (12)	1 (4)	0	0	0
3. Motivation when coming to class.	15 (60)	1 (4)	3 (12)	3 (12)	1 (4)	2 (8)	0	0
4. Dynamism of practical classes.	16 (64)	1 (4)	2 (8)	3 (12)	0	2 (8)	0	1 (4)
5. Active participation in the developed scenarios.	14 (56)	4 (16)	3 (12)	4 (16)	0	0	0	0
6. Interaction with colleagues.	7 (28)	2 (8)	7 (28)	3 (12)	0	3 (12)	1 (4)	2 (8)
7. Interaction with teachers.	14 (56)	5 (20)	3 (12)	1 (4)	0	1 (4)	0	1 (4)
8. Satisfaction with the degree of difficulty of the scenarios.	7 (28)	5 (20)	4 (16)	1 (4)	6 (24)	1 (4)	0	1 (4)
9. Satisfaction with the post-scenario discussion (debriefing).	9 (36)	1 (4)	6 (24)	4 (16)	4 (16)	0	0	0
10. Linking scenarios to theory.	20 (80)	1 (4)	2 (8)	2 (8)	0	0	0	0
11. Adequacy to the themes developed in classes.	16 (64)	5 (20)	0	2 (8)	2 (8)	0	0	0
12. Productivity during practical classes.	14 (56)	3 (12)	2 (8)	4 (16)	1 (4)	1 (4)	0	0
13. Realism of the developed scenarios.	15 (60)	6 (24)	2 (8)	2 (8)	0	0	0	0
14. Credibility during the scenario.	15 (60)	6 (24)	2 (8)	2 (8)	0	0	0	0
15. Quality of the material used in practices.	23 (92)	1 (4)	1 (4)	0	0	0	0	0
16. Quality of equipment used in practices.	23 (92)	2 (8)	0	0	0	0	0	0
17. Quality of simulators.	21 (84)	2 (8)	1 (4)	0	1 (4)	0	0	0

Source: the authors (2023).

According to Table 1, most of the items were evaluated as a ten by the academics, indicating they felt satisfied with the simulated practical classes.

Li et al.<sup>13</sup> show a positive correlation between interest in learning and satisfaction with learning. The level of effect and individual involvement in the activity influences the satisfaction assessment because motivation is high when students are interested in learning and are satisfied with the learning activity.

In the work of Peng et al.<sup>14</sup>, 95.5% of students reported satisfaction with simulation-based teaching, and in the work of Liu et al.<sup>15</sup>, 100% of participants were satisfied with the same teaching method. This satisfaction occurs because simulation-based teaching allows the training of procedural skills and unique tasks based on the creation of problem situations (clinical scenarios) by the teacher and the resolution in stages by the students with the possibility of repetitions in a simulated environment.<sup>16</sup>

For Vilaça et al.<sup>17</sup>, simulation-based teaching comes closer to reality and with greater dynamism, providing meaningful learning and greater motivation during the learning process compared to purely theoretical classes. In fact, in the current work, according to the answers obtained in item 3, it was observed that 60% of students reported greater motivation to go to classes.

It is essential to highlight that the objective of simulation-based teaching is not only to replicate behaviors correctly but also to integrate first-aid situations into teaching scenarios so that these scenarios are seen as legitimate, provoking the same reactions and responses that they would have in real situations, to consolidate the theory, develop clinical and reflective thinking, in addition to encouraging the active participation of academics.<sup>14</sup> In the study by Teles et al.<sup>18</sup>, the more active participation of academics and the organization of small groups in the scenarios indicate that the learning process is more significant than lectures. However, the authors also reported that the shyest participants mentioned that observing their colleagues' performance and the debriefing session were important in the learning process. Therefore, for the authors, this corroborates the importance of involving students in the simulation by recognizing learning styles and characteristics.

According to studies by Alves et al.<sup>10</sup>, Peng et al.<sup>14</sup>, and Liu et al.<sup>15</sup>, during the simulations, in addition to the skills of consolidating theory, developing clinical thinking, decision-making, and technical skills, communication skills, interpersonal interaction with the team and collaboration are also produced. However, in this study, it was observed that only 28% of students rated interaction with colleagues as a 10. This finding was not a surprise because the teachers had already identified that this class has problems with interpersonal relationships and communication, with the formation of subgroups. Therefore, as a strategy to mitigate these problems and develop communication and cooperation skills, it might be necessary to draw lots among the members who go to the scenarios and, thus, encourage more significant interaction and communication between them.

Another item rated as a ten by only 28% of students was the item that refers to the degree of difficulty of the scenarios. According to Peng et al.<sup>14</sup>, the difficulty level of the scenarios needs to be adequate. The purpose of the first aid discipline at this HEI is to expose situations that can be experienced daily by all people and who, after the discipline, can take the appropriate initial measures to preserve the victim's life until the arrival of the prehospital care emergency carried out by the Fire Department or the Mobile Emergency Care Service, known as SAMU. Therefore, the simulated scenarios proposed in the practices were following this action.

The last item that presented a low percentage (36%) for a score of 10 was regarding the post-scenario discussion (debriefing). According to Seam et al.<sup>19</sup>, debriefing with feedback is essential for simulation-based teaching. This teaching methodology is based on constructivist learning theory, which suggests that students acquire knowledge and meaning based on their experiences. To achieve this, during the debriefing, the facilitator must explain the relevant clinical skills and guide the students to reflect on their actions, reactions, and emotions experienced in the scenarios. Debriefing aims to correct errors and promote clinical reasoning and judgment skills through reflection and feedback.<sup>20</sup>

The other items evaluated deal with realism, the credibility of the scenarios, and the quality of materials and simulators. According to Teles et al.<sup>18</sup>, simulation-based teaching has good results when the construction of scenarios has a high degree of realism due to environmental and psychological fidelity, not necessarily using high-fidelity simulators for this. Even so, according to the authors, the fidelity of the equipment does not seem to worry most students —despite evaluating the practice with high-fidelity simulators better— because they all allow interaction with the scenario, and there is immediate feedback for the actions carried out. However, for Chernikova et al.<sup>21</sup>, simulators with a higher technological level, high fidelity, and virtual reality significantly affect learning.

Regarding the open question, only six academics made comments/suggestions. As the answers were obtained anonymously, the letter A (for academic), followed by the order in which the questionnaire was answered on Google Forms, was used to identify the participants. The responses received were transcribed without editing, and because they were few, they were not categorized.

According to A1: "In my opinion, everything is great in terms of both practical and theoretical classes!". Non-traditional teaching methods in a highly simulated learning environment increase satisfaction with learning due to the simulation's involvement and proximity to the real event.<sup>13</sup>

However, for A10: "I think she made a mistake in the practical classes, showing many videos and not demonstrating as much, and also, she was not as objective when explaining the theory". The videos took place in just one practical class and one of the scenarios so that students could perform immobilization in a clinical case of shoulder dislocation. The video had previously been sent to academics in the HEI virtual environment. However, academics reported that they did not watch the video. As there was only one teacher for 17 students in practice, the video was made available for them to watch and reproduce during that moment. However, it is essential to highlight that the teacher helped and corrected the technique during practice.

According to A12: "It would be interesting to have more time for practice". For Chernikova et al.<sup>21</sup>, the longer the duration of the simulated practices, the greater their effects on learning. However, due to the need to follow an academic calendar and with a large class of just one teacher, a more extended period of simulated practice was not possible.

For A14: "The whole subject was very dynamic with several teachings". According to Massoth et al.<sup>17</sup>, there is a positive association between emotion, especially fun, and the ability to learn new content, as well as the perception of this learning by the academic, which was observed in this comment.

According to A17: "There should be more first aid classes, as it is an important subject for the curriculum and everyday life". This comment was believed to be made because the first aid discipline for the physiotherapy course at this HEI is 35 class hours, which allowed only ten meetings.

Finally, for A22: "I liked the practices, I found the cases interesting, and I would like it to improve the class discussion". According to Lee et al.<sup>20</sup>, there are several debriefing methods, and they vary widely between HEIs. However, limited evidence indicates which debriefing method and duration is most effective on learning outcomes. For the context of this work, the fact that this was mentioned twice (in the multiple-choice item and the open question) reinforces the importance of a longer duration of the debriefing.

The main limitation of this study was the sample size and little diversity of academics. However, the results indicate important ways for new studies to be carried out with a larger group of academics to discuss and validate simulated clinical scenarios on first aid and to measure the impact of these simulations on physiotherapist training.

## 4. Conclusion

The present work showed that, in general, there was student satisfaction with the simulated practical classes despite three items having obtained lower percentage marks. This result reinforced the importance of the teacher in planning classes

with simulated practices, in addition to paying attention to developing skills such as interpersonal communication and group work. Furthermore, simulated clinical scenarios must be created with adequate difficulty and sufficient time for debriefing, which is considered the crucial moment in simulation-based teaching.

Therefore, considering the results obtained, simulation-based teaching should be encouraged in undergraduate Physiotherapy courses due to its potential benefits to academics, teachers, and patients.

### Authors' contributions

Girardi TA carried out the lectures and simulated practices, participated in writing the methodology part of the article, and analyzed the responses obtained by the questionnaire. Marcos L determined the gamification used for the discipline and the activities carried out by the students while they were not in the simulation and participated in writing the other topics of the article.

### Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, foundations) have been declared for any aspect of the submitted work (including, but not limited to, grants and financing, advisory board participation, study design, preparation manuscript, and statistical analysis).

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