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ORIGINAL ARTICLE

Family member knowledge on healthy eating for children: application of stop-motion technology

Conhecimento de familiares sobre alimentação saudável de crianças: aplicação de uma tecnologia stop motion

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ABSTRACT

Objective: To evaluate the knowledge of family members on child nutrition through the application of stop-motion, audiovisual, educational technology. **Method:** Before-and-after, methodological, and quasi-experimental study, consisting of the following steps: technology development, validation, pre-test, and post-test. The sample was composed of 33 family members of children aged between 6 and 12 years old, enrolled in a public school in a municipality in Northeast Brazil. **Results:** In the post-test, an increase was observed in the number of correct answers per participant and there was an improvement in knowledge classification. There was statistical significance (p=0.0028) regarding the knowledge of the children's family members after the application of the stop-motion technology. **Conclusion:** The use of stop-motion technology was shown to have generated a positive effect for family members regarding knowledge related to healthy eating for children.

Descriptors: Nursing; Child; Child Nutrition; Educational Technology; Diet, Healthy.

RESUMO

Objetivo: Avaliar o conhecimento de familiares sobre a alimentação de crianças por meio da aplicação de uma tecnologia educativa audiovisual em stop motion. **Método:** Estudo metodológico e quase experimental do tipo antes e após, composto pelas seguintes etapas: desenvolvimento da tecnologia, validação, pré-teste e pós-teste. Amostra composta por 33 familiares de crianças na faixa etária de 6 a 12 anos, matriculadas em uma escola pública de um município do Nordeste do Brasil. **Resultados:** No pós-teste observou-se o aumento do número de acertos de questões por participante e uma melhora na classificação do conhecimento. Houve uma significância estatística (p=0,0028) no que concerne ao conhecimento dos familiares das crianças após a aplicação da tecnologia stop motion. **Conclusão:** Foi evidenciado que a utilização da tecnologia stop motion gerou efeito positivo para os familiares no que tange aos saberes relacionados à alimentação saudável de crianças.

Descritores: Enfermagem; Criança; Nutrição da Criança; Tecnologia Educacional; Dieta Saudável.

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INTRODUCTION

Eating behavior is established during childhood, the bases of which are transferred by the family and supported by traditions. Thus, the consumption of unhealthy foods by children may be associated with the frequency with which parents demonstrate unhealthy eating habits[1].

In this context, the industrialized and ultra-processed foods that are offered to children are sources of fat, sodium, and sugar. The frequent consumption of these foods can trigger several problems, including being overweight and childhood obesity[2,3]. In addition, studies in different countries show that such foods predispose children, at an accelerated rate, to the prevalence of non-communicable chronic diseases, such as hypertension and diabetes mellitus and diseases that compromise child health. These diseases can extend into adulthood, causing a public health problem[4].

In line with this, parents are seduced by the practicality of industrialized foods, in addition to being influenced by advertisements in the formation of children's eating patterns, demonstrating that there is a strong influence of extra-familial factors (social networks and other media) that shape the eating behavior of the family[5].

Thus, ensuring the quality of the food offered to children and eaten during childhood is a complex task, as is stimulating interest in healthy eating. However, even in the face of such complexity, several strategies and methodologies can be used in order to change/improve eating habits.

Schools stand out among the many community spaces that can be used for such actions, as they are environments where children and adolescents can be found, who, in a teaching-learning process, are multipliers of information[6]. In addition, on occasions, there is the presence of the students' parents, which facilitates the assimilation of information by other entities in the community and within the family.

In this regard, of the health professionals working within the school environment, nurses stand out, as since graduating, and throughout their professional career, they have developed skills in relation to health education, with a view to preventing and promoting student well-being[7].

Among the innovative resources that can be used in these teaching-learning processes, stop motion, audiovisual technology stands out. In this technique, a video is created from images captured by photographic equipment, in which they are displayed in sequence over a period of time, creating the illusion of movement and portraying the developed script[8]. From this perspective, findings in the literature indicate that this type of technology enables the development of learning and knowledge construction in different areas[9]. In addition, it enhances the imaginative and creative capacity of the target demographic, who acquire the ability to assimilate and articulate new elements in a short period of time, showing involvement and concentration[10].

Therefore, the following question arises: can the use of stop-motion educational technology within the school environment support the information/knowledge needed to bring about changes, or maintain healthy behaviors, in relation to eating habits among the family members of children?

The present study is justified by the importance of educational technologies, as they are capable of raising the level of knowledge and confidence and improving care, in addition to encouraging healthy practices and discouraging inappropriate practices[11,12]. However, through searching the literature, it can be perceived that stop-motion technology has been little used by health professionals as an educational tool, despite knowledge of its easy construction, applicability, low cost, and ability to increase knowledge[9]. Therefore, knowing its benefits and the importance of working on healthy eating, its application becomes justifiable.

In view of the above, this study aimed to evaluate the knowledge of family members on child nutrition, through the application of stop-motion, audiovisual, educational technology.

METHOD

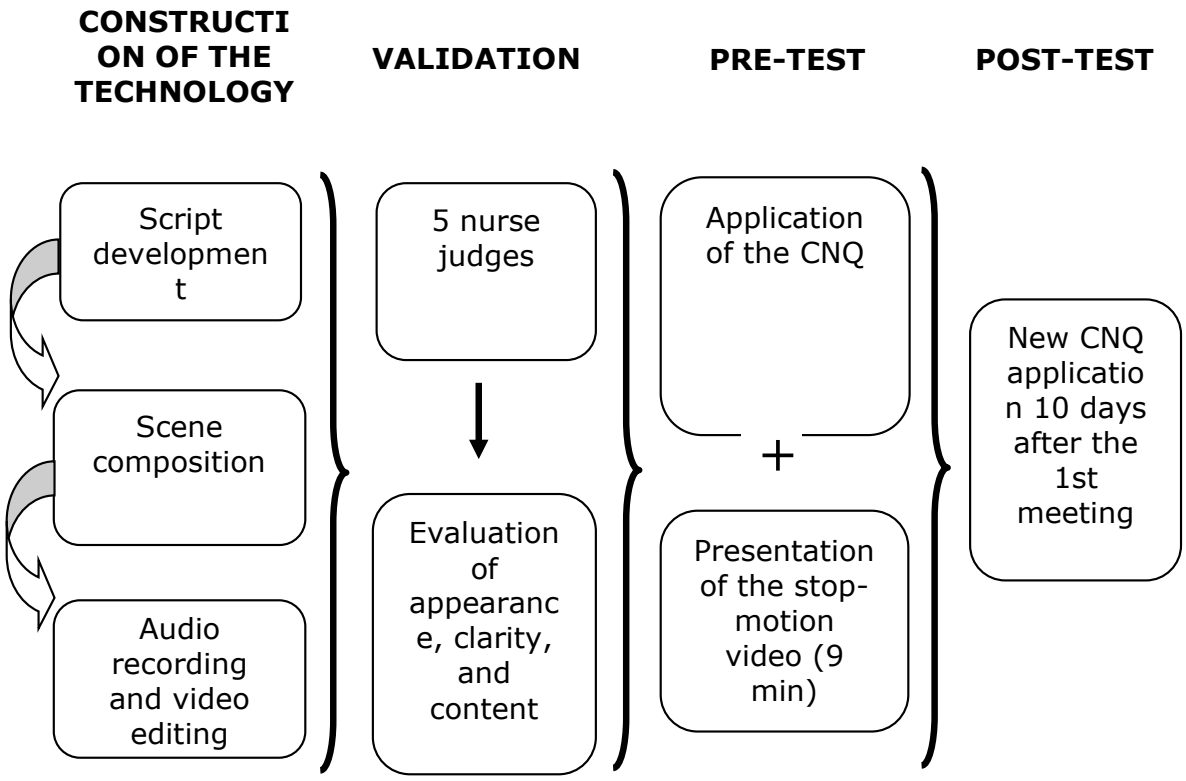
This is a before-and-after, quasi-experimental, methodological study on the development and validation of educational technology for application in the learning of family members.

This study was carried out between November 2019 and March 2020 in four stages, as shown in Figure 1: Construction of the technology; Technology validation; Knowledge evaluation before the application of stop-motion technology (pre-test); and, Knowledge evaluation after the application of stop-motion technology (post-test).

Technology development

Initially, the video with the developed script was devised based on a previous study[13] on the theme assessing the knowledge of parents on child nutrition, in which variables that were used to build the stop-motion technology were described.

The development of all the material/content contained in the technology was based on a literature review of the theme, including both national and international production, acquired through searches of the Latin American and Caribbean Health Sciences Literature (LILACS), Public/Publisher MEDLINE (PubMed), and Scientific Electronic Library Online (SciELO) databases and the Coordination for the Improvement of Higher Education Personnel (CAPES) Journal Portal, through the script to be addressed in the video. This consisted of: diet characteristics with positive and negative consequences for health (emphasizing which types



CNQ: Child Nutrition Questionnaire.
Source: Research data.
Figure 1. Study stages, 2020.

of foods are healthy for consumption and which are harmful to health for being related to the onset of diseases, such as industrialized foods); behaviors that mediate the rules for daily eating practices (exploring the ideal number of meals per day, intervals between meals, the importance of varying food choices among existing groups); attitudes based on food, cultural, and family beliefs (demystification and removal of taboos regarding the consumption and combination of healthy foods which, in turn, could be linked to harm, due to perpetuated popular knowledge); nutritional knowledge that guides daily life for the use of different food groups (exploring the diversity of foods that constitute food groups, focusing on the nutrients provided, which are essential for the functioning of the body). After reading in full, ten articles were selected that addressed the theme, along with a guide from the Ministry of Health of Brazil. After reading all the material, relevant information was extracted, and a record was made in order to provide solid and essential knowledge on the subject.

For the preparation of the video, a computer, camera, tripod, table, images, foods (fruits, legumes, green leaves, grains, vegetables, milk and dairy products, meat, and cereals), pens, cardboard, utensils and materials for the preparation of the food, and a clock, were used.

For the composition of the images, printed illustrations of food with playful and attractive content, short texts, and drawings of people and food by a professional in the area were used, along with real photographs of food and objects. The content of these referred to the quality, quantity, and ideal time of meals in a day, the types and nutritional sources of foods, the benefits of healthy eating, and the risks and harm to health when a healthy diet is not followed.

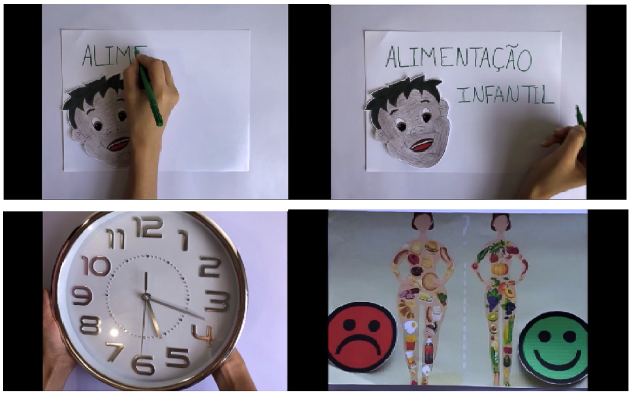
Then, scenes were composed using the materials described above, being moved manually, such that the camera, coupled to a tripod, captured the photos, grouped in sequence, at a time interval which created the illusion of movement[8].

The photos taken using the camera were transferred to a computer file. From this material, 3,000 photographs were selected to compose the video. The stop motion, audiovisual, technology was developed with the combination of selected photographs, in addition to the audio recording created by the researchers themselves based on the script. For video production and editing, the movie maker computer program was used.

Below, Figures 2 and 3 show grouped cuts of the finished scenes of the stop-motion technology.

Technology validation

In this stage, the technology was validated by nurse-judges, two with a doctoral degree in nursing and three with a master's degree in nursing. All the judges work in the area of technologies in health care and nursing, are members of the *Processo de cuidar em saúde da criança e do adolescente* (Care process in child and adolescent health) research group of the Universidade da Integração Internacional da Lusofonia Afro-Brasileira (UNILAB), and have experience in the topics of technologies in care in health and nursing, child and adolescent health, and health education.



Alime: feed...; Alimentação infantil: infant feeding.
Source: Research data.

Figure 2. Cuts of the introductory scenes of the stop-motion technology, 2020.

cálcio: calcium; zinco: zinc; ferro: iron; açúcar: sugar; quantidade: the amount; qualidade: quality.
Source: Research data.

Figure 3. Cuts of the sequential scenes of the stop-motion technology, 2020.

The literature indicates divergences in the number of judges needed to validate technologies but considers between three to ten judges an ideal number. In addition, importance should be given to the training, qualification, production of technologies, and clinical experience of the judges involved in this process[14].

It is emphasized that this thorough, analytical appraisal generated the production of knowledge and the analysis gave meaning to the content on display.

Evaluation of the knowledge of family members on diet before applying the technology (pre-test)

This stage was carried out in an elementary school in an urban area, located in a municipality in Ceará in the region of the Baturité massif. The school provided educational services with classes from the 1st to the 5th grade, for children aged 6 to 12 from the local community.

The children enrolled in this institution came from a day care center where outreach activities on child nutrition are developed, in conjunction with a public higher education institution in the same city. In this context, it was identified that children brought many industrialized snacks from home, and refused the healthy food offered by the school. Therefore, the plan was to extend actions through the application of the stop-motion technology to the families of the elementary school children, since they had not participated in interventions in previous years when the children were still in the aforementioned daycare.

The study population consisted of family members of children who were duly enrolled at the school. The inclusion criteria were being a father, mother, or guardian of one or more children duly enrolled at the school that is the locus of the study; attending the previously scheduled meeting (assessment before technology); and participating in a phone call to assess knowledge after applying the technology. The exclusion criterion was presenting any disease/limitation that would hinder the assessment of knowledge and the application of the stop-motion technology.

Initially, the research was presented to the educational institution. Subsequently, the families of the 330 children enrolled at the school were invited to a meeting. Through a non-probabilistic convenience sampling process, the sample consisted of the 33 family members that attended the meeting. For these family members, the research and its objectives were clarified, with the participants being assured of the confidentiality of their identities. They were then invited to participate in the research and sign the Informed Consent Form in duplicate.

At this time, to evaluate their knowledge before the application of the stop-motion technology, an instrument called the *Questionário de Alimentação Infantil* (QAI) (Child

Nutrition Questionnaire — CNQ) was used. It was developed and validated in a methodological study of Portuguese origin[13] to assess parents' knowledge on preschool child nutrition, and is divided into four axes: Food and Health; Food Rules; Family Food Beliefs; and, Variety/Diversity in the Food Pattern. This instrument contained 55 items; after reading all the items, five were removed as they were not suitable for the Brazilian demographic, as they mentioned types and characteristics of foods specific to the previous study, relevant to the Portuguese reality.

As such, the CNQ included a survey of sociodemographic data and 50 dichotomous statements (true/false). The researchers addressed the group of participants to explain the composition and division of the questionnaire and the types of statements it contained; subsequently, family members were asked to fill out the instrument with sociodemographic data, telephone contact, and use an "X" to mark the statements that corresponded to what they did, thought, and knew about their child's diet.

The statements were related to the variety and choice of food, quantity and intervals of meals, types, nutritional properties and importance of food, and the relationships of weight with diet and diet with child development.

After completing the instrument, the technology was presented, through projection, in a reserved, private place with adequate lighting. The video lasted nine minutes and then the students' families were informed that they would receive a call, after ten days, for reassessment. For this, the day and time were agreed upon and scheduled in advance with the participants to carry out the call, according to the availability of each, so as not to interrupt their daily activities and tasks.

Evaluation of the knowledge of family members on diet after applying the technology (post-test)

Ten days after the first meeting, a new assessment was carried out (post-test) and the same questionnaire was once again applied to verify the absorption of the content presented in the video. The assessment was carried out through a telephone call with an average duration of 30 minutes. The calls were made by the researchers, and all followed the same approach: they identified themselves, explained the reason for the call and that it was in accordance with what had been previously arranged, and that the same instrument filled in by the participant in the first meeting would be applied again. As the researchers read the statements, the participants were to answer true or false for each item, and the responses were recorded.

The score per item varied between 1 for correct answers, indicating adequate knowledge on child nutrition, and 0 for error, indicating insufficient knowledge. The score to be obtained in this test ranged from 0 to 50, obtained from the sum of all the questions answered correctly. The higher the total score, the better the knowledge of family members regarding child nutrition, according to the classification of the level of knowledge by cut-off groups established in the study of the construction and validation of the CNQ on child nutrition[13].

As five items were removed from the original instrument, as mentioned above, it was necessary to adapt the knowledge classification. For this purpose, from the instrument composed of the remaining 50 items, the proportion formula was applied in order to establish the new cut-off points in relation to the number of correct answers, generating the new classification of knowledge shown in Figure 4.

Finally, the data obtained were organized and compiled using Microsoft Excel® 2016 and the Statistical Package for Social Sciences (SPSS), version 23.0, was used to perform descriptive statistics and Wilcoxon test with a p-value of 0.05.

The research followed the recommendations of Resolution 466/12, being forwarded to the Ethics Committee and receiving approval, decision no. 3.701.525 and CAAE 96310618.8.0000.5576. To preserve the anonymity of the participants, they were identified by numbers, from one (1) to 33.

RESULTS

Table 1 shows the sociodemographic data of the sample.

As observed in Table 1, the sociodemographic profile was characterized by participants with a mean age of 32 years (±10.13), with most participants being female, 32 (97%).

Classification of knowledge on the original instrument Total 55 items	Classification of knowledge on the adapted instrument Total 50 items
Insufficient knowledge (<=37)	Insufficient knowledge (<=33)
Sufficient knowledge (38–41)	Sufficient knowledge (34–37)
Good knowledge (>=42)	Good knowledge (>=38)

Source: Research data.

Figure 4. Classification of family members' level of knowledge on child nutrition, 2020.

Table 1. Sociodemographic profile of the family members, 2020.

Variable	n (33)	%
Sex		
Female	32	97
Male	1	3
Relationship		
Mother	24	72.7
Father	1	3
Other	8	24.2
Marital Status		
Married	22	66.7
Single	10	30.3
Widow	1	3
Occupation		
Self-employed	9	27.3
Housewife	8	24.2
Unemployed	7	21.2
Employed (private sector)	5	15.2
Student	2	6.1
Employed (public sector)	2	6.1
Education		
Never studied	1	3
Incomplete primary education	5	15.2
Complete primary education	6	18.2
Complete high school	19	57.6
Incomplete higher education	2	6.1
Location		
Urban area	26	78.8
Rural area	7	21.2

Source: Research data.

The number of mothers, 24 (72.7%), stood out in relation to other types of relationship, such as father and others (sister and grandmother). Regarding marital status, 22 (66.7%) were categorized as married/stable union.

Regarding the employment situation, there was a predominance of housewives, with eight (24.2%). The monthly family income was 1.85 minimum salaries (±0.71) on average. It is worth highlighting that the minimum salary corresponded to 998.00 Brazilian Reais at the time of data collection. With regard to the level of education, 19 (57.6%) had completed high school, but it varied between people who had never studied and others who were already attending higher education. In terms of origin, 26 (78.8%) lived in the urban area.

Below, Table 2 presents the information from the analysis of the responses of family members regarding the instrument used in the collection.

Note that most family members obtained better results in the second assessment. However, six of the participants maintained the same score in both assessments. As such, the number of correct answers per individual increased by a mean of 2.3 questions in the second assessment.

Below, Table 3 shows the comparison of assessments carried out at the two moments of the study.

Table 4, which classifies the knowledge of the family members based on the scores obtained in the assessments, is shown below.

As shown in Table 4, there was an improvement in the knowledge of the target demographic, with a drop in the classification of "insufficient knowledge" and "sufficient knowledge" and an increase in data in the classification of "good knowledge". Therefore, there was statistical significance regarding the knowledge of the children's family members after the application of the stop-motion technology.

DISCUSSION

In a previous study, carried out with the aim of evaluating the knowledge of parents and caregivers on healthy eating for children[15], there was also a predominance of female guardians, all mothers. These data can be interpreted as maintenance of a tradition that is still in force, in which the woman is traditionally seen as the caregiver of the home and family.

Another aspect revealed in the research concerns the income of parents and/or guardians. Most of the participants come from low-income classes, a condition that can sometimes influence healthy eating habits, even if the family has knowledge on which products are most suitable for nutrition[15]. Furthermore, the scarcity of financial resources may prevent the family's needs, such as the maintenance of essential services (water, electricity, telephone, rent), from being met, also limiting the resources intended for education, food, health, and leisure[16].

Corroborating the above findings, a systematic review study evaluated the relationship between poverty among the population living in urban areas and lack of access to healthy food. Their findings confirmed this association and showed worse nutritional results among this demographic, such as obesity, being overweight, and malnutrition[17].

Regarding education, similar research carried out with mothers of preschool children revealed that this variable was associated with the child's adequate nutrition, that is, the higher the level of education, the more information was

Table 2. Analysis of family members' responses by assessment, pre- and post-test – 2020.

Family member	1st Assessment (Pre-test)		2nd Assessment (Post-test)		Difference in correct answers between assessments
	n	%	n	%	
1	39	78	41	82	+2
2	36	72	36	72	0
3	40	80	42	84	+2
4	31	62	36	72	+5
5	32	64	33	66	+1
6	43	86	44	88	+1
7	32	64	35	70	+3
8	35	70	37	74	+2
9	37	74	37	74	0
10	41	82	42	84	+1
11	34	68	36	72	+2
12	41	82	41	82	0
13	44	88	45	90	+1
14	36	72	36	72	0
15	35	70	40	80	+5
16	35	70	38	76	+3
17	42	84	43	86	+1
18	39	78	43	86	+4
19	42	84	43	86	+1
20	38	76	41	82	+3
21	40	80	40	80	0
22	41	82	44	88	+3
23	44	88	45	90	+1
24	41	82	44	88	+3
25	41	82	41	82	0
26	41	82	45	90	+4
27	41	82	41	82	0
28	39	78	42	84	+3
29	42	84	45	90	+3
30	34	68	40	80	+6
31	36	72	40	80	+4
32	42	84	45	90	+3
33	25	50	35	70	+10

Source: Research data.

sought regarding the foods to be consumed by the children. In the same study, the highest level of education presented by mothers was complete high school[18].

This reinforces the need to develop more accessible health education processes for people with low education, making use of technologies that facilitate the construction of knowledge, such as the use of illustrative images, and educational videos and audios, with simple, easy-to-interpret language. By using this type of technology, professionals will provide the learner with greater immersion in the topic

Table 3. Comparison of pre- and post-test assessments, 2020.

	Mean	Standard deviation	Min.	25%	Median	75%	Max.	Mode
Pre-test	38	4.3	25	35	39	41	44	41
Post-test	40	3.5	33	37	41	43	45	41

Min.: minimum; Max.: maximum.

Source: Research data.

Table 4. Classification of family members' level of knowledge according to pre- and post-test assessments, 2020.

Classification of knowledge	1st Assessment (Pre-test)		2st Assessment (Post-test)		*Wilcoxon* (p-value)
	n (33)	%	n (33)	%	
Insufficient knowledge <=33	4	12.1	1	3	0.0028
Sufficient knowledge 34 to 37	9	27.3	8	24.3	
Good knowledge >=38	20	60.6	24	72.7	

Source: Research data.

discussed, giving rise to a more significant and satisfactory level of learning[19].

With regard to the number of correct answers, there was a greater number of correct questions in the post-test and a consequent improvement in the level of knowledge of the family members. This may be associated with the use of the stop-motion technology, as shown by the statistical analysis performed in the study. The literature indicates that information and communication technologies, which have been widely used for teaching, research, and education in health services, promote improvements in the field in which they are applied[19].

Other studies that have used technological tools in the field of health[20-21] resulted in positive outcomes in the assimilation of knowledge by learners. This reinforces the potential for the application and use of technological resources, such as audiovisual resources, leading to growth in public interest in the topic, as well as a quick assimilation of the content presented, a result that is in line with the findings in this research.

In addition, the audiovisual resource promotes the teaching-learning relationship, as, through it, it is possible to capture the public's attention and arouse their curiosity in relation to the themes addressed, enabling knowledge levels to be raised. This can be demonstrated through several studies in the literature that use this type of technology in their different areas of activity[22,23].

The literature reinforces that educational materials have positive responses as an appropriate instrument to help parents, families, students, and health professionals in health education activities[21]. In the literature, there are several types of educational technologies; however, those with audiovisual resources, such as games, applications, and videos, manage to reach the viewer in a multisensory manner, allowing interactivity and enabling a better grasp of the content being broadcast[24].

Also concerning the use of audiovisual technologies by health professionals, a study carried out by nurses showed that the use of these tools proved to be satisfactory as a result of interventions carried out collaboratively among children, in addition to enabling an approximation between the child, guardian, and healthcare team[25].

As limitations, the failure to capture the target demographic by sample calculation, the small number of participants, and the treatment of data by descriptive and non-analytical analysis, stand out. What makes it difficult to generalize the data is the regionality of the facts, characterized by the difficulty of family members to attend scheduled meetings, as many lived in rural areas of the city far from the school, were dependent on public transport, incurred expenses involved with travel, and had difficulty getting away from home due to housework. In addition to this, the meetings also suffered losses due to the holidays and subsequent installation of the Sars-Cov-2 pandemic, at the beginning of the year 2020, as well as the short time interval between assessments, which could potentially lead to a recall bias.

CONCLUSION

The present study concluded that the use of stop-motion technology generated a positive effect for family members regarding knowledge related to healthy eating. Thus, making use of technological tools in teaching-learning processes is beneficial for both the user and the professional. Results such as these reinforce the need for the disclosure of content in new technologies to encourage the modification of health habits, seeking to achieve benefits for society. As such, the incorporation of technologies in health/education services emerges as an alternative for the transmission of knowledge, making the content to be transferred more attractive, dynamic, and easy to apply to the public.

In addition, this study contributes to the area of nursing by presenting a new tool that may contribute to the work process of nurses, in order to open up a range of possibilities within their professional performance.

Finally, the use of these technologies constitutes an innovation of the profession amid advances in the technological era in which we live and increasing improvement in the care process.

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