Texto & Contexto - Enfermagem
ISSN: 0104-0707
ISSN: 1980-265X
Universidade Federal de Santa Catarina, Programa de Pós Graduação em Enfermagem

Moura, Thais Norberta Bezerra de; Moreira, Thereza Maria Magalhães; Sousa, Alcilene Dalília de; Santos, Antonino Calisto dos; Sousa, Renan Xavier e; Lima, Luisa Helena de Oliveira

DEVELOPMENT AND VALIDATION OF A SMARTPHONE EDUCATIONAL GAME REGARDING HEALTHY LIFESTYLE HABITS FOR ADOLESCENTS

Texto & Contexto - Enfermagem, vol. 28, e20180252, 2019
Universidade Federal de Santa Catarina, Programa de Pós Graduação em Enfermagem

DOI: https://doi.org/10.1590/1980-265X-TCE-2018-0252

Available in: https://www.redalyc.org/articulo.oa?id=71465278133

Original Article

TEXTO & CONTEXTO ENFERMAGEM
TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

DEVELOPMENT AND VALIDATION OF A SMARTPHONE EDUCATIONAL GAME REGARDING HEALTHY LIFESTYLE HABITS FOR ADOLESCENTS

Thais Norberta Bezerra de Moura[1]
Thereza Maria Magalhães Moreira[2]
Alcilene Dalília de Sousa[1]
Antonino Calisto dos Santos Neto[3]
Renan Xavier e Sousa[1]
Luisa Helena de Oliveira Lima[1]

[1]Universidade Federal do Piauí. Teresina, Piauí, Brasil.
[2]Universidade Estadual do Ceará. Fortaleza, Ceará, Brasil.
[3]Universidade Federal do Maranhão. São Luís, Maranhão, Brasil.

ABSTRACT

Objective: to elaborate and validate the content and appearance of an educational game regarding healthy lifestyle habits for adolescents
Method: methodological study carried, in 2016 out in Picos (Brazil). In order to develop the initial version of the game, a survey gathered scientific information and the content. In the end, the game was divided into: home screen and the living room, kitchen and the square scene, where the sports scene was inserted. To validate the instrument, 15 experts were selected, who evaluated the content, didactics and appearance of the game. Ten adolescents evaluated the appearance and usability. In addition, one questionnaire was used for the specialists and another for the adolescents. The Content Validation Index was used to validate the game, which considered the instrument and the items as validated when an index ≥ 0.78 was obtained.
Results: the room scene had access to the kitchen and the square. The sport scene was designed for physical activity and the purchase of food, which would be consumed in the kitchen scene. The experts gave the game a Content Validation Index of 0.88 for the item “objectives”, 0.87 for “structure and presentation” and 0.99 for “relevance”, reaching a overall Content Validation Index of 0.89. For adolescents, the item “appearance” reached the index 0.97 and for the other items, 1.0 and overal index of 0.99.
Conclusion: the game was validated in terms of content and appearance and could be validated clinically with adolescents as an incentive to adopt protective behaviors for their health.

DESCRIPTORS: Adolescent. Healthy lifestyle. Educational technology. Technology in health. Validation studies.

HOW CITED: Moura TNB, Moreira TMM, Sousa AD, Santos Neto AC, Sousa RX, Lima LHO. Development and validation of a smartphone educational game regarding healthy lifestyle habits for adolescents. Texto Contexto Enferm [Internet]. 2019 [cited YEAR MONTH DAY]; 28:e20180252. Available from: http://dx.doi.org/10.1590/1980-265X-TCE-2018-0252

ELABORAÇÃO E VALIDAÇÃO DE JOGO EDUCATIVO PARA *SMARTPHONE* SOBRE HÁBITOS DE VIDA SAUDÁVEIS PARA ADOLESCENTES

RESUMO

Objetivo: elaborar e validar conteúdo e aparência de um jogo educativo sobre hábitos de vida saudáveis para adolescentes.
Método: estudo metodológico realizado em 2016, Picos (Brasil). Para a elaboração da versão inicial do jogo, realizou-se um levantamento de informações científicas e escolha do conteúdo que se desejava ensinar. Ao final, o jogo dividiu-se em: tela inicial e os cenários da sala, da cozinha e da praça, onde foi inserido o cenário de esporte. Para validação do instrumento, selecionaram-se 15 especialistas, que avaliaram o conteúdo, didática e aparência do jogo e dez adolescentes, que avaliaram aparência e usabilidade. Além disso, utilizou-se um questionário para os especialistas e outro para os adolescentes; Índice de Validação de Conteúdo para validação do jogo, considerou-se validado o instrumento e os itens que obtiveram índice ≥ 0,78.
Resultados: o cenário da sala possuía acesso à cozinha e à praça. O cenário do esporte foi pensado para a prática de atividade física e compra de alimentos, que seriam consumidos no cenário da cozinha. Para os especialistas, o jogo teve Índice de Validação de Conteúdo 0,88 para o item "objetivos"; 0,87 para "estrutura e apresentação"; e 0,99 para "relevância", atingindo Índice de Validação de Conteúdo global de 0,89. Para os adolescentes, o item "aparência" atingiu o índice 0,97 e para os demais itens,1,0 e índice global de 0,99.
Conclusão: validou-se o jogo quanto ao conteúdo e aparência, podendo ser validado clinicamente junto aos adolescentes como incentivo na adoção de comportamentos protetores à sua saúde.

DESCRITORES: Adolescente. Estilo de vida saudável. Tecnologia educacional. Tecnologia em saúde. Estudos de validação.

DESARROLLO Y VALIDACIÓN DE UN JUEGO EDUCATIVO *SMARTPHONE* SOBRE ESTILO DE VIDA SALUDABLE PARA ADOLESCENTES

RESUMÉN

Objetivo: elaborar y validar el contenido y la apariencia de un juego educativo sobre hábitos de vida saludables para adolescentes.
Método: estudio metodológico realizado, en 2016, en Picos (Brasil). Con el fin de desarrollar la versión inicial del juego, una encuesta reunió información científica y el contenido. Al final, el juego se dividió en: pantalla de inicio y la sala de estar, cocina y la escena cuadrada, donde se insertó la escena deportiva. Para validar el instrumento, se seleccionaron 15 expertos, que evaluaron el contenido, la didáctica y la apariencia del juego. Diez adolescentes evaluaron la apariencia y usabilidad. Además, se utilizó un cuestionario para los especialistas y otro para los adolescentes. El **Í**ndice de Validación de Contenido se utilizó para validar el juego, que consideró el instrumento y los elementos como validados cuando se obtuvo un índice de 0,78.
Resultados: la escena de la habitación tuvo acceso a la cocina y la plaza. La escena deportiva fue diseñada para la actividad **física y** la compra de alimentos, que serían consumidos en la escena de la cocina. Los expertos le dieron al juego un índice de validación de contenido de 0,88 para el elemento "objetivos", 0,87 para "estructura y presentación" y 0,99 para "relevancia", alcanzando un **Índice de** Validación de Contenido general de 0,89. En el caso de los adolescentes, el elemento "apariencia" alcanzó el índice 0,97 y para los demás elementos,1,0 e índice general de 0,99.
Conclusión: el juego fue validado en **términos de** contenido y apariencia y podría ser validado clínicamente con adolescentes como un incentivo para adoptar comportamientos protectores para su salud.

DESCRIPTORES: Adolescente. Estilo de vida saludable. Tecnología educativa. Tecnología en salud. Estudios de validación.

INTRODUCTION

The world´s population, as well as Brazilian society, has undergone processes of socioeconomic transformation in the last century. One of these transformations is the advent of modernization, brought by the innumerable (re)invented technologies, which improved quality of life, by providing greater convenience in everyday life. However, it has also affected eating habits and energy expenditure, which influence the health / disease process.[1]

In a study carried out with 68 health professionals from a Primary Health Unit (UBS), in the city of Belo Horizonte (Brazil) respondents considered that healthy lifestyle habits are related to healthy eating and physical activity. In their opinion, the greatest barrier to the adoption of healthy lifestyle habits is the difficulty of changing a long-standing habit already present in people's day to day lives.[2]

Therefore, the importance of adopting healthy lifestyle habits in childhood and adolescence, as well as the development and implementation of tools capable of verifying their knowledge about healthy lifestyle is emphasized. Thus, new information and communication technologies are increasingly present in the discussion of health issues of collective interest, encompassing resources such as computers, the internet, mobile phones and various educational software.[3]

The study conducted with children and adolescents who use the internet between the ages of 9 and 17 nationwide between November 2015 and June 2016, observed that in 2016, 91% (22 million) accessed the internet via their mobile phone daily or almost every day. By 2014, cell phones accounted for 82% of accesses to the internet.[4]

According to data from the aforementioned study, doing homework is the second most common activity on the Internet, with 68% of young people admitting that they use the internet to help schoolwork, thus, it is observed that the use of cellular devices can positively influence teaching and learning in this age group.

Regarding the benefits of using educational technologies, professionals need to be aware of the advantages that these didactic resources provide to the educational practice, with the purpose of exercising and awakening criticality, creativity, autonomy of thought and curiosity in adolescents.[5]

This proposal is justified by the application of new technologies in the area of collective health, in behavior patterns in adolescents due to the technological and economic transformations and to support or increase the quality of health care of this population.

It is worth mentioning that, although the subject is widely discussed in the literature, the technology used in this research, with the use of the smartphone, is different from other studies, as most use printed materials, such as educational booklets[6–7] or computer games.[8]

In this perspective, the present study aims to develop and validate the content and appearance of an educational game regarding healthy life habits for school adolescents.

METHOD

This is a methodological study carried out in Picos, Piauí, Brazil, focused on the development, evaluation and improvement of tools and methodological strategies.[9]

The methodological proposal for the validation of the instrument was adapted from the criteria established by Pasquali,[9] which involves the theory of the elaboration of measurement instruments of subjective phenomena and is composed of three sets of procedures: theoretical, empirical (experimental) and analytical (statistical).

In order to develop the initial version of the educational game, scientific information was gathered, and the content was chosen, which guided the rules and the interaction that would compose the technology. The initial survey was done by the author herself, and elaborated by two students

of the Information Systems course under the supervision of the advisor and the Information System professor.

Based on the main idea of the game, the following activities were performed: elaboration of the name of the game (Healthy Adventure) and the central character (Brave C-haracter); idealization of the opening screen and game operating screens; establishment of the physical activity and healthy eating and choice of designs that would compose the game.

Thus, the game was divided into: home screen, room scene, kitchen scene and square scene, which is inserted in the sport scene.

Regarding the validation environment, the group of expert judges worked in their place of work or residence, with a smartphone and internet access in order to download the application and to respond to the questionnaire. The group composed by adolescents evaluated the application in the auditorium of a public school in the municipality of Picos. Data collection took place from August to October 2016.

Intentional non-probabilistic sampling was used to choose study participants, whose main characteristic is not to use random selection. In non-probabilistic sampling, the researcher is interested in the opinion (action, intention, etc.) of certain elements of the population, but not in their numerical representativity.[10]

Thus, two groups of evaluators were selected to validate the content and appearance: expert judges - composed of 15 professionals with a high level of knowledge and experience in their area of work, who evaluated the software regarding content, didactics and appearance; end users of the software - composed of ten adolescents who evaluated aspects regarding the appearance and usability of the software.

Regarding the selection of judges, six to 20 experts is recommended for the validation process.[11] Thus, with regard to expert judges, 15 professionals from the following categories were selected: three nurses, three physical education professionals, three nutritionists, three programmers and three teachers. It is worth noting that the exact number of judges should contain an odd number in order to avoid a tie of opinions.[6]

The judges were selected by means of snowball sampling, in which, when identifying a subject that fits the criteria for participation in the study, they were asked to suggest other participants.[12]

The selection criteria for the selection of the judges' committee[13] included the following items: have a PhD; MSc degree; have completed a master's thesis and / or doctoral thesis on the subject - healthy lifestyle habits, educational technology and / or validation; specialize in special groups such as adolescents; have scientific papers published on the theme of healthy lifestyle habits in adolescents and / or validation; have had professional experience in the area of adolescents for at least a year; participate in research groups / projects that involve the theme of healthy lifestyle habits, technology in health; possess knowledge about the subject - healthy lifestyle habits, adolescents; possess knowledge on the subject-educational technology; have knowledge on the theme - construction and instrument validation.

Only judges whose profile fulfilled at least three or more criteria, except the pedagogical professional and programmer, were part of this committee, considering that they evaluated the software according to didactics and appearance.[13]

The expert judges were invited to participate in the research by e-mail, which included an invitation letter and an Informed Consent Term (ICF). After accepting and signing the ICF, the educational game and evaluation instrument were sent, which had to be completed and returned within 20 days.

When there was no return in the previously stipulated timeframe, further contact was made for additional clarifications and ten extra days were added as a new deadline. Those who did not respond within 30 days were excluded from the survey.

In order to analyze the appearance and usability, students in the 5th and 7th grade of the school that had the largest number of students, in the municipality of Picos, were invited to participate in the study after randomly choosing the sample.

The target audience should observe aspects such as: appearance of the material, font size and color, images, alert and warning messages, ease of navigation and usability as a whole.

The invitation to the validation process occurred by means of an invitation letter sent to the parents / guardians of the adolescents, so that they had knowledge about the procedure and authorized the participation of the adolescent.

Inclusion criteria were; aged between 10 and 12 years, have a smartphone, as well as a signed informed consent form. The exclusion criterion was the absence of the adolescent at the time of data collection. When this happened, a new random selection was held.

Two types of individual questionnaires were used as data collection instruments: one aimed at expert judges and another at adolescents. These instruments were adapted from a study on the validation of educational technologies.[13] However, as they refer to the validation of printed materials and this study is considered digital material, it was necessary to introduce specific indicators to the instrument relating to the evaluation of digital technologies.

The Content Validation Index (CVI) was used to validate the content and appearance of the educational game. This method measures the proportion of judges who agree on certain aspects of the instrument. In addition, it allows to initially analyze each item individually and then the instrument as a whole. This method uses a Likert scale with a score of one to four.[14] The index score is calculated by the sum of agreement of the items that were marked as “3” or “4” by the experts and divided by the total number of replies.[15]

$$\text{CVI} = \frac{\text{number of replies with “3” or “4”}}{\text{total number of replies}}$$

The following valuation was adopted: totally adequate (4); (3); partially adequate (2), and inadequate (1).

The instrument and the items that obtained a CVI between the expert judges and target public higher or equal to 0.78 were considered validated, serving as a decision criterion for the relevance and / or acceptance of the item to which it refers theoretically.

In addition it complied with the directives and regulatory standards determined by Resolution 466/2012 of the National Health Council with respect to research involving human beings; respecting the ethical principles, privacy rights and study participant anonymity.

RESULTS

The home screen of the game has three topics: “Start,” “Continue,” and “About.” The “start” button starts the game; the “continue” button is used if the player wants to leave the game and continue at another time, or when the player plays for 10 minutes and a message appears on the screen saying that he must stop the game to do another activity with greater caloric expenditure, such as playing football, running, cycling, etc. The “about” button, contains the purpose and description of the game, as well the the name of the developers.

The room scene has two doors, one that accesses the kitchen scene and another gives access to the square scene. The player must click and hold on the arrows, which are in the lower right and left in order to move to any of the scenes.

The sport scenario was designed for the practice of physical activity, as well as the possibility of buying food from the supermarket in order to eat healthily. Here, the doll character should jump over the obstacles to earn coins, generating more interaction for the players.

The coins were used to buy groceries from the supermarket (square scene), which were divided by groups of the food pyramid. This way, when choosing a group, with a click, information about the food (energy, regulators, builders) and quantity indicated per portion was visualized. With two clicks, the food group option was purchased and automatically inserted into the refrigerator that was in the kitchen scene. In addition to the food groups, the option of water intake was added, showing its importance, as well as indicating the amount of water that should be consumed per day.

In the kitchen scene, the character should eat the food that was bought at the supermarket. It is worth mentioning that the character can only buy the maximum quantity indicated per portion of each food group, thus, the game can be used as a tool to encourage a balanced diet.

It is also worth noting that when entering each scene, instructions are given about the game as well as about healthy lifestyle habits, such as: “You should eat every 3 hours.”

Regarding the profile of the expert judges, the majority are female (73.3%), are aged 35 or older (53.3%), have more than 10 years of professional experience (53.3% %) and 40.0% have a master’s degrees as their highest degree.

Table 1 describes the validation results regarding the objectives of the educational game and the number of individuals who judged the item to be “Inadequate”, “Partially adequate”, “Adequate” and “Totally adequate”.

Table 1 – Evaluation of expert judges regarding the objectives of the educational game. Picos, Piauí, 2016

Objectives	PA*	A†	TA‡	CVI§
The information / contents are consistent with the age range of the users (children in grades 5 to 7 of Elementary School)	3	6	6	0,80
The information/content is consistent with the needs of educational technology users.	2	10	3	0,87
Invites and/or instigates behavior and attitude change.	2	9	4	0,87
It can circulate in the scientific environment of the area.	1	7	7	0,93
It is suitable for use by any professional working in the field of educational technology target audience.	1	6	8	0,93
Total	-	-	-	0,88

*PA: Partially Appropriate; †A: Appropriate; ‡TA: Totally Adequate; §CVI: Content Validation Index.

No judge assessed the objective of the game as “Inadequate”, giving an CVI of 0.88 for the proposed objectives.

The result of the validation of the educational game in terms of its structure and presentation is shown in Table 2.

Table 2 – Evaluation of expert judges regarding the structure and presentation of the educational game. Picos-Piauí, 2016

Structure and presentation	I*	PA†	A‡	TA§	CVI¶
The Educational technology is appropriate for users (children from 5th to 7th grade)	-	2	6	7	0,87
The messages are presented clearly and objectively	-	2	5	8	0,87
The information / contents are scientifically correct	-	1	5	9	0,93
The Educational technology is appropriate to the sociocultural level of the users	-	3	5	7	0,80
The information is well structured in agreement with the spelling	-	-	8	7	1,00
The style of the writing corresponds to the level of knowledge of the users	-	2	7	6	0,87
The font size of the title, topics and texts are adequate	1	4	3	7	0,67
The navigability of the Educational technology is intuitive	-	3	4	8	0,80
Texts, icons, tabs and buttons facilitate user interaction with the Educational technology	1	2	8	4	0,80
The colors used facilitate the visualization of the textual elements, icons and graphics of the Educational technology	-	1	5	9	0,93
The Educational technology has varied alternatives for users to perform a task (keyboard, icons, shortcuts)	-	2	9	4	0,87
The location of help buttons and texts is unchangeable	-	-	7	8	1,00
Error messages are appropriate	-	1	7	7	0,93
The TE does not have slowness or freeze during use	3	3	7	2	0,60
The user is informed about what is happening during use	-	-	7	8	1,00
The user can exit at any time from the system, undo an operation or return to the previous state	-	-	5	10	1,00
2.17 The user has access to help that guides their actions	-	1	7	7	0,93
Total	-	-	-	-	0,87

*I: Inadequate; †PA: Partially appropriate; ‡A: Appropriate; §TA: Totally adequat; ¶CVI: Content Validation Index.

The structure and presentation of educational technology achieved a CVI of 0.87, and was considered validated. However, in sub-item 2.7, which dealt with the font size of the title, topics and texts if appropriate, one judge considered this subitem to be “Inadequate” and four as “Partially adequate”, which led the item to achieve a lower CVI of 0.78 (0.67).

In this subitem, which dealt with Educational Technology, there was no slowness or obstruction during navigation, three judges considered it to be “Inadequate” and three “partially adequate” thus, also reached a CVI of less than 0.78 (0.60).

Table 3 shows the results regarding the relevance of the educational game.

Table 3 – Judges' evaluation of the relevance of the educational game. Picos, Piauí 2016

Relevance	PA*	A†	TA‡	CV§I
The themes portray key aspects that need to be strengthened.	-	7	8	1,00
The educational technology allows the transfer and generalization of learning to different contexts (school and home).	-	6	9	1,00
The educational technology proposes the construction of knowledge.	-	3	12	1,00
The educational technology addresses issues that users need to know.	1	5	9	0,93
The educational technology allows the interdisciplinary work of other contents.	-	7	8	1,00
Total	-	-	-	0,99

*PA: Partially Appropriate; †A: Appropriate; ‡TA: Totally Adequate; §CVI: Content Validation Index.

No subitem was considered "Inadequate" and all subitems were validated, obtaining a CVI of 0.99. The overall CVI of the game by the specialist judges was 0.89 and was successfully validated.

After modifications made on the basis of the observations of the expert judges regarding subitems 2.7 and 2.14, which obtained a lower CVI than that recommended, with an increase in the font and adjustments in the slowness and freezing issues in the game, validation with the adolescents continued, with the majority being 11 years old (60.0%), female (80.0%) and in the 5th grade(70.0%).

The results of the evaluation by the adolescents regarding objective and organization is shown in Table 4.

Table 4 – Evaluation of the target audience regarding the objectives and organization of the educational game. Picos, Piauí. 2016

Variables	A*	TA†	CVI‡
Objectives			
Meets the objectives.	1	9	1,0
Organization			
The home screen is attractive and indicates the content of the material.	4	6	1,0
The size of the title and the content in the topics is suitable.	2	8	1,0
The home screen is easy to understand.	3	7	1,0
There is consistency between the information on the home screen, the registration screen and other screens of the system.	3	7	1,0
The themes portray important aspects.	-	10	1,0
Total	-	-	1,0

*A: Adequate; †TA: Totally Adequate; ‡CVI: Content Validation Index.

No adolescent considered the goals and organization, as "inadequate" or "partially appropriate". It is worth mentioning that in subitem which evaluates if the themes portray important aspects, all adolescents considered "totally adequate", reaching the CVI of 1.0 regarding the items objective and organization.

Table 5 shows the evaluation of the adolescents regarding the writing style, appearance and motivation of the educational game.

Table 5 – Adolescents' evaluation of the writing style, appearance and motivation of the educational game. Picos, Piauí. 2016

Variables	PA*	A†	TA‡	CVI§
Writing Style				
The writing style is adequate.	-	2	8	1,0
The text is interesting. The tone is friendly.	-	3	7	1,0
The Vocabulary is accessible.	-	2	8	1,0
There is an association of the theme of each module with the corresponding text.	-	1	9	1,0
The text is clear.	-	-	10	1,0
The writing style corresponds to your level of knowledge.	-	3	7	1,0
Total	-	-	-	1,0
Appearance				
The pages or sections appear organized.	-	-	10	1,0
The illustrations are simple - preferably drawings	1	5	4	0,9
The illustrations serve to complement the texts.	-	1	9	1,0
The illustrations are expressive and sufficient.	-	4	6	1,0
Total	-	-	-	0,97
Motivation				
The game is attractive.	-	-	10	1,0
The content of the game is presented in a logical way.	-	1	9	1,0
The game is interactive. Suggests actions.	-	4	6	1,0
The game addresses the subjects necessary for your day to day life.	-	-	10	1,0
Invites / instigates behavior change and attitude.	-	1	9	1,0
The game offers information	-	4	6	1,0
You would play again	-	-	10	1,0
You would recommend this game to somebody	-	-	10	1,0
Total	-	-	-	1,0

*PA: Partially Adequate; †A: Adequate; ‡TA: Totally Adequate; §CVI: Content Validation Index.

Regarding the evaluation of writing style, no adolescent considered "Inadequate" or "Partially adequate", thus the CVI referring to this item was 1.0. On the other hand, in the item appearance, a teenager considered subitem, which observes if the illustrations are simple - preferably drawings, as "partially adequate", therefore, the CVI with respect to the appearance reached a total of 0,97, without compromising the validation.

As for the motivation of the game, no subitem was considered "inadequate" or "partially adequate" by the target audience. It is noteworthy that subitems, which observes whether the game is attractive, which observes whether the game addresses the issues necessary for the daily life of adolescents, which asked if the adolescent would play again and would recommend the game to someone, respectively, were considered "totally adequate", thus, the item reached the CVI 1.0. The target audience gave the educational game an overall CVI of 0.99.

DISCUSSION

The game is considered as a potential educational instrument capable of contributing to the development of education as well as to the construction of health knowledge, appearing as an innovative pedagogical proposal, as opposed to traditional pedagogical models in health education due to its attractiveness, playful nature and development.[16]

The study performed with adolescents and teachers of a municipal school aiming to analyze their perspective on the use of a mixed game (physical and digital game) as a strategy to approach health content in the context of educational practices, revealed a positive participant evaluation in relation to the use of the game for the construction of health knowledge.[17]

It is worth emphasizing the importance of the writing style, which in the present study reached the CVI 1.0, with short and objective sentences, since according to the data of the National Literacy Assessment (2014) performed with students in the 3rd grade of elementary school, 22.21% are only able to read words composed of syllables that have a vowel and a consonant and only 11.2% can identify verbal tenses, syntactic structures and the meaning of words in longer texts.[18]

Attractiveness and interaction should be addressed in all educational technologies, in order to stimulate and maintain public interest until the end of the educational material, favoring learning and increasing interactivity.[19]

The use of technology based on the active participation of the multiprofessional team is fundamental to improve the quality of care. In addition, the contributions brought by the population are also fundamental in the process, since they represent the target of health actions. Therefore, there was a concern regarding the inclusion of adolescents in the analysis of the educational game, as was done in other studies in the area.[20–21]

It should be noted that, although the game has been well evaluated by the judges, they have recorded their contributions and observations that were accepted by the authors, such as changing the orientation of the game to horizontal. These contributions guarantee the best quality of educational material for the population, and contribute to the enrichment of the final product and improve its applicability, through the reformulation of information, replacement of terms and revision of the illustrations.[22]

The overall CVI of the game by the expert judges was 0.89 and similarly, studies[7] that validated the educational booklet which dealt with healthy eating during pregnancy, presented a level of agreement between the judges between 0.818 and 0.954.

Corroborating with the findings of the present study, a study carried out with the objective of validating the content and appearance of an educational game about sexuality for adolescents, by a committee of 16 experts, presented a CVI of 0.93, presenting itself as a reliable educational material to use with adolescents.[21]

At the end of the questionnaire, the adolescent was asked to give the game a score, which ranged from 1 to 10. All adolescents gave the game a score of 10. Thus, it is observed that the game was well accepted by the target audience, however, its impact will only be confirmed with later studies.

The use of smartphones as educational technology is still limted in the literature, however, its adoption as the main interface for the user, will allow the development of games that can connect healthy habits and promote physical activities in the dynamics of a game.[23]

A review study[24] aiming to identify [articles in the scientific literature that used the serious game strategy, an inactive game that focuses on the persuasive aspect to change behaviors, in the prevention and / or treatment of childhood obesity, found that there were limited publications in Brazil during the initial selection and after the analysis of the studies no Brazilian study was included, evidencing a gap in the scientific literature, highlighting the importance of more research on the subject, given its relevance to the promotion of self-care.

The difficulty to develop and improve the game due to the lack of a faster internet connection is highighted as a limitation of this study, as well as the difficulty that some judges had to install the game, which consumed a considerable amount of time. Whenever possible, the specialist was contacted to help with this difficulty or the researcher provided a previously installed game for the purpose of the evaluation.

CONCLUSION

It was concluded that the objective of the study was achieved, i.e, the content and appearance of the educational game called “Healthy Adventure”, which deals with healthy lifestyle habits for adolescents, was developed and validated.

The game aims to sensitize adolescents to the importance of healthy lifestyle habits through a balanced diet and regular physical activity. Therefore, through the game, the adolescent will acquire knowledge on the subject, and, consequently, will decrease the worrying statistics related to the increase of risk factors for cardiovascular diseases in adolescents.

The originality of the work with the development of an educational game for a smartphone is emphasized, thus, from the process of clinical validation of the educational game, it is expected its availability, dissemination and use in a massive and democratic form, and become a part of the curriculum in schools.

Therefore, it is hoped that the adolescents feel encouraged to adopt protective behaviors, and become active and participatory subjects with regard to care for their health.

REFERENCES

1. Moura IH, Silva AFR, Rocha AESH, Lima LHO, Moreira TMM, Silva ARV. Construction and validation of educational materials for the prevention of metabolic syndrome in adolescents. Rev Latino-Am Enfermagem [Internet]. 2017 [cited 2018 May 25]; 25:e2934. Available from: https://dx.doi.org/10.1590/1518-8345.2024.2934
2. Barbalho SM, Kawakubo AM, Souza KGF, Traldi JG Júnior, Mendes CG, Nery FM, et al. Study of the presence of metabolic syndrome and its relationship with the familiar history in students. Semina [Internet]. 2013 [cited 2018 May 25]; 34(1):23-32. Available from: https://dx.doi.org/10.5433/1679-0367.2013v34n1p23
3. Dias CRSD. “Pirâmide@alimentar.kids”: validação de uma tecnologia educacional sobre alimentação saudável para crianças do Ensino Fundamental [dissertação]. Belém (BR): Universidade do Estado do Pará; 2013 [cited 2018 May 28]. Available from: https://dx.doi.org/10.5753/cbie.sbie.2014.867
4. ICT Kids Online Brazil: survey on Internet use by children in Brazil 2016 / Núcleo de Informação e Coordenação do Ponto BR. São Paulo(BR): Comitê Gestor da Internet no Brasil, 2017 [cited 2018 May 28]. Available from: http://cetic.br/media/docs/publicacoes/2/TIC_KIDS_ONLINE_2016_LivroEletronico.pdf
5. Luna IT. Vídeo educativo com enfoque na prevenção de DST/AIDS para adolescentes em situação de rua [tese]. Fortaleza (BR): Departamento de Enfermagem, Universidade Federal do Ceará; 2014 [cited 2018 May 28]. Available from: http://www.repositorio.ufc.br/bitstream/riufc/11068/1/2014_tese_itluna.pdf
6. Oliveira SC, Lopes MVO, Fernandes AFC. Development and validation of an educational booklet for healthy eating during pregnancy. Rev Latino-Am Enfermagem [Internet]. 2014 [cited 2018 May 26];22(4):611-20. Available from: https://dx.doi.org/10.1590/0104-1169.3313.2459
7. Galdino YLS. Construção e validação de cartilha educativa para o autocuidado com os pés de pessoas com diabetes [dissertação]. Fortaleza (BR): Universidade Estadual do Ceará; 2014. Available from: http://www.uece.br/cmacclis/dmdocuments/YARALANNE.pdf
8. Zortea CF, Kliszcz S, Parreira FJ, Silveira SR. “Super Zid”: desenvolvimento de um jogo educacional digital para apoiar o combate ao aedes aegypti. CINTED-UFRGS [Internet]. 2017 [cited 2018 Oct 06]; 15(1). Available from: http://www.seer.ufrgs.br/renote/article/download/75102/42544
9. Pasquali L. Principles of elaboration of psychological scales. Rev Psiq Clin [Internet].1998 [cited 2018 may 25]; 25(5):206-13. Available from: http://mpet.ifam.edu.br/wp-content/uploads/2017/12/Principios-de-elaboracao-de-escalas-psicologicas.pdf

10. Marconi MA, Lakatos EM. Técnicas de pesquisa: planejamento e execução de pesquisas, amostragens e técnicas de pesquisas, elaboração, análise e interpretação de dados. São Paulo(BR): Atlas; 2009.

11. Pasquali L. Psicometria: teoria e aplicações. Brasília(BR): Editora UnB;1997.

12. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para as práticas da enfermagem. 7a ed. Porto Alegre(BR): Artmed; 2011.

13. Oliveira MS, Fernandes AFC, Sawada NO. Educational handbook for self-care in women with mastectomies: a validation study. Texto Contexto Enferm [Internet]. 2008 [cited 2018 May 26]; 17(1): 115-23. Available from: https://dx.doi.org/10.1590/S0104-07072008000100013

14. Alexandre NMC, Coluci MZO. Content validity in the development and adaptation processes of measurement instruments. Ciênc Saúde Coletiva [Internet]. 2011 [cited 2018 May 26]; 16(7):3061-8.Available from: https://dx.doi.org/10.1590/S1413-81232011000800006

15. Grant JS, Davis LL. Selection and use of content experts for instrument development. Res Nurs Health [internet]. 1997 [cited 2018 May 28]; 20(3):269-74. Available from: https://dx.doi.org/10.1002/(SICI)1098-240X(199706)20:3<269::AID-NUR9>3.0.CO;2-G

16. Gontijo DT, Vasconcelos ACS, Monteiro RJS, Facundes VLD, Trajano MFC, Lima LS. Occupational therapy and sexual and reproductive health promotion in adolescence: a case study. Occupational Ther Intern [Internet]. 2015 [cited 2018 Oct 10]; 23:19-28. Available from: https://dx.doi.org/10.1002/oti.1399

17. Perim CM, Giannella TR, Struchiner M. Análise do uso de um jogo para educação em saúde com adolescentes. Ensino, Saúde e Ambiente [Internet]. 2014 [cited 2018 Oct 10]; 7(1):1-12. Available from: https://dx.doi.org/10.22409/resa2014.v7i1.a21183

18. Ministério da Educação (BR). Avaliação Nacional de Alfabetização 2014. Brasília(BR): Ministério da Educação; 2014 [cited 2018 May 28]. Available from: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=21091-apresentacao-ana-15-pdf&Itemid=30192

19. Joventino ES. Elaboração e validação de vídeo educativo para promoção da autoeficácia materna na prevenção da diarreia infantil [Tese]. Fortaleza(BR): Universidade Federal do Ceará, Departamento de Enfermagem; 2013. Available from: http://www.repositorio.ufc.br/bitstream/riufc/8307/1/2013_tese_esjoventino.pdf

20. Costa PB, Chagas ACMA, Joventino ES, Dod RCMT, Oriá MOB, Ximenes LB. Development and validation of educational manual for the promotion of breastfeeding. Rev. RENE [Internet]. 2013 [cited 2018 May 25];14(6):1160-7. Available from: https://dx.doi.org/10.15253/2175-6783.2013000600012

21. Sousa MG, Oliveira EML, Coelho MMF, Miranda KCL, Henriques ACPT, Cabral RL. Validation of educational game for adolescents about the sexuality topic. Rev Fund Care Online [Internet]. 2018 [cited 2018 Oct 10]; 10(1):203-9. Available from: https://dx.doi.org/10.9789/2175-5361.2018.v10i1.203-209

22. Guimarães FJ, Carvalho ARLF, Pagliuca LMF. Elaboration and validation of an assistive technology assessment questionnaire. Rev Eletr Enferm [Internet]. 2015 [cited 2018 May 25];17(2):302-11. Available from: https://dx.doi.org/10.5216/ree.v17i2.28815

23. Carrino S, Caon M, Angelini L, Mugellini E, AbouKhaled O, Orte S, et al. PEGASO: a personalised andmotivational ICT System to empower adolescents towards healthy lifestyles. Stud Health Technol Inform [Internet]. 2014 [cited 2018 May 25]; 207:350-9. Available from: https://dx.doi.org/10.3233/978-1-61499-474-9-350

24. Dias JD, Tibes CMS, Fonseca LMM, Zem-Mascarenhas SH. Use of serious games for coping with childhood obesity: integrative literature review. Texto Contexto Enferm [Internet]. 2017 [cited 2018 May 25]; 26(1):e3010015. Available from: https://dx.doi.org/10.1590/0104-07072017003010015

NOTES

ORIGIN OF THE ARTICLE

Article extracted from the thessis - Elaboration and validation of an educational game about healthy lifestyle habits for adolescents presented to the Graduate Program in Sciences and Health of the *Universidade Federal do Piauí,* in 2016.

CONTRIBUTION OF AUTHORITY

Study design: Moura TNB, Sousa AD, Santos Neto AC, Sousa RX, Lima LHO.
Data collection: Moura TNB.
Data analysis and interpretation: Moura TNB, Moreira TMM, Lima LHO.
Discussion of the results: Moura TNB, Lima LHO.
Writing and / or critical revision of content: Moura TNB, Moreira TMM, Lima LHO.
Review and final approval of the final version: Moreira TMM, Lima LHO.

ACKNOWLEDGMENT

To the extension scholarship program (PIBEX) of the *Universidade Federal do Piauí.*

ETHICS COMMITTEE IN RESEARCH

Approved by the Research Ethics Committee of the *Universidade Federal do Piauí*, and approved with the Certificate of Ethical Assessment for Presentation No. 03864912.9.0000.5214, and opinion number:1,544,066

CONFLICT OF INTEREST

There is no conflict of interest.

HISTORICAL

Received: July 07, 2018
Approved: October 23, 2018

CORRESPONDENCE AUTHOR

Thais Norberta Bezerra de Moura
thaisinha_moura@hotmail.com