Cogitare Enfermagem

ORIGINAL ARTICLE

INTERVENTION STUDY WITH SCHOOLCHILDREN USING THE CARD GAME "THE PYRAMID ENIGMA" ABOUT HEALTHY EATING

Celia Maria Ribeiro de Vasconcelos[1]
Eliane Maria Ribeiro de Vasconcelos[2]
Vânia Pinheiro Ramos[2]
Ana Lucia Ribeiro de Vasconcelos[3]
Maria Cristina Falcão Raposo[4]
Jefferson Wildes da Silva Moura[5]
Raimundo Valmir de Oliveira[1]

ABSTRACT

Objective: to evaluate the knowledge about healthy eating promoted by educational technology. Method: quasi-experimental (pre/posttest design) performance evaluation study. test design). Participated 204 students, aged between nine and 10 years, from three public schools of Recife-PE-Brazil, in September 2018. Knowledge gain was observed by the following process: decreasing from the Mean Score Observed after the intervention (PMO-2) to the Mean Score Observed before the intervention (PMO-1); dividing the number obtained by PMO-1 and then multiplying the result obtained by 100. Results: before the intervention 16/204 students (7.8%) scored ≥ 7. After the intervention 160/204 students (78.4%) achieved this score. The proportion of students who scored ≤ 5 went from 49/204 (24%) to 1/204 (0.5%). Four students maintained their initial score. The average knowledge gain after a single move was 38.5%. Conclusion: these results proved the effectiveness of the game, and its use promoted socialization among the students.

DESCRIPTORS: Food and Nutrition Education; Health Education; Preschool Education; Feeding Behavior; Educational Technology.

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[1]Instituto Federal de Educação, Ciência e Tecnologia de Pernambuco, Campus Pesqueira, Pesqueira, PE, Brasil.
[2]Universidade Federal de Pernambuco, Programa de Pós-Graduação em Enfermagem, Recife, PE, Brasil.
[3]Fundação Oswaldo Cruz, Instituto Aggeu Magalhães, Recife, PE, Brasil.
[4]Universidade Federal de Pernambuco, Programa de Pós-Graduação em Estatística, Recife, PE, Brasil.
[5]Universidade Federal de Santa Catarina, Programa de Pós-graduação em Enfermagem, Florianópolis, SC, Brasil.

INTRODUCTION

Building healthy eating habits in childhood will have a favorable impact throughout the individual's life, ensuring balanced nutritional needs and good hygiene conditions[1-4]. The promotion of healthy eating habits is a strategy of public policies on food and nutrition[5-6], introduced in schools through the School Health Program (SHP), established by Decree No 6286/2007, in the context of actions related to prevention, care, and health promotion, considering the school environment ideal for these actions[4,7]. In this environment, the use of educational technology of easy applicability will facilitate the dissemination of knowledge about healthy eating among school students, becoming a very useful educational tool for health professionals integrated into the School Health Program (SHP), by arousing in students a greater interest in the educational content addressed, stimulating greater attention, concentration, and socialization[11], favoring the teaching and learning process.

This study aimed to evaluate the knowledge about healthy eating promoted by the educational technology called "The Pyramid Enigma" in a group of students from elementary school 1, to demonstrate the effectiveness of using this educational technology[9-11].

METHOD

This is a quasi-experimental study (pre and post-test design, with the latter evaluation occurring immediately after the intervention in order to avoid external influences on the results achieved), of performance evaluation (evaluation of the knowledge acquired by 204 students from the 4th and 5th grade of Elementary School 1 about healthy eating with the use of the educational technology "The Pyramid Enigma" in three public schools in Recife-PE-Brazil, randomly selected among 34 schools of the municipal network in the 4th Political and Administrative Region of Recife). This study was carried out in the 1st School on 14 and 15/09/2018; in the 2nd School on 21 and 22/09/2018; and in the 3rd School on 28 and 29/09/2018; being contemplated on the 1st day the 4th grade students and on the 2nd day the 5th grade students.

The minimum sample size was established, considering: (i) the game rules of four to six schoolchildren per group of players; (ii) the proportion of expected hits after the intervention "P" = 70% or p=0.7; with a maximum error of five percentage points, and confidence level of 95% ($Z_{\alpha/2}$ = 1.96). Having: $n = (Z_{\alpha/2})^2 * P*Q/d^2$ where "d" is the maximum permissible error (5%) and "Q=100-P"; and (iii) the proportion of hits expected before the intervention "Q" = 7% or p=0.07. Then, the minimum sample size "n" in each group of students was established using the following formula: $n = 1.96^2 * 70*7/5^2 = 75$ (75 students distributed in six groups of four children from the 4th grade of three municipal schools, and the same number from the 5th grade, totaling 150 students).

The students were selected based on the following inclusion criteria: being regularly enrolled in the selected schools; being literate, attending the 4th and 5th grades of elementary school (early years); being between nine and 10 years old. And, as exclusion criteria: children with some cognitive problem; visual impairment; and hearing or communication impairment because there was no person with knowledge of Libras on the research team. All students in the three schools/classes mentioned met the inclusion criteria and did not fit the exclusion criteria. Thus, 204 students participated in the educational intervention, including 97 from the 4th grade (35 from the 1st school, 32 from the 2nd school, and 30 from the 3rd school) and 107 from the 5th grade (36 from the 1st school, 36 from the 2nd school, and 35 from the 3rd school).

The main researcher supervised all the stages of the research, with six assistants, previously trained, to conduct the groups of students. Before proceeding to the intervention with the card game "The Pyramid Enigma", each student was evaluated by means of an instrument about healthy eating composed of two parts. The first with eight questions and eight food images (each question corresponding to only one correct alternative). In the second part, with 36 food images, it was up to the student to place an "X" on the foods that should be little consumed or ideally avoided because they are not healthy (11 correct answers)[10-11].

As already mentioned, the same instrument was applied immediately after the intervention, making this outcome evaluation study a quasi-experimental type[12]. This recommendation aimed to avoid interference from external factors that might interfere with the results of the study[13]. All questions were read aloud, and a time was allowed for everyone to answer, after which we moved on to the next question.

The following formula was used to observe the average knowledge gain achieved (GMA) by the students.

$$GMA = \frac{PMO\text{-}2 - PMO\text{-}1}{PMO\text{-}1} \times 100$$

PMO-1 = Mean Observed Score (average score of students) before the intervention.;
PMO-2 = Mean Observed Score (average score of the students) after the intervention.

Intervention with the card game "The Pyramid Enigma": as they entered the room prepared for the intervention, the students were numbered from one to six, thus composing the groups for the first round. Then, the students of equal numbers were grouped for the second round. The champions of each group participated in the third round, obtaining the two finalists who competed for the prize, the card game "The Puzzle of the Pyramid". The other students were also awarded school supplies (a history book, notebook, diary, etc.). In this way, each student played at least twice, and those who were not playing in the third round participated in the "cheering", which provided an opportunity to fix the knowledge proposed by the intervention also on this occasion. As mentioned in the first paragraph of this item, the interventions in the fourth and fifth grades were performed at different times in the three participating schools. The data were typed and analyzed using the Excel program (version 365).

This study is part of a thesis presented to the Graduate Nursing Program of the Federal University of Pernambuco (UFPE)[10]. The educational technology "The Pyramid Enigma" was one of the products of this thesis and can be accessed at (https://repositorio.ufpe.br/handle/123456789/34302). This study was approved by the Research Ethics Committee of the Health Sciences Center of the Federal University of Pernambuco (Opinion no. 1,814,698 on 11/09/2016) and was carried out according to the recommendations of Resolution 466/2012[10].

RESULTS

The learning of 204 students about healthy eating with the use of the educational technology "The Pyramid Enigma" is presented in Tables 1 and 2 and in Chart 1, demonstrating the effectiveness of this card game to be used as an important pedagogical tool for teaching and learning.

As can be seen in Table 1, before the intervention, only 16/204 students (7.8%) scored ≥ 7. After the intervention (Table 2), 160/204 students (78.4%) scored this score (905.1% increase). Looking at the proportion of those who scored ≤ 5, we found 49/204 students (24.0%) before the intervention and 1/204 (0.5%) after the intervention (97.9% decrease). Although the following information cannot be seen in the Tables and Chart, it is noteworthy that this student who did not score higher than five after the intervention showed a 100% increase from his initial score, and only four students (one from 4th grade and three from 5th grade), after the use of educational technology, maintained their initial score.

Table 1. Pre-intervention test. Performance of 204 schoolchildren, aged between nine and 10 years of the 4th and 5th year of elementary school 1, early years. Recife-Pernambuco, Brazil, 2018.

Students n (%)			PO (PM=19)	Score
4th grade n =97	5th grade n=107	Total n=204		
0	1 (0.9)	1 (0.5)	17	8.9
0	1 (0.9)	1 (0.5)	16	8.4
3 (3.1)	6 (5.6)	9 (4.4)	15	7.9
2 (2.1)	3 (2.8)	5 (2.4)	14	7.4
21 (21.6)	14 (13.1)	35 (17.2)	13	6.8
16 (16.5)	29 (27.1)	45 (22.1)	12	6.3
21 (21.6)	12 (11.2)	33 (16.2)	11	5.8
11 (11.3)	15 (14.0)	26 (12.7)	10	5.3
9 (9.3)	7 (6.5)	16 (7.8)	9	4.7
6 (6.2)	7 (6.5)	13 (6.4)	8	4.2
4 (4.1)	3 (2.8)	7 (3.4)	7	3.7
2 (2.1)	4 (3.7)	6 (2.9)	6	3.2
1 (1.0)	3 (2.8)	4 (2.0)	4	2.1
1 (1.0)	1 (0.9)	2 (1.0)	3	1.6
0	1 (0.9)	1 (0.5)	1	0.5

PM = Maximum Score (total of questions in the assessment instrument on healthy eating); PO = Observed Score (total number of correct answers in the test).

Source: Authors.

Table 2 Post-intervention test. Performance of 204 schoolchildren, aged between nine and 10 years, from the 4th and 5th grades of elementary school 1, early years. Recife- Pernambuco, Brazil, 2018.

Students n (%)			PO (PM=19)	Score
4th grade n =97	5th grade n =107	Total n =204		
6 (6.2)	7 (6.5)	13 (6.4)	19	10.0
3 (3.1)	5 (4.7)	8 (3.9)	18	9.5
13 (13.4)	10 (9.4)	23 (11.2)	17	8.9
15 (15.5)	27 (25.2)	42 (20.6)	16	8.4
17 (17.5)	16 (14.9)	33 (16.2)	15	7.9
20 (20.6)	21 (19.6)	41 (20.1)	14	7.4
12 (12.4)	12 (11.2)	24 (11.7)	13	6.8
6 (6.2)	7 (6.5)	13 (6.4)	12	6.3
3 (3.1)	1 (0.9)	4 (2.0)	11	5.8
1 (1.0)	1 (0.9)	2 (1.0)	10	5.3
1 (1.0)	0	1 (0.5)	8	4.2

PM = Maximum Score (total of questions of the assessment instrument on healthy eating); PO = Observed Score (total number of correct answers in the test)

Source: Authors.

As can be seen in Chart 1, the average gain in knowledge about healthy eating obtained after the intervention was 38.5% of the total sample. The 5th grade students had the greatest gain in knowledge (40.0% increase) compared to the 4th grade students (36.8%). And, by participating institution, the average gain observed was greatest among 4th grade children in the 3rd School (45.0% increase) and 5th grade children in the 2nd School (42.6% increase). It is important to note that these results were achieved in a single round of the card game.

It is also worth mentioning that, in this type of study, the important thing is the individual and collective performance observed before and after the intervention. That is, in a round, according to the game rules mentioned in the method, the champions of each group are admitted in the third move, however, as also mentioned in the method, this fact does not interfere in the individual result, since all students participate in the activity until the end, playing once more or cheering for their colleague who is playing.

Chart 1. Analysis Matrix of the Average Knowledge Gain with the intervention on Healthy Eating achieved by 204 schoolchildren aged between nine and 10 years of the 4th and 5th grades of elementary school 1, early years. Recife - Pernambuco, Brazil, 2018

Education / Institution	PM	PMO-1	PMO-2	GMA (%)

4th grade	1st School	665 (35 x 19)	396 (35 x 11.31)	507 (35 x 14.48)	28.03
	2nd School	608 (32 x 19)	359 (32 x 11.22)	501 (32 x 15.66)	39.57
	3rd School	570 (30 x 19)	300 (30 x 10.00)	435 (30 x 14.50)	45.00
	∑	1.843 (97 x 19)	1.055 (57.24%) (97 x 10.88)	1.443 (78.30%) (97 x 14.88)	36.76
5th grade	1st School	684 (36 x 19)	398 (36 x 11.05)	548 (36 x 15.22)	37.74
	2nd School	684 (36 x 19)	375 (36 x 11.42)	535 (36 x 14.86)	42.61
	3rd School	665 (35 x 19)	384 (35 x 10.97)	537 (35 x 15.34)	39.83
	∑	2.033 (107 x 19)	1.157 (56.91%) (107 x 10.81)	1.620 (79.68%) (107 x 15.14)	40.05
	∑ Total	3.876 (204 x 19)	2.212 (57,07%) (204 x 10,84)	3.063 (79,02%) (204 x 15,01)	38,47

PM = No. of participants x Total questions of the healthy eating knowledge assessment instrument; PMO = Mean Observed Score (No. of participants x Mean Score obtained by students = hits). PMO-1 (pre-intervention) and PMO-2 (post-intervention); GMA = (Mean % of hits after intervention - Mean % of hits before intervention) ÷ Mean % of hits before intervention x 100.
Source: Authors.

DISCUSSION

Considering that the elementary school plays an important role during the individual's integral formation and, among them, the guidance related to the practice of healthy eating and living habits, the present study as well as that of several authors[14-16] come to collaborate for the implementation of this health promotion action in schools, either by addressing aspects related

to the awareness of teachers about the role of the school in the formation of healthy eating habits in students[14], or by investigating the eating habits of schoolchildren[15] and identifying factors that influence children's eating behaviors[16] and also, like this study, in the construction, validation, and provision of pedagogical teaching and learning tools[17,18].

Using technological resources as a facilitating tool in the learning process in a playful way is an excellent teaching strategy, considering that playfulness contributes to stimulate the students' interest and, once they are motivated, their learning will happen more effectively with naturalness and spontaneity. Among these studies, four were conducted with schoolchildren[7,17,23,27]. Thus, and emphasizing that childhood is the best time to consolidate the formation of good eating habits, this study prioritized building/validating the educational tool "The Pyramid Enigma" for this target audience, using low-cost, simple and practical resources with the aim of providing economically disadvantaged students with

a viable resource to achieve optimal performance in their teaching and learning process[18].

The use of playful activities with games contributes to learning, as it provides the participants with pleasant moments of relaxation and disinhibition, making the learning process happen smoothly and imperceptibly for those who are playing/learning, thus offering to the participants the fixation of knowledge that will accompany them in their lives[19]. The present study shows how relaxed, pleasant, and soft the moments of the educational intervention with the card game "The Pyramid Enigma" were, and it also shows that in a single game the gain of knowledge about healthy eating acquired by the students was very expressive. Other authors have reported that play, by stimulating socialization, promotes biopsychosocial and emotional development[4,21,22,24-25].

The theme of nutrition, emphasizing healthy eating and using a playful-didactic approach with elementary school students has proven its contribution to improving the parameters of nutrition education[17]. Another author mentions that instruments whose purpose is to assess students' knowledge make it possible to measure the effects of the teaching-learning process and should be used in educational programs[19]. This same purpose was also one of the purposes of the present study. From this perspective, the knowledge gain using playful resources was evidenced in a study conducted in a Hispanic school[23]. Another study showed an increase in the number of correct answers per participant and an improvement in the classification of the knowledge of children's relatives after the application of playful educational technology on child nutrition[29].

The recognition of the importance of using educational tools in the teaching-learning process has been growing, from the simplest to the most sophisticated, such as the U-Learning mobile educational game, sensitive to the context of the user's location, based on the "Naval Battle" game. In this game, the authors made the learning of Analytic Geometry playful, providing the student with the opportunity to create a link between theory and practice[28]. Another study showed the effectiveness of the card game in teaching chemistry[25].

The limitation of this study was that financial resources were not available, leaving only five games for each educational institution participating in the research.

CONCLUSION

The results of the evaluation of knowledge about healthy eating promoted by the educational technology card game "The Pyramid Enigma" proved its effectiveness in the teaching-learning process. It was also shown that the use of this technology promoted socialization among students, being a very useful tool during the activities carried out in the School Health Program, and in the educational activities of primary care teams, the Family Health Strategy, and the Community Health Workers Program, since it enables sustainable actions when performed and shared equally with parents, educators, and health professionals. It is noteworthy that, during the implementation of educational activities, "networks of shared responsibility" must be established among parents, educators, health professionals, and the community.

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Corresponding author:
Celia Maria Ribeiro de Vasconcelos
Instituto Federal de Educação, Ciência e Tecnologia de Pernambuco IFPE Campus Pesqueira
BR 232, Km 208, Prado CEP: 55200-000, Pesqueira, PE Brasil.
E-mail: celia@pesqueira.ifpe.edu.br

Role of Authors:
Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - Vasconcelos CMR de, Vasconcelos EMR de, Vasconcelos ALR de, Raposo MCF; Drafting the work or revising it critically for important intellectual content - Vasconcelos EMR de, Vasconcelos ALR de, Moura JW da S, Oliveira RV de; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - Vasconcelos CMR de, Vasconcelos EMR de, Ramos VP, Vasconcelos ALR de, Moura JW da S. All authors approved the final version of the text.

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