Proyecto Veggies4myHeart: Instrumentos de educación alimentaria y nutricional para preescolares - un análisis DAFO

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Resumen

Fundamentos: Las herramientas de educación nutricional para promover el consumo de verduras en el contexto escolar, aparecen como potenciadoras de los conocimientos y comportamientos alimentarios de los niños. El propósito de este estudio es evaluar la perspectiva de los diferentes actores del proyecto Veggies4myHeart en relación con su potencial de un juego digital, un libro de cuentos y la Rueda de los Alimentos de Portugal para promover el consumo de verduras en la edad preescolar.
Métodos: La muestra consistió en 26 participantes que participaron en el proyecto Veggies4myHeart. Se trata de un estudio cualitativo, que utiliza el análisis de contenido temático. Las respuestas se analizaron mediante el software WebQDA**.**
Resultados: Teniendo en cuenta el análisis DAFO se identificaron los puntos fuertes, los puntos débiles, las oportunidades y las amenazas de cada herramienta de educación nutricional. Los participantes identificaron un mayor número de aspectos positivos y negativos con respecto al juego digital**.**
Conclusiones: Este estudio ha permitido conocer la perspectiva de los creadores y/o usuarios de las herramientas de educación alimentaria en relación a su potencial para promover el consumo de verduras en edad preescolar. Un análisis DAFO da la posibilidad de conocer las limitaciones o potencialidades que pueden estar asociadas a la difusión de estas herramientas en la comunidad educativa.

Palabras clave: Educación Sanitaria; Preescolar; Niño; Verduras.

Veggies4myHeart Project: food and nutrition education tools for pre-schoolers – a SWOT analysis

Summary

Background: Nutrition education tools to promote vegetable consumption in the school context appear as enhancers of children's knowledge and eating behaviors. The purpose of this study is to assess the perspective of the different stakeholders of the Veggies4myHeart project regarding the potential of a digital game, child storybook and the Portuguese Food Wheel Guide to promote vegetable consumption in preschool age**.**
Methods: The sample consisted of 26 participants who were involved in Veggies4myHeart project. This is a qualitative study, using thematic content analysis. The answers were analyzed using the WebQDA qualitative analysis software**.**
Results: Considering the SWOT analysis were identified strengths, weaknesses, opportunities and threats for each nutrition education tool. Participants identified a greater number of positive and negative aspects regarding digital game**.**
Conclusions: This study has allowed the perspective of creators and/or users of food education tools to be known in relation to their potential to promote the consumption of vegetables at pre-school age. A SWOT analysis of each food education tool gives the possibility to know the constraints or potentialities that may be associated with the dissemination of these tools in the educational community**.**

Key words: Health Education; Preschool; Child; Vegetables.

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Background

The early years are a critical period for the establishment of healthy eating habits and regular physical and cognitive development[1]. It is during childhood that eating habits and behaviours that last into adulthood are created and will contribute to the prevention or onset of certain diseases such as obesity, cardiovascular disease, or certain cancers[2]. One of the World Health Organization's (WHO) strategies for reducing childhood obesity is the implementation of programs that promote healthy food intake, reduction of unhealthy food intake and sugary drinks by children and adolescents[1]. Vegetable consumption is known to be particularly low in childhood despite all the scientific evidence associating vegetable consumption with a lower risk of chronic diseases, in particular obesity[1,3–5]. The Portuguese National Food Survey, presented in 2017, revealed that 52.7% of Portuguese people do not consume more than 400 g/day of fruit and vegetables (WHO's recommendation), and in children this percentage of non-compliance increases to 68.9%, standing out lower consumption of vegetables compared to fruit[6]. In Portugal there are few food and nutrition education tools to promote the consumption of vegetables in preschool children and their effectiveness is unknown. Therefore, it is important to create food and nutrition education programs that enhance the knowledge and skills needed for children to make healthy food choices. It is recognized that well-designed food and nutrition education programs have the potential to facilitate motivation and preference for healthy foods by favouring the implementation of appropriate eating habits[7–9]. A review that identified characteristics associated with successful nutrition education programs for children, found that there is greater effectiveness of the program when they are integrated experimental activities, such as games, gardening or cooking, and when the goal of the program is based on changing a specific aspect of diet[7]. On the other hand, the integration of health education programs in the academic curricula themselves and in the activities of the school contexts is an increasingly need to enhance their effectiveness[10].

The Veggies4myHeart project was structured with the aim of promoting the consumption of vegetables in preschool children by conducting food and nutrition education sessions using different educational tools: the Veggies4myHeart digital game, the child storybook "Who wants to go to the village market? " and the Portuguese Food Wheel. The digital game and the child storybook were created specifically for this project through the collaboration of a multidisciplinary team (Computer Programmers, Designers, Nutritionists, and specialists of Portuguese Literature, Preschool Education and, Didactics).

In order to analyse the food and nutrition education tools used in the Veggies4myHeart project, the SWOT (Strengths, Weaknesses, Opportunities, and Threat) matrix was used. The objective of this study is to assess the perspective of the different stakeholders of the Veggies4myHeart project regarding the potential of these food and nutrition education tools to promote vegetable consumption in preschool age.

The SWOT matrix is a strategic planning tool that results from analysing Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses relate to the internal qualities of the object under analysis while the opportunities and threats relate to the object's interactions with the external environment. SWOT analysis is currently a

very useful tool in the decision-making process and in the analysis of the relationship between the object analysed and its surroundings [11,12].

Material y methods

Participants

Participants were selected from the group of creators and facilitators of the project Veggies4myHeart. A convenience sample was selected according to the following criteria: have participated in the creation of the digital game; have participated in the creation of the storybook and/or have conducted the educational sessions.

Instrumentation

For data collection was used an online open-ended survey. The script for the online survey was developed by researchers and professors in the field of health and nutrition of the Polytechnic Institute of Leiria. A pre-test was conducted in a sample of 4 researchers independent of the project Veggies4myHeart.

Procedure

Prior to the allocation to the study, participants were informed about study goals and asked to participate in an online open-ended question form. A link to access the online form, available from January to February 2020, was sent to 43 participants. The questions were responded by 26 participants revealing a drop-out rate of 39.5%.

Data Analysis

This is a qualitative study, using thematic content analysis according to Bardin[13]. The answers were analysed using the WebQDA qualitative analysis *software*, allowing discussion among researchers for the construction of tree codes. First, the four categories of SWOT analysis (strengths, weaknesses, threats, and opportunities) were defined for each food education tool (digital game, child storybook, and Portuguese food wheel). Next, subcategories were assigned to each of the SWOT analysis categories according to the relevance and frequency of the participants' responses. Finally, the inter-coder reliability between two independent researchers was calculated, which was 0.9. The discrepancies found were discussed until consensus was reached.

Results

Participants

The sample that answered the questionnaire (n=26) was composed by health sciences teachers (3.8%), digital games and multimedia games teachers (7.7%), kindergarten teachers (26.9%), dietetics and nutrition students (46.2%), digital games and multimedia students (7.7%) and nutritionists (7.7%), being 92.3% female and 7.7% male, aged between 19 and 61 years old. Table 1 summarizes the socio-demographics characteristics of the participants according to the form of participation in the project.

Categories and Subcategories

As a result of the analysis of the content of the responses given by the participants it was possible to identify a set of subcategories that characterize their perception of the food education tools used in the Veggies4myHeart project. Figure 1 shows the number of references in each subcategory for each food education tool.

Table 1. Characteristics of participants who answered the on-line questionnaire.

	Digital Game creators	Story Book creators	Digital Game applicants	Story Book applicants	Portuguese Food Wheel Guide applicants
Sex	3 Females; 1 Male	2 Females	8 Females; 1 Male	7 Females	6 Females
Age (mean)	39,5	21,5	30,6	41,9	40,5
Profession	3 High School Professors; 1 High School Student	2 High School Students	1 Kindergarten Teacher; 7 High School Students; 1 Nutritionist	4 Kindergarten Teachers; 2 High School Students; 1 Nutritionist	3 Kindergarten Teachers; 2 High School Students; 1 Nutritionist

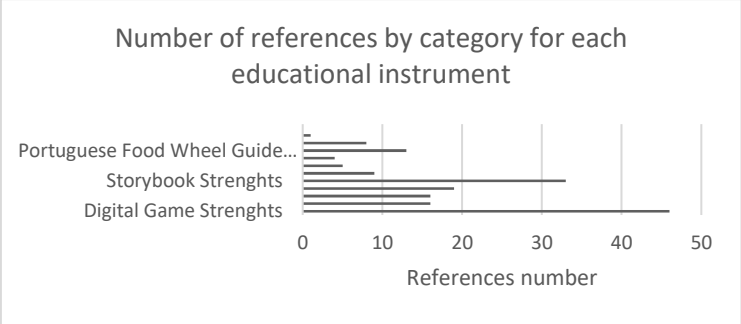

Figure 1. Number of references of swot analysis for the digital game, story book and portuguese food wheel guide.

Tables 2, 3, and 4 list the subcategories identified in each category of the SWOT analysis of the digital game, child story-book, and the Portuguese food wheel, respectively. Each table presents an example of a reference and the total number of references for each subcategory.

Digital game

The analysis of the content of the responses given by the participants who created the digital game or participated in the educational sessions in which it was used provided 97 references for the 25 subcategories identified, being the food education tool in which the highest number of references were obtained in the SWOT analysis.

The forces of the digital game refer to the qualities and characteristics of the game itself that make it capable of promoting the consumption of vegetables for preschool children. In this way, it was possible to recognize that the participants found several strengths in this digital game, both for the technical quality and scientific rigor of the game and for its ability to entertain children and to convey the educational message:

Table 2. SWOT analysis coding scheme for the digital game.

Code	Description	Example	Frequency (n)
Digital Game Strenghts			
Ludic	The digital game is considered a playful resource	*Educational and fun game to encourage children to be healthier*	7
Attractiveness	The digital game is attractive for children	*The digital game was an attractive point for children in the project*	7
Interactivity	The digital game interacts with children	*Dynamic, appealing, interactive, it has the audio part and children can create a certain connection with the characters*	8
Adaptation	Game adapted to the Portuguese context	*Is made for the Portuguese reality, with local vegetables and in Portuguese*	1
Learning	Allows knowledge acquisition and memorization	*Makes the learning process easier*	13
Consumption	Increases the consumption of vegetables	*Promotes the consumption of locally produced vegetables*	4
Scientific Accuracy	The game conveys scientifically valid and accurate information	*The game was created by an interdisciplinary team which guarantees not only its correct functioning, but also the veracity of the information transmitted and its suitability for the age group under study.*	1
Educational Resource	The digital game is a possible resource to educate children about food, nutrition and health	*The digital game can be a good educational resource to promote the vegetable consumption at preschool children*	5
Digital Game Weaknesses			
Sedentary	The digital game promotes sedentarism	*As a digital resource, children spend more time sitting with a smartphone or tablet*	5
Difficulty level	The digital game has levels of difficulty that may be inappropriate for children	*Some games have medium difficulty, so not all children can play and are frustrated: this varies with the age in question*	4
Association game-reality	The game does not allow to associate with reality	*Possible difficulty in creating the association between vegetables in the game and vegetables in reality*	2
Audio	Audio messages may not be well understood by children	*Children can be distracted only by the playful aspect, not paying so much attention to the messages that are transmitted throughout the game*	3
Digital illiteracy	Children are not familiar with digital resources	*Some children may not be familiar with the devices and how their interaction works*	1
Individualism	The digital game promotes the individualism	*The fact that the game is a single-player does not create social ties, a situation that I think is fundamental in these ages*	1
Digital Game Threats			
Lack of time	Lack of time in the classroom to explore the game	*The weak point is that children do not have time to explore it in the classroom context*	2
Concurrence	Existence of many digital games	*Children's "fatigue" with digital games due to over-supply*	2
Vegetable consumption	Low vegetable consumption among children and their families	*Children's lack of vegetable consumption can influence their decision to play the game*	4
Equipment	Availability of devices to carry out the game	*As it is a digital game, it implies that material resources (smartphone or tablet) are available for it to be implemented, which may not always be viable*	8
Digital Game Opportunities			
Accessibility	Availability in different formats (mobile phone, tablet...) and in different contexts	*It is easily "transported" home since the use of smarthphones is widespread in society*	5
Technology	Use of technology as a pedagogical resource	*Increased use of ICT in education and health promotion*	4
School Programs	Inclusion of game themes in health promotion and healthy eating programs and in school activities.	*The digital game can be introduced in any project of health promotion or healthy eating.*	5
Concurrence	Concurrence of educational games in the field of food and nutrition	*Low competition of educational games in Portugal*	1
Digital literacy	Preschool children are increasingly able to use digital resources	*The target audience is skilled in the use of digital mobile games.*	1
Topicality	The topic of the digital game is ruling	*…the fact that having as main theme the promotion of a healthier diet is also a relevant issue since it is a current concern*	2

New products	Possibility of creating new products associated with the digital game	*…the fact that there are characters associated with food allows the creation of derived products (soft toys, figures, etc.), which increases the promotion of the game*	1

Table 3. SWOT analysis coding scheme for the story-book.

Code	Description	Example	Frequency (n)
Story-Book Strenghts			
Graphics	Appealing graphics	*The illustrations throughout the story*	3
Message	Simple message to be understood	*simple story to be perceived*	9
Vegetables benefits	Clear identification of the benefits of vegetables	*the story focused well on the benefits of each vegetable*	4
Autonomy	No more resources are needed to be able to use the storybook properly	*The story does not need external supports (the book itself is enough)*	1
Use in different contexts	The storybook can be used in different contexts (family, school ...) and different health promotion programs	*The story will be a support resource for promoting the consumption of vegetables and can be streamlined and contextualized whenever appropriate*	6
Vegetable consumption	Promotes the consumption of vegetables and influences the purchase of healthy foods	*The story will be another support resource that can be streamlined and contextualized in preschool, with the aim of encouraging children to consume vegetables often and with pleasure.*	3
Vegetables personification	Vegetables take on people's characteristics	*vegetables are the main characters and speak*	2
Age-appropriate	Suitable for preschool age	*The story is appropriate for preschool age*	1
Organization	Story well-structured and organized	*The story is divided into short and concise chapters*	4
Story-Book Weaknesses			
Title	Title hardly suited to the story	*The title is not indicative of the purpose of the book*	1
Illustration	Story Illustration	*The illustration could be more colourful*	2
Autonomy	Children's ability to understand the story themselves	*For children to be able to explore this resource, monitoring is necessary, since preschool children are not yet able to read alone*	3
Limited	Restricted to only five foods	*Have only food from the village market*	1
Monotony	Monotonous plot	*Too simple story. The fact that it's always the same short story and doesn't get away from it, monotonous.*	2
Story-Book Threats			
Reading habits	Decreased reading habits	*The excessive use of new technologies by children can result in a lack of interest in storybooks*	4
Acquisition	Purchase unavailability	*The book is not commercially available*	1
Story-Book Opportunities			
Health concerns	People are increasingly concerned with health	*The growing trend of concern about health determinants at young ages*	1
Educational resources	Association with other educational resources	*Allows educators to create various plots around the story (theatres, "tell the story", new narratives inspired by it, etc.).*	3

"*The game is a very interactive educational support, in which the child, through technological support, contacts a series of activities in which not only learns the benefits of vegetables but also thinks about how to pass the levels and has fun because of the use of music and appealing visual scenarios*.

The most mentioned force by the participants is related to the acquisition and memorization of knowledge that is provided by this digital game:

"*There is faster learning of the concepts to be transmitted.*"

"*The game teaches about the benefits and properties of vegetables in a fun way*"

The weaknesses of the digital game refer to the disadvantages of using this game for food education sessions to promote vegetable

consumption. The weaknesses most pointed out by the participants relate to the fact that digital games promote sedentary behaviours, which is contradictory to the healthy lifestyle that the game tries to promote:

"*Doesn't promote physical activity."*

Some of the weaknesses are also related to the technical characteristics of the game, for example, the audio messages, where participants indicated that it was difficult to hear the messages, and the levels of the game, stating that some levels were too demanding for younger children of preschool age.

The opportunities of digital game most mentioned by the participants are related to their accessibility and to the possibility of integrating the game in school activities or in any programs promoting healthy eating:

"*Ease of access to the product (Google Play)*";

"*The game can be installed in any technological support from tablets to mobile phones, which increases the possibility of access to this tool*".

Table 4. SWOT analysis coding scheme for the Portuguese food wheel guide.

Code	Description	Example	Frequency (n)
Portuguese Food Wheel Guide Strengths			
Vegetable identification	Allows to identify vegetables	*Allows children to know and be able to identify vegetables*	3
Visual information	Visually transmits information	*Understanding the amount of vegetables to consume visually*	7
Wide use	Wide possibility of use and exploration	*The food wheel gives us immense possibilities for exploration. We can use it in various activities, depending on the creativity of each one*	3
Portuguese Food Wheel Guide Weaknesses			
Attractiveness	The Portuguese Food Wheel Guide is not attractive for children	*It is an instrument low dynamic and attractive*	2
Previous knowledge	It is necessary to understand proportionality	*Requires knowledge of fractions, proportionality*	2
Interactivity	Does not allow interactivity with the child	*It is a little interactive educational tool*	3
Foods	Food displayed on the Portuguese Food Wheel Guide	*For greater specificity and reading of images by children it was necessary to introduce some more typical foods from our country*	1
Portuguese Food Wheel Guide Threats			
Receptivity	Children's receptivity to the Portuguese Food Wheel Guide	*The pre-school population is not so receptive to nutrition education strategies based on the food wheel*	1
Portuguese Food Wheel Guide Opportunities			
No participant expressed Opportunities for the Portuguese Food Wheel Guide			

Another opportunity mentioned by the participants refers to the exponential use of technology in education, which may motivate educators to use this type of tools in food education, this need being even more pressing in the post-COVID era.

Digital game threats most frequently mentioned in the participants' responses

relate to the fact that a device (*smartphone* or *tablet*) is needed to access the game since these devices are not always available in kindergartens:

"*The game needs a tablet or other mobile device to be used, and there are children in the age range who don't have access to them or have limited access in the home environment;*

"*There may not be enough tablets in the schools*."

One category found in both threats and opportunities of the digital game concerns competition. It is perceived as a threat in that there is currently a large number of digital games on the most diverse subjects, which may lead to a saturation of the child with respect to digital games:

"Children's "fatigue" with digital games due to over-supply"

On the other hand, it is also understood as an opportunity since in Portugal there are few digital games with healthy eating theme.

Child Story-book

The number of participants responding regarding the qualities and characteristics of the story-book as a food education tool capable of promoting the consumption of vegetables at preschool age was lower than the number of participants responding regarding the digital game, as can be seen in table 3. Also, the number of subcategories and references found was lower.

The strengths of the child story-book are related to its characteristics that make it capable of promoting the consumption of vegetables at preschool age. The most mentioned strength relates to the message of the story because it is clear and easy to understand:

"*Children have internalized the benefits of vegetables well*"

Other strengths found are related to the graphics of the story, its organization into chapters, the fact that it clearly identifies the benefits of each vegetable, and the possibility of use in different contexts or in different health promotion programs.

The weaknesses in the story that were pointed out by the participants are related to the illustration, the restriction of the story to the five foods being explored in the project, and the fact that preschool children are not literate, which makes it necessary for an adult to support more comprehensive exploitation of this resource:

"*The story will always have to be read by someone other than the child itself*".

The opportunities that participants highlighted regarding the use of the story refer to the fact that there is an increasing concern for health and the possibility of linking this story with other educational resources that also enhance the consumption of vegetables:

"*...in parallel with the game, they will make a complement to assimilate the concepts intended from the consumption of vegetables and their benefits for health*";

The threats found to children's story are related to the possible reduction of reading habits by families and to the fact that the book is not available for sale, since it was conceived solely for this project:

"decrease in the purchase of books by families"

"The excessive use of new technologies by children may result in a disinterest in history"

Portuguese food wheel

The Portuguese food wheel is a picture or graphic representation composed of seven groups of foods that were made to help choose and combine the foods that should be part of a daily diet. This food guide is present in school textbooks and in many Portuguese schools and kindergartens. The participants who responded regarding the capacity and potential of using this food guide as an educational tool to promote the consumption of vegetables at preschool age were fewer than those who responded regarding the digital game or storybook (Figure 1).

The forces of the Portuguese food wheel mentioned reflect the ability to use this tool in various programs to promote healthy eating and the ability to understand the message conveyed only by visual information:

"*How information is visual is easier to understand for young children*"

The weaknesses of the Portuguese food wheel are related to the fact that it is an unattractive and non-interactive tool and also to the need to have knowledge of proportionality for a good understanding of the message:

"It *can be non-interactive and playful*."

"*If not explained, the children don't understand the message the guide wants to convey*"

Participants did not identify any external factors that could positively influence the use of this food education tool in promoting the consumption of vegetables in the age group under study.

The threat identified by the participants is related to the low level of receptivity that children may have when working with a tool that is already used in several healthy eating promotion activities:

"*The preschool population is not so receptive to food education strategies based on the food wheel*"

Discussion

The results of this qualitative study allowed us to know the perspective of some of the participants of the Veggies4myHeart project who created or used the food education tools, regarding the tools themselves and also regarding the internal and external aspects that can enhance or devalue these tools. Of the three instruments analysed, the digital game was the one in which a greater number not only of positive aspects (strengths and opportunities) but also of negative aspects (weaknesses and threats) were identified. In this analysis the participants highlight some positive aspects of the digital game related to the ability to entertain and transmit an educational message simultaneously, stating that it can be advantageous for the assimilation of knowledge. The term *edutainment* emerged from this association between entertainment and education, is described by some authors as a useful strategy in the learning of lower order cognitive skills, such as the ability to recognize and interpret information, or as a way to increase awareness in health promotion campaigns[14,15], having proved effective in the retention of long-term information[16]. Other studies report that the advantages of *serious games* (games in which the main objective is to convey an educational message, being more than pure

entertainment) are related to the experiences and elements intrinsic to the game that make education enjoyable and fun, being an appropriate method to promote knowledge about nutrition and the promotion of healthy eating behaviors[14,17,18]. A study conducted with adolescent Nigerians[19] concluded that gamification in nutrition can change attitudes, knowledge, and dietary behaviour, positively affecting these three dimensions of the recognized food education model KAB[20] (Knowledge-Attitude-Behaviour). In this way, the digital game used in preschool education can be a good tool for conducting food education.

One of the negative aspects of the digital game that has been most frequently mentioned by participants is the sedentary associated with the use of mobile devices, which has been subject of debate by health professionals. The excessive time of exposure to screens in preschool age has been associated with a shorter time of physical activity and also with less metabolic health and motor, cognitive, and psychosocial development losses[21]. Despite all scientific evidence associating excessive exposure to screens with worse health outcomes[22], namely with the consumption of high energy density food and, consequently, increased risk of obesity[23,24], there are more and more studies indicating that the use of *serious games* may have some positive effects[25,26]. Some studies with children suggest that those who use digital games the most are those who have more friends, easier conversations with colleagues, greater problem-solving skills, and greater creativity. In addition, they develop beliefs about their intelligence and skills outside of games, seeming to enhance their performance in school tasks as well[25,26]. In this way, the evidence that moderate exposure to screens may be more beneficial than the absence or excessive use of screens, contradicts some beliefs of parents and health professionals. Currently, it is more important to consider the type of screen to which the child is exposed than just the time of exposure: exposure to television is associated with worse health outcomes than exposure to educational games, which may improve intellectual and academic performance[24]. Recent studies[27–30] have emerged with very promising results regarding the use of video games to promote physical activity, the consumption of fruit, and vegetables and the promotion of healthy eating, revealing to be useful as complementary components to other strategies to promote physical activity and increase knowledge on nutrition[23].

Some of the opportunities for the digital game mentioned by the participants in this study refer to the fact that there are still a few digital games in Portugal that promote knowledge and consumption of vegetables. They also point to the fact that preschool children already have some digital literacy. In fact, it is known that the current generation of children is known as the "digital natives" generation because "they were born in the online world and are native speakers of digital language" [31]. In Portugal, the game TuttiNutriscience was created with the purpose of promoting nutritional literacy and healthy food consumption[31], being one of the few Portuguese digital games with healthy eating as the main theme.

Regarding the story-book, the participants of the Veggies4myHeart project considered that one of the weaknesses of this tool is related to the fact that children need adult support to use the story since at preschool-age children are not yet literate. However, there is a consensus that only visual exposure to books with food images increases familiarity with exposed foods, thus increasing the child's willingness to eat the food he or she has visualized, as well as the preference for

it[5,32–35]. Some studies demonstrate that visualization of books with images of vegetables increases the preference and consumption of foods exposed in the book, despite individual, family or demographic factors that may influence the food preferences of children[33,36]. Thus, although the preschool child is unable to read the written content of the story, she will be able to visualize the images in the book and retain this information, allowing his familiarization with vegetables and possible consumption. However, a study that compared the effect on a child's food preferences when exposed to books with images only or to books with information associated with food images found that the results are more robust when the child observes images in association with food information[37]. Other more recent studies also reveal that conceptual knowledge about food may be as or more important than visual recognition[33,38]. In this way, the book created for the Veggies4myHeart project could be a good food education tool for this age group as it complements objective and simple information with conceptual information about foods portrayed in history:

The threat that was most highlighted in the children's story referred to the fact that children and families are currently decreasing their reading habits due to the excessive use of technology. However, it is known that although technology is increasingly present in children's lives, reading is still an activity they enjoy and that most parents try to stimulate[39]. In Portugal, the reading habits of children and parents were evaluated, concluding that 75% of parents read to their child daily or several times a week, this being a more prominent habit in mothers with children between 3 and 5 years of age[40]. Considering that it is mainly in this age group that parents most value and promote reading, it is of great importance to optimize the book as a food education tool, opting for simple, accessible and valid contents, enabling visual exposure to healthy foods.

As regards the Portuguese food wheel, it was not possible to obtain in-depth an analysis of the importance of this food education tool in promoting vegetables as in the other tools analysed. The lowest response rate for this instrument may be related to the fact that the Portuguese food wheel has been present in school food education for several years, which does not generate so much discussion or controversy about it, being an instrument that has always proved useful in Portuguese food education. Nevertheless, some strengths and weaknesses of this instrument have been identified. The strengths of the Portuguese food wheel most mentioned by the participants referred to the visual information that is issued by this food guide. In fact, food guides, such as food wheels or food pyramids, are created with the aim of transforming scientific language into simple information that is easy to read and interpret. Portugal adopted the Food Wheel as a food guide for the Portuguese population in 1977, as a symbol of the campaign "Knowing how to eat is knowing how to live", and since then it has been used by health professionals and teachers in the most diverse campaigns to promote healthy eating. Although in 2003 the Portuguese food wheel was modified, it kept its original shape in a circle in order to maintain the shape the population was already used to and also to resemble a plate, which makes the visual information more perceptible to the whole population, regardless of age or education[41].

One of the subcategories found in the weak points of the Portuguese food wheel is related to the foods present on the Wheel, in which the participant considers that the Wheel should include more traditional Portuguese food. In 2016, Portugal created

the Mediterranean Food Wheel, with the inclusion of traditional Portuguese foods and typical of Portuguese gastronomy[42]. However, the Mediterranean Food Wheel is not yet as widespread in Portuguese schools, which may justify the identification of this weakness.

One of the limitations identified in this study is that the sample does not integrate the total number of participants in the Veggies4myHeart project (creators and users), which limits the conclusions that can be drawn from this analysis. It would also be interesting to check whether the profession, age, or being a creator and/or user of the instrument would influence the results, which was not possible in this study given the low number of participants.

This study has allowed the perspective of creators and/or users of food education tools to be known in relation to their potential to promote the consumption of vegetables at preschool age. A SWOT analysis of each food education tool by different professionals involved in the development and/or use of these same tools gives us the possibility to know the constraints or potentialities that may be associated with the dissemination of these tools in the educational community by the different actors of the project. We intend to understand the limitations and strengths associated with more traditional food education tools, such as the children's story or the Food Wheel, as well as an analysis of innovative, digital tools associated with a new era of education, such as the Veggies4myHeart digital game. We understand that the story-book is well received by any audience because it allows the interaction between the child and the speaker, stimulates the acquisition of language, creativity, and imagination. However, in a time like today, there is a need to discuss online learning systems and those used in food education should be no exception. It is important to know the potentialities and limitations of this type of educational instruments, not only through those who receive the educational messages but also through those who convey them. The Veggies4myHeart project has contemplated not only the creation of food education tools but also their application in a school context, which will allow us in the short term to know the impact of the use of these tools both on the consumption of vegetables in children and on the knowledge obtained through them.

In view of the increasingly technological educational environment, it is important that those responsible for school institutions acquire enough electronic/computer equipment to allow both educators and students to promote their knowledge with consequent changes in healthy behaviours and habits, while also potentiating their digital skills.

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