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CONSTRUCTION AND VALIDATION OF A PODCAST FOR THE PREVENTION OF METABOLIC SYNDROME IN ADOLESCENTS

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ABSTRACT

Objectives: to create a podcast for the prevention of metabolic syndrome in adolescents and to validate its content, face and agreement with the target audience.
Method: a methodological and quantitative study carried out in three stages from August 2022 to November 2023, after approval by an Ethics Committee. Stage 1: Pre-production – Construction of the storyboard based on a validated booklet and the principles of the Cognitive Theory of Multimedia Learning. This was followed by content validation with 22 nurses that are experts in adolescents' health, using the Health Education Content Validation Instrument. Stage 2: Production – adjustments and recording. Stage 3: Post-production: face validation with 12 nurses that are experts in the construction of educational technology, using a validated instrument and agreement validation with the target audience, using the Educational Podcast Evaluation Instrument. The Content Validity Index, *Cronbach*'s α and *Aiken*'s *V* were calculated and considered valid for values ≥0.80, ≥0.70 and ≥0.81, respectively.
Results: the global Content Validity Index for the storyboard was 0.985, and 0.985 for face, with *Cronbach*'s α values of 0.896 and 0.901, respectively. In the agreement validation with the target audience, *Aiken*'s *V* was greater than 0.81 for 18 of the 20 items in the Educational Podcast Evaluation Instrument.
Conclusion: the podcast can be considered valid in terms of content, face and agreement with the target audience and may be used for health education in the prevention of metabolic syndrome in adolescents.

DESCRIPTORS: Adolescents' health. Education in health. Educational technology. Metabolic Syndrome. Validation study. Nursing.

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CONSTRUÇÃO E VALIDAÇÃO DE UM *PODCAST* PARA PREVENÇÃO DE SÍNDROME METABÓLICA EM ADOLESCENTES

RESUMO

Objetivos: construir um *podcast* para prevenção de síndrome metabólica em adolescentes e validar o conteúdo, a aparência e concordância com o público-alvo.
Método: estudo metodológico e quantitativo, realizado em três etapas, de agosto de 2022 a novembro de 2023, após aprovação de um Comitê de Ética. Etapa 1: pré-produção – construção do *storyboard* com base em cartilha validada e nos princípios da Teoria Cognitiva da Aprendizagem Multimídia. Após, validação de conteúdo por 22 enfermeiros *experts* em saúde de adolescentes, usando o Instrumento de Validação de Conteúdo Educacional em Saúde. Etapa 2: produção – ajustes e gravação. Etapa 3: pós-produção: validação de aparência por 12 enfermeiros *experts* em construção de tecnologia educacional, por meio de instrumento validado e validação de concordância com o público-alvo, utilizando o Instrumento de Avaliação de *Podcast* Educativo. O Índice de Validade de Conteúdo, o *α Cronbach* e o *V de Aiken* foram calculados e considerados válidos para valores ≥ 0,80, ≥ 0,70 e ≥ 0,81, respectivamente.
Resultados: o Índice de Validade de Conteúdo global do *storyboard* foi de 0,985 e de aparência foi de 0,985, com valores do *α Cronbach* de 0,896 e 0,901, respectivamente. Na validação de concordância com o público-alvo, o *V de Aiken* foi maior do que 0,81 para 18 dos 20 itens do Instrumento de Avaliação de *Podcast* Educativo.
Conclusão: o *podcast* pode ser considerado válido quanto ao conteúdo, à aparência e concordância com o público-alvo e poderá ser usado para educação em saúde na prevenção da síndrome metabólica em adolescentes.

DESCRITORES: Saúde do adolescente. Educação em saúde. Tecnologia educacional. Síndrome metabólica. Estudo de validação. Enfermagem.

CONSTRUCCIÓN Y VALIDACIÓN DE UN *PODCAST* PARA PREVENIR EL SÍNDROME METABÓLICO EN ADOLESCENTES

RESUMEN

Objetivos: construir un *podcast* para prevenir el Síndrome Metabólico en adolescentes y validar su contenido, aspecto y concordancia con el público objetivo.
Método: estudio metodológico y cuantitativo realizado en tres etapas de agosto de 2022 a noviembre de 2023, después de obtenerse la debida aprobación de un Comité de Ética. Etapa 1: Preproducción – elaboración del *storyboard* basado en un folleto validado y en los principios de la Teoría Cognitiva da Aprendizaje Multimedia. Subsiguientemente, el contenido fue validado por 22 enfermeros especializados en salud de los adolescentes, utilizando el Instrumento de Validación de Contenido Educativo en Salud. Etapa 2: Producción – ajustes y grabación. Etapa 3: Posproducción: validación del aspecto a cargo de 12 enfermeros que son expertos en la construcción de tecnologías educativas, por medio de un instrumento validado y validación de la concordancia con el público objetivo, empleando el Instrumento de Evaluación de *Podcasts* Educativos. Se calculó el Índice de Validez de Contenido, α de *Cronbach* y *V* de *Aiken*, y se los consideró válidos para valores ≥0,80, ≥0,70 y ≥0,81, respectivamente.
Resultados: el Índice de Validez de Contenido global del *storyboard* fue de 0,985, y 0,985 para el aspecto, con valores do α *Cronbach* de 0,896 y 0,901, respectivamente. En la validación de concordancia con el público objetivo, el *V* de *Aiken* fue superior a 0,81 para 18 de los 20 ítems del Instrumento de Evaluación de *Podcasts* Educativos.
Conclusión: puede considerarse que el *podcast* es válido en términos de contenido, aspecto y concordancia con el público objetivo y podrá ser usado para educación en salud en la prevención del Síndrome Metabólico en adolescentes.

DESCRIPTORES: Salud de los adolescentes. Educación en salud. Tecnología educativa. Síndrome Metabólico. Estudio de validación. Enfermería.

INTRODUCTION

Chronic Non-Communicable Diseases (CNCDs) are responsible for more than 70% of all deaths worldwide[1]. Their etiology involves behavioral risk factors such as tobacco use, unhealthy diet, lack of physical activity and harmful alcohol use, which in turn result in overweight and obesity, as well as in increased blood pressure and cholesterol, causing CNCDs[1]. Three of these risk factors exert a major impact on the onset of Metabolic Syndrome (MS)[1].

MS is the combination of three or more of the following risk factors: large waist circumference; high blood pressure; resistance to the effects of insulin; low high-density lipoproteins (HDLs); and high triglycerides (TGs)[2]. For adolescents, there is no consensus on the definition of MS and its prevalence varies depending on the diagnostic criteria used for the definition[3–4]. Globally, the prevalence of MS in adolescents varies between 0.2% and 38.9%, with higher proportions observed among overweight and obese subjects[5].

Preventive strategies, such as health education interventions in the community and at school on behavior and lifestyle changes, can prevent MS in adolescents[5]. In this sense, health education interventions that use Digital Information and Communication Technologies (DICTs) may be more appealing for the prevention of MS in adolescents, as they are used to employing them on a daily basis to obtain health-related information[6].

Podcasts are among the DICTs that can be used in health education interventions with adolescents to inform, prevent risks and improve the health of this population segment. These podcasts have been gaining prominence as an educational resource due to their low cost, easy access via smartphones, availability at any time and place, the possibility of unlimited repetition and language accessible to the target audience[7]. A podcast was developed and validated for sexual and reproductive health education targeted at adolescents[7]. However, there is scarcity of studies that construct and validate podcasts for health education on the prevention of MS in adolescents.

The reason for this study is the need to construct and validate a podcast that can be used as a resource in health education with adolescents for early identification of MS risk factors. In this sense, podcasts may emerge as a DICT accessed by this population group via mobile devices, anywhere and at any time, helping to prevent MS.

Given the above, the objectives of this study were to create a podcast for the prevention of MS in adolescents and to validate its content, face and agreement with target audience.

Finally, the study research question was as follows: Is the podcast considered valid in terms of face and content by nurses that are experts in adolescents' health and educational technology construction and by the target audience?

METHOD

A methodological and quantitative study carried out from August 2022 to November 2023 in three stages: Pre-production, Production and Post-production[8].

The study setting was state public schools in a city from inland Piauí (Picos-PI-Brazil), located 307 km from Teresina, a state which, under the State Education Department (*Secretaria de Estado da Educação*, SEDUC), has 21 Regional Education Departments (*Gerências Regionais de Educação*, GREs), with Picos as the headquarters and member of the 9th GRE, along with another 51 municipalities[9]. Picos-PI has 15 state schools, divided into comprehensive, regular and youth and adult schools. The researchers selected five of them in the central region for convenience.

Study development protocol

Stage 1 – Pre-production of the technology

The podcast name, format and learning objectives were defined. The storyboard was created by nurses with experience in educational technologies and MS in adolescents and a private graphic design company. This construction was based on a booklet about MS prevention validated with the target audience[10] and on the principles of the Cognitive Theory of Multimedia Learning (CTML)[11].

The storyboard was then subjected to content validation by nurses that are experts in adolescents' health and the changes they suggested were implementing before recording. The sample was obtained by convenience, from nurses included in the *Lattes* Platform (https://lattes.cnpq.br/), through a search by subject and using the following terms: "*Adolescentes*", "*Síndrome metabólica*" and "*Enfermagem*" ("Adolescents", "Metabolic Syndrome" and "Nursing"). The *Lattes* CVs of 100 nurses were consulted to verify that they met the inclusion criteria[12]: having a dissertation, thesis, research paper or article; and working or specializing in the study area. The snowball technique was also used to increase the number of nurses with expertise in adolescents' health; therefore, each nurse included in the study indicated another possible participant. With each nomination, the researcher verified the potential participant's *Lattes* CV to see if they met the inclusion criteria. The exclusion criterion was not achieving at least five points in the aforementioned criteria.

A characterization questionnaire was applied with items on the participants' sociodemographic profile (gender and region of the country) and professional profile (articles published in the area in reference journals and experience time in the area). The Health Educational Content Validation Instrument (*Instrumento de Validação de Conteúdo Educativo em Saúde*, IVCES) was used for content validation[13]. IVCES has 18 items distributed across three domains: Objectives (five); Structure/Presentation (ten); and Relevance (three). Each item can be answered using a three-point Likert scale, where: 0 = I disagree, 1 = I partially agree and 2 = I totally agree. When the item's score is equal to 0 or 1, suggestions for improvements can be recorded in the instrument. For data collection, the experts were emailed a *Google Docs* form, which contained an invitation letter, a Free and Informed Consent Form (FICF), the storyboard and characterization and validation instruments. The deadline for completing and returning the instruments was 30 days.

The data collected were organized in *Microsoft Office Excel* 2016® spreadsheets and analyzed using the *Statistical Package for the Social Sciences* (SPSS), version 20.0. Descriptive statistics were used to analyze the experts' characterization, using absolute and relative frequencies for the qualitative variables and mean and standard deviation for the quantitative ones. To analyze agreement between the experts in relation to the IVCES[13] items, the overall Content Validity Index (CVI) was calculated, by domain and for each item[14], considered valid when the agreement percentage between the experts was equal to or greater than 80%. *Cronbach's α* was also used to assess internal consistency of the instruments used, with a minimum acceptable value of 0.700[15].

Stage 2 – Production of the technology

A private graphic design company assisted in preparing the storyboard, recorded the podcast in MP4 and made it available on *YouTube*. Chart 1 shows a synthesis of the podcast episodes.

Chart 1 – Synthesis of the podcast episodes. Teresina, PI, Brazil, 2023.

Topic, length in time and link of the podcast episodes	Overview of the podcast episodes
Episode 1: Metabolic Syndrome and its characteristics (2:58s) https://youtu.be/pjd8LljggAg	OPENING (Narrator): Hello, in this podcast, we're going to tell the story of Pedro, a teenager who found out that he was at risk of developing MS a few months ago. [...] DEVELOPMENT (Guest Nursing professional): MS can be called insulin resistance or X syndrome. [...] END (Narrator): Therefore, as you can see, MS is a combination of several problems. [...]
Episode 2: Diagnosis, ways of acquiring and preventing metabolic syndrome (3:57s) https://youtu.be/lNmWJCQIhiU	OPENING (Narrator): Hi guys, in the previous episode we told you how Pedro discovered HIS risk of developing MS and explained what it is. But first, I want to know if you know who can get it and how we can prevent it? DEVELOPMENT (Guest Nursing professional): All adolescents that don't eat a healthy diet, don't exercise frequently or make excessive use of screens (such as computers, cell phones, laptops, video games) may be at risk of developing MS.[...] END (Narrator): [...] Following this healthy lifestyle will only bring benefits. [...] Then just enjoy life and be happy.

Stage 3 – Post-production of the technology

The podcast was subjected to face validation by nurses that are experts in constructing educational technology and to agreement validation with target audience, and the suggested changes were made. The sample was obtained by convenience from nurses included in the CNPq *Lattes* Platform (https://lattes.cnpq.br/), through a search by subject and using the following terms: "Educational technology", "Adolescents", "Metabolic Syndrome" and "Nursing". The Lattes CVs of another 80 nurses were consulted to verify that they met the following inclusion criteria[12]: having a dissertation, thesis, research paper or article; and working or specializing in the area. The snowball technique was also used to increase the number of nurses with expertise in constructing educational technology. With each nomination, the researcher verified the potential participant's *Latte*s CV to see if they met the inclusion criteria. The exclusion criterion was not achieving at least five points in the aforementioned criteria. For face validation, a validated instrument[16] was used, which included functionality, usability, audiovisual technique and environment. Each item can be answered using a five-point Likert scale: I strongly agree, I agree, I neither agree nor disagree, I disagree and I strongly disagree. The experts that validated the podcast face were also emailed a Google Docs form containing the following: an invitation letter; the FICF; links to the podcast episodes and characterization and validation instruments. The deadline for completing and returning the instruments was 30 days.

The target audience that validated the agreement was comprised by adolescents[17]. Considering the population of 1,202 adolescents, a sample of 292 subjects was estimated for the study, using the two-stage stratified sampling technique, by school and grade, weighting a 95% confidence interval (confidence degree of), 50% variability (p=0.5), which represents maximum data variability and a 5% sampling error (e=0.05), adding 20% for possible losses, resulting in a minimum sample size of 350 adolescents. For schools with more than one class per grade, the R software was employed to draw the classes participating in the study. Once the class had been drawn, the adolescents were drawn. The inclusion criteria were as follows: being regularly enrolled and having access to virtual communication tools (cell phone, tablet or computer). The exclusion criterion was dropping out during the study. To validate agreement with the target audience, two instruments were used:

a characterization instrument adapted from PeNSE[18], through which the sociodemographic and technological profile of the target audience was investigated, and the Educational Podcast Evaluation Instrument (*Instrumento de Avaliação de Podcast Educativo*, IAPE)[19], which addresses four factors: access and use; design and structure; content adequacy; and importance as a learning tool, with answers on a Likert-type scale from 1 to 5 (1- I strongly disagree, 2- I disagree, 3- I neither agree nor disagree, 4- I agree and 5- I strongly agree). The data were collected in four phases. Phase 1 – Locating the adolescents through school enrollment. Phase 2- Contacting the adolescents and their parents/guardians. Phase 3- Invitation, verification of the inclusion criteria and provision of the Free and Informed Assent Form (FIAF) for adolescents aged between 10 and 17 and the FICF for those aged 18 or over and the parents/guardians of minors. Phase 4 – Viewing the podcast on YouTube and completing the characterization and evaluation instruments.

The data collected were organized in Microsoft Office Excel 2016® spreadsheets and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20.0. Descriptive statistics were used to analyze the experts' characterization, using absolute and relative frequencies for the qualitative variables and mean and standard deviation for the quantitative ones. In order to analyze agreement between the experts in relation to the items of the validated instrument[16], the global Content Validity Index (CVI) was calculated, by domain and for each item[14], considered valid when the agreement percentage between the experts was equal to or greater than 80%. Cronbach's α was also used to assess internal consistency of the instruments used, with a minimum acceptable value of 0.700[15]. For IAPE[19], the relevance mean scores of the items and the respective standard deviations were calculated, along with Aiken's *V* index, with a criterion of 0.81 as the minimum indication of adequacy[20]. The R software, version 4.2.3, from the "psych" package, was used to calculate the confidence intervals for Aiken's V index.

The research followed the ethical and legal precepts recommended by Regulation No. 466/2012 regarding research studies with human beings and was approved by the Research Ethics Committee of Universidade Federal do Piauí.

RESULTS

The podcast is entitled "*Síndrome metabólica: como prevenir?*" ("Metabolic Syndrome: How to prevent it?"). Of the 56 nurses that are experts in adolescents' health that met the inclusion criteria, 22 participated in the storyboard content validation process. The majority (19 [86.4%]) were female and had a PhD. All (22 [100%]) had published articles on adolescents' health in a leading journal, and the mean experience time in the field was 11.9 years (Standard Deviation: 5.9). In relation to the region of the country, 18 (81.8%) were from the Northeast.

The storyboard Global CVI was 0.985. Of the 18 IVCES items, 15 had a CVI = 1.000 and *Cronbach*'s α was 0.896 (Table 1).

Of the 54 nurses that are experts in constructing educational technology and met the inclusion criteria, 12 took part in the podcast face validation process. Ten (83.3%) were female; the majority had a PhD (11 [91.7%]); had published articles in the field in a leading journal (10 [83.3%]); and their mean experience time in the field was 8.6 years (Standard Deviation: 6.9). In relation to the region of the country, nine (75%) lived in the Northeast.

The global CVI for functionality, usability, efficiency, audiovisual technique and environment was 0.917 and, with the exception of those related to the environment, all the items obtained CVI values over 0.80; finally, *Cronbach*'s α was 0.901 (Table 2).

Chart 2 shows the changes made to the storyboard content and face, according to the expert nurses' suggestions.

Table 1 – Content Validity Index of the IVCES items, according to nurses that are experts in adolescents' health, Teresina, PI, Brazil, 2023. (n=22)

Variables	Inadequate	Partially Adequate	Adequate	CVI*
	n (%)	n (%)	n (%)	
Objectives: purposes, goals or aims				0.982
It addresses the topic proposed		2 (9.1)	20 (90.9)	1.00
It is suitable to the teaching-learning process		2 (9.1)	20 (90.9)	1.00
It clears doubts about the topic addressed		5 (22.7)	17 (77.3)	1.00
It provides a reflection on the topic		3 (13.6)	19 (86.4)	1.00
It encourages a change in behavior	2 (9.1)	4 (18.2)	16 (72.7)	0.91
Structure/Presentation: organization, structure, strategy, coherence and sufficiency				0.982
Adequate language for the target audience		4 (18.2)	18 (81.8)	1.00
Appropriate language for the educational material		3 (13.6)	19 (86.4)	1.00
Interactive language, allowing for active involvement in the educational process	3 (13.6)	3 (13.6)	16 (72.7)	0.86
Correct information	1 (4.5)	3 (13.6)	18 (81.8)	0.95
Objective information		1 (4.5)	21 (95.5)	1.00
Enlightening information		4 (18.2)	18 (81.8)	1.00
Necessary information		3 (13.6)	19 (86.4)	1.00
Logical sequence of ideas		2 (9.1)	20 (90.9)	1.00
Current topic			22 (100.0)	1.00
Adequate text size		4 (18.2)	18 (81.8)	1.00
Relevance: significance, impact, motivation and interest				1.000
It stimulates learning		6 (27.3)	16 (72.7)	1.00
It contributes to knowledge in the area		3 (13.6)	19 (86.4)	1.00
It arouses interest in the topic		5 (22.7)	17 (77.3)	1.00
Global CVI				0.985

*CVI = Content Validity Index
Cronbach's α value: 0.896

Table 2 – Content Validity Index in relation to functionality, usability, efficiency, audiovisual technique and environment, according to nurses that are experts in educational technologies, Teresina, PI, Brazil, 2023. (n=12)

Variables	SA†	A‡	NN§	D‖	SD¶	CVI*
FUNCTIONALITY						0.958
1.1 The podcast is a suitable tool for its intended purpose	8 (66.7)	3 (25.0)		1 (8.3)		0.917
1.2 The podcast can generate positive results in the teaching-learning process on the theme	7 (58.3)	5 (41.7)				1
USABILITY						0.944
2.1 The podcast is easy to use	7 (58.3)	4 (33.3)	1 (8.3)			0.917

Table 2 – Cont.

Variables	SA†	A‡	NN§	D‖	SD¶	CVI*
2.2 It is easy to learn the theoretical concepts used and their applications	3 (25.0)	8 (66.7)		1 (8.3)		0.917
2.3 It allows the user to ease into the concepts in their routine	5 (41.7)	7 (58.3)				1
EFFICIENCY						0.917
3.1 The podcast length (time used) is adequate for the user to understand the content	9 (75.0)	2 (16.7)		1 (8.3)		0.917
3.2 The number of episodes is consistent with the time proposed for the podcast	7 (58.3)	4 (33.3)		1 (8.3)		0.917
AUDIOVISUAL TECHNIQUE						0.972
4.1 The narrator's tone and voice are clear and appropriate	7 (58.3)	4 (33.3)			1 (8.3)	0.917
4.2 The podcast narration is used efficiently and is understandable to the clientele	5 (41.7)	7 (58.3)				1
4.3 Users can return to any part of the episode whenever they wish	10 (83.3)	2 (16.7)				1
ENVIRONMENT						0.750
5.1 The podcast reflects adolescents' everyday life	5 (41.7)	4 (33.3)	2 (16.7)	1 (8.3)		0.75
5.2 The images used for the scenes are adequate to guarantee transmission of the content proposed by the podcast	5 (41.7)	4 (33.3)	2 (16.7)	1 (8.3)		0.75
Global IVC						0.917

*CVI = Content Validity Index; †SA = I Strongly Agree; ‡A = I Agree; §NN = I Neither Agree Nor Disagree; ‖D = I Disagree; ¶SD = I Strongly Disagree. Cronbach's α = 0.901

Chart 2 – Suggestions from the nurses that are experts in adolescents' health and in the construction of educational technology, and changes made to the storyboard content and the podcast face. Teresina, PI, Brazil, 2023.

Suggestions from the nurses that are experts in adolescents' health	Changes made to the podcast storyboard
Specify whose voice is in the script	• Inclusion in the script of the 'narrator's voice and of the 'Guest Nursing professional'.
Add informal language descriptions to technical terms	• Included in the first episode the phrase "blood sugar", when referring to fasting glucose.
Remove words and/or phrases that describe MS as a disease	• Words and phrases that treat MS as a disease and the description as a set of characteristics were excluded.
Add information about the risk of screen overuse	• A recommendation on the risk of screen overuse was included.
Exclude recommendations about not smoking and drinking too much alcohol	• Exclusion of all texts referring to smoking and drinking habits among adolescents.
Incorporate dietary recommendations for adolescents	• Guidance on lactose intolerance or cow's milk allergy was included; • A recommendation to eat eggs, meat and fish was included; • The recommendation regarding eating pasta and bread was excluded.
Exclude phrases that refer to aesthetic terms	• The phrase "it will look really cool" was excluded.

Chart 2 – Cont.

Suggestions from the nurses that are experts in constructing educational technology	Changes made to the podcast face
Improve the background of some images	• Exclusion of background images, making the information conveyed visibly 'cleaner'.
Incorporate new characters and change the environment where the podcast takes place	• A crosswalk in the street in front of the school was included; • Backpacks and notebooks in the adolescents' hands were included and the weight of one of them was changed; • Addition of two community agents to the health team, with their profession and name identified on their coats.
Modify the soundtrack	• Changing the soundtrack to a more neutral sound in order to maintain concentration.
Add terms in the podcast speech and description	• Inclusion of terms that are more routine to the adolescents' reality, in order to bring the content closer to them.
Describe the coat of arms' abbreviations	• Inclusion of a description of the coats of arms at the end of the podcast, in order to make them more didactic and comprehensible.

Most of the 406 adolescents that took part in the podcast evaluation were female (241 [59.2%]), brown-skinned (216 [(53.1%]) and lived with their parents (355 [87.2%]). The mean age was 15.1 years old (Standard Deviation: 2.1). Three hundred and ninety (95.8%) adolescents had a cell phone, 154 (37.8%) had a computer or notebook at home and 400 (98.3%) had Internet access at home. The device most used to access the podcast was the cell phone (378 [92.9%]). Three hundred and one (74%) listened to podcasts. Sport (108; 26.5%) and health (81; 19.9%) were the subject matters they most liked to listen to on podcasts. Two hundred and ninety-nine (73.5%) spent up to an hour a week listening to podcasts and the majority (257 [63.1%]) listened to some podcast with health education content.

In the podcast evaluation with the target audience, 18 of the 20 IAPE item obtained *Aiken*'s values greater than 0.81, with the exception of the "I was able to view the podcast in several places (home, street, job, bus, shopping mall, etc.)" and "The podcast cover (design) is appealing" items, and changes were made to make them even more appealing and understandable to the target audience (Table 3) *podcast.*

Table 3 – Aiken's V of the IAPE items, according to the evaluation with the target audience. Teresina, PI, Brazil, 2023. (n=409)

IAPE items	Mean	Standard Deviation	V*	95%CI†	
				LL‡	UL§
Factor 1. Access and use					
1. Was it easy to access the podcast?	4.53	0.59	0.88	0.87	0.90
2. I was able to view the podcast on several devices (cell phone, computer, tablet, notebook, etc.).	4.32	0.75	0.83	0.81	0.85
3. I was able to view the podcast in various places (home, street, work, bus, shopping mall, etc.).	4.09	0.86	0.77	0.75	0.79
4. Was it easy to find the podcast online?	4.29	0.7	0.82	0.80	0.84

Table 3 – Cont.

IAPE items	Mean	Standard Deviation	V*	95%CI†	
				LL‡	UL§
Factor 2. Design and structure					
5. Is the podcast length appropriate for understanding its content?	4.35	0.72	0.84	0.82	0.86
6. Is the podcast cover (design) appealing?	4.07	0.83	0.77	0.75	0.79
7. Is the podcast presentation format good?	4.41	0.65	0.85	0.83	0.87
8. Is the podcast audio clear?	4.53	0.57	0.88	0.86	0.90
9. Are the audio and video well synchronized?	4.55	0.58	0.89	0.87	0.90
Factor 3. Content adequacy					
10. Does the podcast offer a good summary of the subject matter?	4.52	0.62	0.88	0.86	0.89
11. Are the words used in the podcast appropriate?	4.53	0.61	0.88	0.87	0.90
12. Are the examples used in the podcast appropriate?	4.46	0.62	0.86	0.85	0.88
13. Is the podcast content relevant to the subject matter?	4.53	0.61	0.88	0.87	0.90
Factor 4. Importance as a learning tool					
14. Did the podcast help you learn about the subject matter?	4.45	0.65	0.86	0.85	0.88
15. Did the podcast improve my understanding of the subject matter?	4.35	0.70	0.84	0.82	0.86
16. Has the podcast made the subject matter enjoyable?	4.34	0.71	0.83	0.82	0.85
17. Was the podcast useful for learning about the subject matter?	4.42	0.70	0.86	0.84	0.87
18. Am I satisfied with the podcast as a resource for learning this subject matter?	4.38	0.68	0.84	0.83	0.86
19. Does the podcast encourage listeners to learn on their own?	4.22	0.87	0.80	0.78	0.82
20. Did as the podcast improve my understanding of the content of each subject matter?	4.4	0.73	0.85	0.83	0.87

*V = *Aiken*'s V; †95%CI = 95% Confidence Interval; ‡LL = Lower Limit; §UL = Upper Limit.

DISCUSSION

The podcast in this study can contribute as a resource for health education in adolescents, as it can stimulate lifestyle changes and, consequently, reduce risk factors and the development of MS. Another study constructed and validated the "*Coisa de Adolescente*" ("A Teenage Thing") podcast to promote sexual and reproductive health among adolescents[7]. Incorporating DICTs to the adolescents' everyday life has made podcasts popular in learning environments, whether schools or health services, easing health education actions with this target audience[7].

MS is not a disease but a set of characteristics: central obesity, hypertension; insulin resistance; high TG and low HDL cholesterol, and it does not take all of them to develop it; however, a person with one characteristic is more likely to having others[21]. In this sense, the podcast in this study reinforced guidelines on the MS characteristics, diagnosis, ways of acquiring and prevention. In Brazil, these contents have previously been covered in a booklet, validated for promoting knowledge about the prevention of MS in adolescents[22].

Although adolescents possess many important digital health literacy skills and generally feel self-effective in using them, critical health literacy needs to improve. They need to enhance their digital

health literacy so that they can confidently evaluate the health information they find online and on social media. Interventions designed with the involvement of health professionals are necessary to build critical literacy skills among adolescents and enable them to become active health agents[23]. In this study, the storyboard was prepared by a multiprofessional team. Similarly to other research studies, educational technology can be developed that brings together a variety of specialized knowledge[24–25].

Other studies have validated the content of DICTs to verify their suitability and the possibility of using them in the teaching-learning process on various topics with different target audiences[25–26]. Studies that have also validated educational technologies have obtained satisfactory statistical indices[7,24], as in the current one. No less important is face validity by experts or technical staff with experience in constructing educational technologies, so that they are appealing and easy-to-use resources for the target audience.

Most of the guidelines expressed by the experts in relation to the storyboard were followed, as using new media (podcasts) makes it possible to diversify the way of editing and transmitting knowledge, with the aim of motivating the target audience and making the activity more appealing and enjoyable[27].

In addition, changes to the face were also made based on suggestions from the experts with experience in constructing educational technologies. Similarly, another study with aged people in Brazil also made changes to the face of an educational technology[26], where visual, auditory and cognitive changes such as font size, shorter sentences, restricted use of unfamiliar terminology and addition of more images before the final product were necessary.

In the agreement validation process, the podcast was considered easy to access and use by the target audience, and may be important in health education to reduce risk factors and prevent MS. A similar result was obtained in the validation of a digital educational technology for promoting mental health in adolescents attending school[28].

In other studies, agreement validation with the target audience is an important stage in confirming effectiveness of the product[28]. A number of researchers have made and continue to make use of this technique to reinforce the validity of the educational technology developed, be it an educational booklet[22], online course[28], video[26], mobile app[24] or podcast[7]. Corroborating this, a study carried out with women deprived of their freedom in a public prison from the state of Ceará validated a video that was also considered appropriate by the target audience[29].

Among the tools available as an adjunct to health care, podcasts stand out as educational resources, as they bring the target audience's reality and language closer together, as well as easy access, low cost, unrestricted possibility of repetition, location and time; they are also a resource that eases the educational process in health[7].

The study limitations were as follows: nonexistence of studies using podcasts on the theme of MS for adolescents, which reduces the comparative nature; using a pre-defined script (booklet), which restricted participation of the target audience in relation to the choice of important aspects for them on the topic; impossibility of evaluation by hearing-impaired adolescents, as the CTML framework uses two channels (auditory and visual); and the fact that no implementation phase was performed.

Given the above, this study is highly relevant to the Nursing, Health and Public Policy fields due to the absence of studies with similar purposes in the literature, which reduces the potential for comparisons with other realities.

CONCLUSION

In this study, the podcast was created based on stages referenced in the literature (Pre-production, Production and Post-production), on validated educational material on MS prevention in adolescents and on the CTML principles. Validation was carried out with nurses that are experts in

adolescents' health (content), nurses specialized in the construction of educational technology (face) and the target audience (agreement), obtaining higher values than those recommended.

Therefore, the podcast may be used to improve the adolescents' knowledge about the risk factors for MS and also to promote the prevention of this event in this population segment. However, the importance of subjecting this technology to usability validation with adolescents is emphasized.

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NOTES

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Data collection: Sousa ASJ.
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