ORIGINAL ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

VALIDATION OF A SERIOUS GAME FOR BABY CARE: A METHODOLOGICAL STUDY

VALIDAÇÃO DE UM *SERIOUS GAME* PARA ATENDIMENTO AO BEBÊ: ESTUDO METODOLÓGICO

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ABSTRACT

Objective: to validate the usability and applicability of a serious game about assistance to infants under one year of age in cardiac arrest, from the perspective of nursing professionals in an emergency care service. **Method:** methodological study that used Participatory Design and the EGameFlow instrument. The subjects were nine nursing professionals from an Emergency Care Unit. Data were collected through a focus group and submitted to thematic categorical analysis. **Results:** all dimensions of the EGameFlow instrument proved to be adequate. The group discussion allowed the configuration of two categories 1) Difficulties experienced by the team in the use of Reanimabebê; 2) Reanimabebê: technological innovation and realism as strategies for permanent education. The results were consolidated based on the game's evaluation by the professionals. **Final Considerations:** the tool is suitable for applicability, in addition to being innovative, didactic and close to the experienced reality.

Keywords: Software; Educational Technology; Cardiopulmonary Resuscitation; Pediatrics; Emergencies.

RESUMO

Objetivo: validar a usabilidade e aplicabilidade de um serious game sobre assistência ao bebê menor de um ano em parada cardiorrespiratória, na perspectiva de profissionais de enfermagem de um serviço de pronto atendimento. **Método:** estudo metodológico que utilizou Design Participativo e o instrumento EGameFlow. Os sujeitos foram nove profissionais de enfermagem de uma Unidade de Pronto Atendimento. Os dados foram coletados por meio de grupo focal e submetidos à análise categorial temática. **Resultados:** todas as dimensões do instrumento EGameFlow mostraram-se adequadas. A discussão em grupo permitiu a configuração de duas categorias 1) Dificuldades vivenciadas pela equipe no uso do Reanimabebê; 2) Reanimabebê: inovação tecnológica e realismo como estratégias para a educação permanente. Os resultados foram consolidados com base na avaliação do game pelos profissionais. **Considerações Finais:** a ferramenta constitui-se adequada para aplicabilidade, além de ser inovadora, didática e próxima da realidade vivenciada.

Palavras-chave: Software; Tecnologia Educacional; Reanimação Cardiopulmonar; Pediatria; Emergências.

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INTRODUCTION

Serious games are used to train and expand knowledge, discuss solutions, simulate situations in different contexts and raise awareness of children and adults in health education[1]. The player must decide in critical situations that are electronically reproduced, based on the reality experienced in everyday life, whose objective is to verify if the player recognizes the problem and knows how to suggest solutions[2].

The use of mobile devices works as a complement to traditional learning methods, helping to minimize the gap between theory and practice, allowing access to information according to each individual's needs[3-4].

A study conducted in Sweden, based on the use of a serious game aimed at cardiopulmonary resuscitation, showed that in the training, the level of mental tension was low to moderate, as the students said that the game caused a decrease in stress due to its fictitious virtual games feature, opposed to the important apprehension experienced in a real situation of cardiac arrest[5].

In an integrative review on the development and validation of the serious game in Brazil, games were found that explored pathologies aimed at health promotion, prevention, treatment, and rehabilitation, directed at both undergraduate students, health professionals and the general population[6].

In this context, a serious game, called Reanimabebê, was developed, which had as its principle cardiopulmonary resuscitation in babies younger than one-year-old. The choice of theme occurred due to a demand of the referred service and emerged through a focus group held with the team before the development of the game.

It is believed that the use of the game within the health service can help to reduce the gap between theory and practice, besides working as a dynamic strategy for continuing education. It becomes an innovative and pioneering strategy in improving the quality of care. Therefore, it was established as an objective, to validate the usability and applicability of a serious game for assistance to infants under one year old under cardiac arrest, from the perspective of nursing professionals of an emergency care service.

METHODS

This is a methodological study, using Participatory Design (PD)[7], aimed at proposing ways for the individual to effectively participate in the project's design and development cycle, enabling the perspectives and needs of the software to be suggested, developed and evaluated by those who will effectively use it[8]. For the creation of the software, the study had as its starting point the learning needs of the nursing team

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concerning emergencies with children, following the principles of the PD[9].

In the Reanimabebê, the game's scenario and narrative take place in an emergency room of an Emergency Care for Children located in an Emergency Room. The content was created based on the standards of care established in the literature: Pediatric Advanced Life Support (PALS) of the American Heart Association (AHA)[10].

The subjects were nursing professionals from different shifts, intentionally selected, considering the objectives established for the research, based on the following inclusion criteria: having a mobile device with Internet access, having basic computer knowledge and be working in the children's health unit for at least six months, considering this time as a minimum requirement for the professional to be familiar with the service routine; added to the researcher's knowledge about this population[11].

The emergency service provides clinical care to children from the age zero to 13 years, 11 months and 29 days, seeking to stabilize the patient, and begin the diagnostic investigation, defining the need for referral to more complex services. Data collection took place in February 2019, through a focus group conducted by the researcher with the help of an observer who took notes in a field diary, at the institution, at a scheduled time with the team and lasted about 1h30m. A recorder was used to ensure the accurate and complete recording of the speeches for later transcription.

The focus group discussion started from the following triggering question: How did you evaluate the experience of using digital technology as a way/tool for learning about the cardiopulmonary arrest (CPA) in infants under one year of age? A theme guide created by the researcher was used, consisting of items based on the player's experience regarding performance, manipulation, design, dynamics, knowledge improvement, difficulties, and facilities in the game. In the second part of the meeting, the subjects used an instrument to assess the game, called EGameFlow[12].

The instrument was translated, adapted and applied originally by the Learning Objects Laboratory of the Federal University of São Carlos[13] and, later, through a study carried out at the same University, in which the authors assessed a serious game about healthy eating and physical exercise for health promotion and help to fight childhood obesity[14]. Based on a scale of user satisfaction with the virtual game, it helps the team that created the game to recognize the strengths and weaknesses in the player's point of view[12]. The EGameFlow enables the identification of relevant problems in the game, showing that it is a simplified and

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effective method for the detailed analysis of aspects related to entertaining and to learning [15].

The evaluator assigns to each item, of the eight existing dimensions (Concentration, Challenges, Autonomy, Clarity of objectives, Feedback, Immersion, Social Interaction and Knowledge Improvement), a score consistent with their experience when interacting with the educational game. In Reanimabebê, the "social interaction" category, from the original version was eliminated, as it does not have such characteristics. The scores range from 1 to 7, with 1 for "weak" and 7, "strong"; these are then analyzed to determine the score for each dimension. The final grade of each dimension is obtained from the average of the grades of the items that compose it[12]. Items with a final average equal to or below six were considered as items to be reconsidered to improve the final version of the game.

The final score given to each dimension is an average of the ratings of the related items, considering the final grades given by the evaluators. If any item was considered irrelevant to the application or not existing in the game, or when the evaluator did not feel qualified to judge one of these variables, he had the option of excluding the item's evaluation, marked as "Not Applicable" (NA).

Data from the focus groups were transcribed, analyzed and categorized according to the content analysis technique[16]. Data from the EGameFlow questionnaire were quantitatively analyzed using simple descriptive statistics and organized in a table. Participants were identified with the letter N, referring to the first letter of the word Nursing and Arabic numbers.

The research was approved by the institutional Research Ethics Committee, under opinion no. 2.424.019/2018 and Certificate of Presentation for Ethical Appraisal no 79615917.6.0000.0104. The subjects were approached for participation upon consent and accordingly signed an Informed Consent Form.

RESULTS

Nine subjects participated in the research, three nurses and six nursing technicians. Eight were women and one man, aged between 28 and 42 years (mean 34.5 years); seven were married and two were single.

Five subjects had a higher degree in nursing, and four people had a graduate degree. The time since graduation ranged from two to 20 years (average of 7.7 years), with experience in pediatrics from one to six years (mean of three years) and working time at the institution between one and three years (mean of 2.4 years). Regarding the shift, five

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people worked in the morning and four in the afternoon.

Only two people reported having no experience, despite working for a year in the service. All professionals said having participated in training. When asked about the last class or training they attended, three reported that it was five months before, three said three months before, one more than a year ago, and three people did not remember the date or time of the last training. Regarding the theme, two referred to the care of patients in cardiac arrest, one about breastfeeding and six about basic life support. One of the participants mentioned not remembering the theme.

About the game, the scenario is presented to the player, who chooses between two emergencies to start the game. These two situations are stories narrated by the game and that the player must use objects in the scenario, actions, and interactions with other characters to advance through the stages, besides correctly answering the questions that arise.

The results are presented based on the validation of the game by the professionals, through the application of the EGameFlow instrument. Moreover, the data analysis of the focus group, these were consolidated into two thematic categories: 1) Difficulties experienced by the team while using Reanimabebê; 2) Reanimabebê: technological innovation and reality as strategies for permanent education.

Health team assessment using the Egameflow instrument

The validation of the game by professionals was implemented using the EGameFlow instrument. The average scores of the dimensions are shown in table 1.

Table 1 – Mean of evaluations of the Reanimabebê EGameFlow instrument. Maringá, PR, Brazil, 2019

Assessment	Mean
Concentration	
C1 – Does the game catches my attention?	6.4
C2 – Does it have content that stimulates my attention?	7.0
C3 – Are most activities related to the learning task?	7.0
C4 – No distractions from the task are highlighted??	6.4
C5 – Overall, do I stay focused on the game?	6.8
C6 – Am I not distracted from tasks I should be concentrating on?	6.0

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C7 – Am I not overwhelmed with tasks that seem unimportant?	6.0
C8 – Is the game workload adequate?	6.6
Final Mean	6.5
Challenges	
H1 – Do I enjoy the game without getting bored or anxious?	6.5
H2 – Level of difficulty is adequate?	6.3
H3 – Are there “tips” that help with the task?	6.5
H4 – Does it provide online support that helps with the task?	5.5
H5 – Does it provide video or audio to help with the task?	6.6
H6 – Do my skills increase as the game progresses?	6.7
H7 – I’m motivated by improving my skills?	6.7
H8 – Do challenges increase as my skills increase?	6.0
H9 – Does it provide new challenges at an appropriate pace?	6.1
H10 – Does it provide different levels of challenges that suit different players?	6.1
Final Mean	6.3
Authonomy	
A1 – Do I feel in control of the menu?	6.3
A2 – Do I feel in control over features and objects?	6.3
A3 – Do I have a sense of control over interactions between functions and objects?	6.2
A4 – Is it possible to make mistakes that stop the game from progressing?	6.6
A5 – Can I go back in any mistakes made?	6.4
A6 – Do I feel I can use any strategies?	5.7
A7 – Do I have a sense of control and impact on the game?	6.0
A8 – Do I know the next step in the game?	6.0
A9 – Do I feel in control over the game?	5.6
Final Mean	6.1
Clarity of objectives	
G1 – General objectives presented at the beginning of the game?	6.7
G2 – General objectives clearly presented?	6.7
G3 – Intermediate goals presented in the appropriate place?	6.6
G4 – Are the intermediate goals clearly presented?	6.6
G5 – Do I understand the learning objectives through the game?	6.8

Final Mean	6.6
Feedback	
F1 – Do I get feedback on my game progress?	6.6
F2 – Do I get immediate feedback on my actions?	6.8
F3 – Am I reported of new tasks immediately?	6.7
F4 – Am I reported of new events immediately?	6.6
F5 – Do I receive information about the success or failure of intermediate goals immediately?	6.7
F6 – Do I get information about my status, such as level or score?	6.5
Final Mean	6.6
Immersion	
I1 – Do I forget about time while I play?	6.3
I2 – Do I forget things around me while I play?	6.4
I3 – Do I forget about everyday problems while I play?	5.8
I4 – Do I feel an altered sense of time?	6.0
I5 – Can I get involved with the game?	6.8
I6 – Do I feel emotionally involved with the game?	6.6
I7 – Do I feel deeply involved in the game?	6.4
Final Mean	6.3
Knowledge improvement	
K1 – Does the game improve my knowledge?	7.0
K2 – Do I get the basic ideas of the content presented?	6.8
K3 – Do I try to apply knowledge in the game?	6.8
K4 – Does the game motivate the player to integrate the content presented?	7.0
K5 – Do I want to know more about the content presented?	7.0
Final Mean	6.9

Source: The authors, 2019.

Regarding the "Concentration" domain, the team scored a mean score of 6.5, suggesting a story with a coherent and pleasant/motivating sequence.

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The "Challenge" domain had a final mean score of 6.3, indicating the existence of a challenging situation, capable of motivating the player to stay in the game. The item that received the lowest score was related to online support, as the game did not provide such support.

Regarding "Autonomy", the subjects considered having autonomy over the game, with a final grade of 6.1. When questioned while filling out this part of the instrument, they reported that there were questions about what was to be done in certain scenes. Some questions were about accessing the "menu" or recovering from mistakes made during the game. As this is an Alpha version, errors and/or suggestions can later be readjusted in the game.

The score assigned to the "Clarity of Objectives" domain was 6.6. Although the existence of a performance/score scale for each player was not predicted, the category "Feedback" had a score of 6.6, demonstrating that the game had immediate returns (positive and negative feedbacks) after the player's actions through automatic warnings describing whether the course taken was correct or not.

The subjects scored the "Immersion" domain with 6.3, suggesting that the game promotes the individual's involvement, sometimes leading him/her to disconnect from the surrounding environment while playing, ensuring his/her full immersion and concentration. The category "Social interaction" could not be evaluated, as the game does not provide support for this item.

Finally, regarding the domain "Knowledge Improvement", the final average score was 6.9, indicating the participants' perception of knowledge acquisition. In general, there was a positive evaluation of the game, especially based on its innovative, playful, and adequate character in terms of its technical-scientific relevance and regarding its fidelity to the context/care setting portrayed.

Difficulties experienced by the team in using the Reanimabebê

Complementing the validation by the EGameFlow instrument, the subjects mentioned two main difficulties while using the Reanimabebê game. As reported by four people, the dynamics of the game did not make it clear how the baby would be ventilated. This is because it was a stage of the game in which the player remained still, which, in the opinion of the participants, could lead to giving up on the game.

Until then, the scene was monitored by a stopwatch or timer and the player was asked to ventilate the baby with a valve-mask bag. Due to this negative evaluation of the professionals, the researcher, in partnership with the responsible informatics team, chose

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to reformulate this stage of the game, with the incorporation of a clearer instruction about what the player should do:

> *I got stuck in the ventilation part, I didn't get the right time between one and the other 'ventilation' with ambu (valve-mask bag)* (n8).

About medication during the arrest, three subjects reported difficulty in preparing and administering intravenous adrenaline. This finding was evidenced in the speeches of the technical level subjects:

> *I struggled a lot with the medication. Like it or not, the nurse is responsible for this part. I thought it was really cool because it stimulates the person's curiosity* (n6).

Although the subject has raised discussions, the professionals themselves recognized the need for shared knowledge as a necessity for optimizing collaborative and interprofessional work in the situation of caring for babies in cardiac arrest:

> *It is also important to know about medication* (n1). *We need to know everything that is going on, the whole team working together to provide better care for the baby* (n3).

Amid the reflections in the focus group, some suggestions arose from the group, such as the elaboration of more cases/phases; inclusion of scores or performance scale in the game and the possibility of viewing the scores of other players. The issue of scoring/competitiveness was identified based on the justification that this would promote an incentive/stimulation among players:

> *Even if everyone is in their own house... it could show who is playing in real-time or even a score scale, you know?* (n2). *Seeing the scores of co-workers makes us wish: No, my baby will live, wait a minute, I'll do everything right* (n9).

More outcomes were proposed to make the game even more real, such as the development of new situations to be solved by the player:

> *I think there should be more phases. Although there is already an outcome, there could be more than one, for example, the child progressing to death when we don't get it right. Everyone would have a different experience* (n8). *I felt like this: Wow, I really wanted it to keep going. Because there are many possibilities to happen* (n10).

An issue very discussed was concerning new game ideas for the general people. Some participants suggested the creation of a serious game with the theme "First Aid" to be made available to the population:

> *Even for our children it would be great! Maybe, if it was something about first aid, basic things, because they're interested in the game, it catches their attention* (n6). *I think you should create more cases in this game and other themes in other apps, not only for healthcare professionals but also for lay people. It's very didactic!* (n10).

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Reanimabebê: technological innovation and reality as strategies for permanent education

The creation of game scenarios based on the realities and care contexts they target provides levels of reality that enable the immersion of subjects in the game, increasing involvement and optimizing the results of the educational action:

> *We drew the emergency scenario in that other meeting. I found the images to be very similar to our reality. Even the place where the monitor is located was illustrated* (e1).

The critically ill condition of the child brought to the emergency room was evaluated as very similar to the reality experienced. Additionally, the subjects reported that there is a logical sequence of steps to assist the baby in cardiac arrest, making the game very adequate and didactic:

> *O The Reanimabebê has a sequential logic of events* (n8). *For example, in intubation, the child who has already been intubated does not appear, the tube appears, the electrodes being placed, it was very good!* (n4).

Besides the educational feature, the game was also described as an innovative, practical, original strategy, and an entertainment component to the teaching-learning process:

> *The idea is incredible. Practical. Very good (e4). This way of learning is very didactic and innovative* (e2). *Despite its educational nature, it instigated me as fun* (e7).

DISCUSSION

The findings show that the use of technological approaches within health services can bring positive results to practice, to dynamically empower health professionals. A study conducted in France, in which students were trained with a serious game aimed at obstetric emergencies, showed that active learning was possible, as the subject was immersed in an environment that recreated the obstetric scenario close to reality, enabling to face emergencies which demanded quick decision-making based on effective knowledge[17].

Research conducted at the Federal University of Pernambuco, developed a serious game aimed at adolescents to promote reflections on sexual and reproductive health. After validating the game with the target audience and with professionals in the respective area, it was concluded that immersion in the game was possible because it approximated the game with the daily lives of teenagers, by characters using a specific language, bringing the game closer to reality[18].

In this study, we sought to include the subjects in the development of the game to make learning closer to the local reality and, thus, very similar to the context of the action of the target audience. Besides being an innovative, didactic, and easy-to-handle tool, the game features easy decision-making, as it

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is a very realistic simulation, but in a stress-free environment. This conclusion confirms several studies in the national and international field[17,19-20].

Some subjects reported problems at the stage in which it was necessary to be aware of the preparation and administration of adrenaline. Initially, this was justified by the fact that this is an exclusive nurse's task, however, after group discussion, there was the acknowledgment of the importance that everyone in the team sharing knowledge about the complete management of the baby in cardiac arrest, regardless of the professional category.

It is noteworthy that the nursing team is one of the first to recognize that something is not right with the baby, so keeping the environment and adequate materials, as well as knowing how to handle them correctly and manage the necessary medications, is crucial for decisions taken in emergency care are well performed and include the participation of all, so that the objective is always to re-establish the patient's health, especially the pediatric population[21].

Another important thing highlighted by the group mentioned the baby's ventilation. According to the subjects, this moment was not clear, as they lacked game command details about what to do at the time to continue the game. We chose to improve this step, as the team that will use the device must test it and expose suggestions and implications concerning its reality so that the primary scope (providing learning) is established[8].

Regarding the assessment of the subjects, using the EGameFlow instrument, it can be inferred that all domains (concentration, challenge, autonomy, clarity of objectives, feedback, immersion, and knowledge improvement) presented appropriate scores, indicating the potential for using the game. The limitations of the study are related to not carrying out comparative assessments of the professionals' learning, before and after using the game, besides the limited number of professionals who participated in the study due to the small number of human resources in that location and refusals. It is suggested, therefore, the development of new studies that proceed with the application and evaluation of this tool in other realities.

FINAL CONSIDERATIONS

It is concluded that the serious game Reanimabebê showed good acceptance by the target audience, as the subjects emphatically reported this finding, showing itself to be applicable in an emergency room. It is also noteworthy that it is an innovative, didactic tool that is very close to the reality experienced. The subjects reported that the tool is effective for learning and recommend

its use for other populations and care contexts.

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REVISTA ENFERMAGEM ATUAL IN DERME

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