EVALUATION OF A MOBILE APPLICATION FOR PREVENTING THE USE OF ALCOHOL AND OTHER DRUGS AMONG ADOLESCENTS

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ABSTRACT

Objective: to evaluate a mobile application developed to prevent the use of alcohol and/or other drugs among adolescent students.

Method: methodological study with a quantitative approach carried out from July 2018 to July 2021 based on the stages of Contextualized Learning Design for technology development: analysis, design, development, implementation and evaluation. The content evaluation was carried out by 22 experts. The application's graphic design and usability were tested by 13 teenagers representing the target audience.

Results: the mobile application *"Educação Para Prevenção"* [Education For Prevention] addressed the following psychoactive substances: alcohol, marijuana, cigarettes, ecstasy, crack, cocaine, inhalants (glue and poppers) and amphetamines, dealing with topics such as concepts, physiological and behavioral effects, use during adolescence, prevention and harm reduction strategies. The average Content Validity Index score was 0.87. There was a high level of agreement among adolescents regarding the graphic design and the usability (96.6%) of the application.

Conclusion: the results show that the experts and the adolescents considered the application valid, and nurses will be able to use it as a facilitating instrument in health education actions in schools, aiming to prevent the use of alcohol and/or other drugs among adolescents. It is recommended that an intervention study be carried out to evaluate the effect of the technology developed.

DESCRIPTORS: Education in health. Mobile technology. Validation study. Adolescent. Substance-related disorders. Nursing.

AVALIAÇÃO DE APLICATIVO MÓVEL PARA PREVENÇÃO DO USO DE ÁLCOOL E OUTRAS DROGAS POR ADOLESCENTES

RESUMO

Objetivo: avaliar um aplicativo móvel desenvolvido para prevenir o uso de álcool e/ou outras drogas por estudantes adolescentes.
Método: estudo metodológico, de abordagem quantitativa, realizado no período de julho de 2018 a julho de 2021, baseado nas etapas do Design Instrucional Contextualizado para construção de tecnologia: análise, desenho, desenvolvimento, implementação e avaliação. A avaliação de conteúdo foi realizada por 22 especialistas. O aspecto gráfico e a usabilidade do aplicativo foram testados por 13 adolescentes representantes do público-alvo.
Resultados: o aplicativo móvel "EPP: Educação Para Prevenção" abordou as substâncias psicoativas: álcool, maconha, cigarro, ecstasy, crack, cocaína, inalantes (cola e lança-perfume) e anfetaminas, tratando de temas como conceitos, efeitos fisiológicos e comportamentais, uso durante a adolescência, estratégias de prevenção e redução de danos. A média do Índice de Validação de Conteúdo foi de 0,87. Verificou-se elevado nível de concordância entre os adolescentes quanto ao aspecto gráfico e à usabilidade (96,6%) do aplicativo.
Conclusão: os resultados demonstram que os especialistas e os adolescentes consideraram o aplicativo válido, e os enfermeiros poderão utilizá-lo como um instrumento facilitador nas ações de educação em saúde na escola, visando à prevenção do uso de álcool e/ou outras drogas entre adolescentes. Recomenda-se a realização de um estudo de intervenção para avaliar o efeito da tecnologia desenvolvida.

DESCRITORES: Educação em saúde. Tecnologia móvel. Estudo de validação. Adolescente. Transtornos relacionados ao uso de substâncias. Enfermagem.

EVALUACIÓN DE UNA APLICACIÓN MÓVIL PARA LA PREVENCIÓN DEL CONSUMO DE ALCOHOL Y OTRAS DROGAS EN ADOLESCENTES

RESUMEN

Objetivo: evaluar una aplicación móvil desarrollada para prevenir el consumo de alcohol y/u otras drogas por parte de estudiantes adolescentes.
Método: estudio metodológico, con enfoque cuantitativo, realizado de julio de 2018 a julio de 2021, basado en las etapas del Diseño Instruccional Contextualizado para la construcción de tecnología: análisis, diseño, desarrollo, implementación y evaluación. La evaluación del contenido se llevó a cabo por 22 expertos. El aspecto gráfico y la usabilidad de la aplicación fueron testeados por 13 adolescentes que representaban al público objetivo.
Resultados: la aplicación móvil *"Educação Para Prevenção"* (Educación para la Prevención) abordó sustancias psicoactivas: alcohol, marihuana, cigarrillos, éxtasis, crack, cocaína, inhalantes (pegamento/lanzaperfume) y anfetaminas, abordando temas como conceptos, efectos fisiológicos y conductuales, uso durante la adolescencia, estrategias de prevención y reducción de daños. El Índice de Validación de Contenido promedio fue de 0,87. Hubo un alto nivel de acuerdo entre los adolescentes sobre el aspecto gráfico y la usabilidad (96,6%) de la aplicación.
Conclusión: los resultados demuestran que expertos y adolescentes consideraron válida la aplicación, por lo que los enfermeros podrán utilizarla como instrumento facilitador en acciones de educación en salud en la escuela, con el objetivo de prevenir el uso de alcohol y/u otras drogas entre los adolescentes. Se recomienda realizar un estudio de intervención para evaluar el efecto de la tecnología desarrollada.

DESCRIPTORES: Educación sanitaria. Tecnología móvil. Estudio de validación. Adolescente. Trastornos por uso de sustancias. Enfermería.

INTRODUCTION

Adolescence is a phase marked by significant physiological and psychological changes that occur in parallel with the continuous development of neural systems, both cognitive and affective. The social context in which adolescents are inserted, together with the structural maturation of their brain, has a direct influence on their mental health and encourages the adoption of risky behaviors. These factors contribute to increase their vulnerability to the consumption of alcohol and/or other drugs[1]. The use of psychoactive substances during adolescence represents a serious public health problem on a global scale.

Studies carried out in different international contexts reveal alarming prevalences. For example, a study in the United States found that 29.2% of high school students reported recent alcohol consumption, 13.7% admitted excessive consumption and 21.7% reported current marijuana use[2]. In Spain, a study indicated that 76.8% of adolescents between 14 and 18 years old consumed alcohol in the last year[3]. In Brazil, according to the latest National Survey of School Health (Portuguese Acronym: PeNSE) (2019), 63.3% of adolescents between 13 and 17 years old have already tried alcohol, 47.0% reported at least one episode of drunkenness, 22.6% tried cigarettes and 13.0% admitted they used illicit drugs, highlighting an alarming prevalence of risky behaviors among young people[4].

Factors such as social context, curiosity, need for acceptance and fun, as well as personal challenges, are crucial to understanding the consumption of psychoactive substances by adolescents[5]. Early initiation is worryingly associated with the subsequent development of addictions[6]. Therefore, it is essential to implement educational interventions focused on preventing the abuse of these substances among this age group, with special attention to preventing early consumption. Expanding adolescents' knowledge and encouraging their reflection on substance abuse are crucial steps towards the adoption of healthy behaviors[7].

Health professionals face the challenge of effectively connecting with this population, especially in the school environment, which poses as a vital space for the formation of healthy values and habits, especially for adolescents, who represent the most vulnerable group to start experimenting with alcohol[8]. Initiatives such as the School Health Program (Portuguese Acronym: PSE) highlight the importance of discussing and preventing drug use in schools[9]. In this context, nurses occupy a central position, facilitating the approach to topics related to health and well-being and promoting self-care among adolescents. During adolescence, a period of intense self-discovery, having support from nurses, from the perspective of expanded and shared care, is crucial for the formation of healthy habits.

These professionals are essential for promoting a healthy lifestyle and preventing risky behaviors among students[10]. In this sense, technological progress offers new tools for teaching and learning in the health area, allowing nurses to incorporate educational technologies into their work. One of these technologies is called *mobile health (m-Health)*, which uses mobile devices such as smartphones and tablets to mediate health practices. This approach not only modernizes health interventions, but also makes them more accessible to young people, who are frequent and skilled users of these technologies[11].

The development of mobile applications in the field of health education provides user autonomy and engagement, offering quick access to reliable information. Considering young people's affinity with technology, such resources have significant educational potential[12]. However, in Brazil, research on applications aimed at preventing drug use by adolescents is still limited. It is essential that these technologies are based on scientific evidence and undergo rigorous validation processes[13]. Experts play a crucial role in refining these tools, ensuring they meet high standards of quality and effectiveness[14].

Studies on the creation and validation of digital technologies aimed at preventing the use of alcohol and/or other drugs are important as they enable nurses to adopt approaches that promote greater adolescent engagement. Furthermore, the research contributes to strengthening the evidence base, supporting the incorporation of these technologies into nursing care and reinforcing the role of nurses in promoting health and preventing the consumption of alcohol and/or other drugs by adolescents.

Given the above, this study aims to evaluate a mobile application developed to prevent the use of alcohol and/or other drugs among adolescent students.

METHOD

Methodological study on technological production carried out from July 2018 to July 2021, guided by the stages found in the Contextualized Learning Design's (Portuguese Acronym: DIC) theoretical-methodological framework: analysis, design, development, implementation and evaluation[15]. During the analysis stage, the theme was established, the target audience was identified, and the educational objectives were defined. The theoretical content was extracted from an integrative literature review, official publications, *App Review* and field research carried out with teenagers.

The integrative review was carried out from July to September 2018 with the objective of identifying the main technologies used in electronic devices aimed at preventing the use of alcohol and/or other drugs among adolescents, as well as the themes and substances addressed by these technologies. For its execution, six stages were followed, namely: elaboration of the guiding question, literature search, data extraction, evaluation of the studies found, analysis and synthesis of the results, and presentation of the final work[16]. In this sense, the following guiding question was created for the review: What types of content are covered by Information and Communication Technologies (ICTs) to prevent the use of alcohol and other drugs among adolescents?

The literature search was carried out in the LILACS, PubMed, Scopus, Cochrane, PsycINFO, CINAHL databases as well as in the *Biblioteca Virtual da Saúde (BVS)* [Virtual Health Library (VHL)]. The following controlled descriptors were used: "Technology", "Educational Technology", "Education in health", "Alcohol", "Illicit Drugs" and "Adolescent", in Portuguese and English, combined by the Boolean operators AND and OR. Four crossings were made: "Technology AND Education in Health AND Adolescent"; "Technology AND Education in Health AND Alcohol OR Illicit Drugs"; "Educational Technology AND Alcohol AND Adolescent"; and "Educational Technology AND Illicit Drugs AND Adolescent".

Initially,7,452 articles were identified from the crossings carried out. The studies were evaluated according to the following eligibility criteria: inclusion – original articles in Portuguese, English and Spanish related to the use of ICTs to prevent the use of alcohol and/or other drugs, without restrictions regarding date of publication; exclusion – scientific productions that addressed the development of programs focused on the consumption of alcohol and/or other drug using traditional methodologies such as workshops, lectures and classes. After analyzing titles and abstracts and applying the aforementioned criteria, 121 articles were pre-selected, of which 16, after detailed reading, made up the final sample.

For the data extraction stage, an instrument with the following items was duly adapted: authors, database/virtual library, year of publication, article identification, the technology developed, and the theoretical content covered by it. With the aim of expanding the possibilities to other theoretical contents, further scientific publications from official agencies that address the topic were consulted. Priority was given to information made available in manuals of the Brazilian Ministry of Health (Portuguese Acronym: MS) and the Brazilian Ministry of Education (Portuguese Acronym: MEC), as well as of the United Nations Office on Drugs and Crime (UNODC).

After the integrative review was performed and search in other publications was carried out, in January 2019 an app review (*App Review*)[17] available in virtual stores, specifically in the *PlayStore®*, aimed at Android devices was developed. The searches were carried out in January 2019, with the following central question: What applications aimed at preventing the use of alcohol and other drugs among teenagers are available, and what content do they present? The keywords "Adolescent", " Education in Health", "Adolescent Health", "Prevention", "Alcohol" and "Drugs" were used. The inclusion criteria covered free applications aimed at teenagers or general audiences, as well as informational/ educational applications focused on preventing substance use. Paid applications, games and those that addressed multiple themes in a single application were excluded.

Still regarding the definition of the technology's theoretical content, a descriptive and exploratory study was carried out in June 2019 in state high schools and technical schools of the public network located in a municipality of Northeastern Brazil. The sample consisted of 86 adolescents selected in a non-probabilistic, intentional way according to the following inclusion criteria: age range from 14 to 19 years old, regularly enrolled in one of the three years of high school and present in the classroom at the time of data collection. Adolescents with self-reported health conditions that prevented them from completing the research instrument were excluded. There were no refusals or need for additional exclusion of participants.

Data were collected using an instrument that included aspects such as sociodemographic characterization variables, the knowledge of adolescents on the use of psychoactive substances and opinions about what they would like to see in the technology to be developed. The instrument was developed by the authors and evaluated for its structure and relevance by two teachers who were experts in the area. The average time for participants to complete the questionnaire was 15 minutes.

Once the theoretical content referring to the DIC analysis stage was defined, the design stage was carried out, in which the theoretical content and the navigation sequence were organized, and the image features and other media resources were specified. The development stage involved the technical component – a web designer was responsible for creating the images while a programmer developed the application. Furthermore, this stage also had the participation of teachers who were experts on drugs and health technology assessment. The technological tools used in the development stage were the following: *AngularJS, Ionic Framework, PhoneGap Cordova, Android Studio, VS Code* and the *Windows* operating system.

During the implementation stage, the application was installed on mobile devices and tested by both experts and representatives of the target audience. In the evaluation stage, experts examined the application's content, and the target audience evaluated its visual design and usability. Content evaluation by experts took place remotely, in a virtual environment from March to August 2020, while data collection for evaluating the graphic design and usability by the target audience was carried out in July 2021, in person, after the partial return to in-person school activities after the pandemic, at a state public high school and technical school located in a municipality in the Northeast of Brazil.

To delimit the sample of experts, a sample calculation based on a formula that considers the final ratio of subjects in relation to a dichotomous variable was used as well as the maximum acceptable difference between this ratio, resulting in a sample made up of 22 participants. The experts were selected in a non-probabilistic, intentional way, based on the following inclusion criteria: healthcare professionals, teachers and/or health care workers who provide direct assistance to adolescents with expertise in Mental Health, Alcohol and Drugs in Adolescence and/or Chemical Dependency. The search for these participants was made through the Lattes platform of the National Council for Scientific and Technological Development (Portuguese Acronym: CNPq). Potential experts were invited to participate in the research by email, in which they received an invitation letter, a Free and Informed Consent Form (Portuguese Acronym: TCLE) and, after acceptance, the *link* to *download* and access the referred mobile application.

As for the target audience, the teenage students were selected based on criteria that included being in an age group from 14 to 19 years old and regularly enrolled in one of the three years of high school, with regular school attendance. Adolescents with health conditions that prevented them from using the application and completing the research instrument were excluded. The sample for this stage consisted of 13 participants, in accordance with the recommendations for validation studies focused on educational technology[14]. The teenagers who agreed to participate in the study signed the Free and Clarified Consent Term (Portuguese Acronym: TALE) and their guardians (parents) signed the TCLE.

The content evaluation instrument included items referring to the characterization of experts and domains necessary to evaluate the content of the mobile application such as the technology's objectives (purposes, goals or ends to be achieved with its use), structure and presentation (general organization, presentation strategy, consistency and formatting), and relevance (features that assess its level of significance)[14]. Experts evaluated the domains based on indicators and used a four-point Likert scale: 1 – "Irrelevant, not representative"; 2 – "Of little relevance, needs major revisions to be representative"; 3 – "Relevant, needs minor revisions to be representative"; 4 – "Very relevant item or extremely representative". The instrument for data collection aimed at evaluating the graphic design by the target audience was based on an evaluation protocol for educational technologies used in the health education process[14] and included socioeconomic characterization of the participants and indicators for evaluating the graphic design with "yes" or "no" answers.

The evaluation of the graphic design seeks to assess the level of agreement among adolescents in relation to the objectives, organization, writing style, visual appearance and encouragement to use the application[15]. Additionally, items were included to evaluate its usability. For this purpose, we used the statements from the *System Usability Scale (SUS)*, a scale that evaluates aspects such as ease of learning, efficiency, information retention, error reduction and user satisfaction[18]. The mobile device used by the adolescents to run the application was a *Samsung Galaxy Tab A* tablet that comes with the *Android* operating system, a 7-inch screen, a 1.5 GHz *quad-core* processor, 1.5 GB RAM and a storage capacity of 8 GB.

Quantitative data were analyzed using the SPSS version 20.0 software to obtain the frequencies of sociodemographic variables. As for the descriptive and exploratory study, the data used to define the theoretical content were processed by the *Interface de R pour les Analyzes Multidimensionnelles de Textes et de Questionnaires (IraMuTeQ) 0.7 alpha 2* software. The Descending Hierarchical Classification (DHC) method was used to generate a dendrogram of the most significant words and a Word Cloud strategy was also used. A total of 2,924 occurrences of words were identified and distributed into 435 active forms. The analysis of the *corpus* of the interviews with adolescents resulted in 101 text segments (TS) with active form frequencies ≥ 3:130 and a use of 85.08% of the *corpus*. The dendrogram divided the corpus into three classes, based on the occurrence and co-occurrence of the most significant words evoked by the adolescents: Class 1 – "Representation"; Class 2 – "Consequences"; and Class 3 – "Definition" of alcohol and other drugs. Participants showed interest in topics such as the consequences and effects of the use of alcohol and other drugs, aspects related to prevention and ways of using these substances.

The content evaluation stage of the mobile application was carried out using the R *software*, version 4.0.2. The Item-Level Content Validity Index (I-CVI) and the global average were used[19]. The cutoff point for the CVI was 0.78[20]. Furthermore, Cronbach's alpha coefficient (α) was calculated with the aim of evaluating the reliability of the experts' responses. (α) values greater than or equal to 0.80 show high reliability[21]. The binomial test was used to analyze the ratio of agreement between the experts. When evaluating the graphic design and usability, the percentage of agreement among adolescents in relation to the referred item was calculated, considering items with an Agreement Index equal to or greater than 80% to be valid[21].

The research was approved by the Ethics Committee for Research involving human subjects and complied with the guidelines of Resolution No. 466/2012 of the National Health Council (Portuguese Acronym: CNS).

RESULTS

Content and production of the mobile app

Regarding the integrative review, 16 studies made up the final sample. The results showed that the most used technologies in the studies included computer software, content in CD-ROM (*Compact Disc Read-Only Memory*) format, videos and games. The use of text messages for smartphones, virtual chat agents, as well as Virtual Learning Environments (VLE) was also observed. During the period in which the integrative review was carried out (July to September 2018), no publications were identified in Brazil regarding the use of technologies for electronic devices aimed at preventing the use of alcohol and/or other drugs among adolescents. Regarding the theoretical content presented by the technologies, the most prominent substances were alcohol, marijuana, tobacco and ecstasy. The topics covered included: concepts and classification of the substances; physiological and behavioral effects associated with substance use; and the main risks and prevention strategies.

Regarding the results from the *App Review*, initially,1,000 applications were found, of which 39 were selected after search refinement. Of these, 15 were repeated. Of the remaining 24 applications, 22 were excluded for addressing: control of substance abuse (n=12); adolescent health focused on other themes such as sexuality, growth and development, depression, among others (n=7); guidance for healthcare workers and family members of drug addicts (n=1); games (n=1); and instruments for tracking the use of alcohol and/or other drugs (n=1). In the end, two applications met the *App Review* criteria, one in English and the other in Arabic, covering topics such as: effects of alcohol on a developing brain, drug concept, strategies for drug prevention and refusal, and dependency. No mobile applications similar to the one proposed in this study were found, that is, aimed at teenagers and in Portuguese, which reinforces the relevance of this research.

Based on the evidence found in the literature, the textual content of the mobile application entitled *"EPP: Educação Para Prevenção"* [Education For Prevention] was structured based on the following drugs: alcohol, marijuana, cigarettes, *ecstasy, crack*, cocaine, inhalants and amphetamines. The application's home screens can be seen in Figure 1.

The technology presented the following thematic areas: drug concepts based on legal principles, impacts on the brain and Brazilian legal provisions; the most used drugs and their compositions; the effects of drugs — physiological and behavioral — and their damage to health, both in the short and long term; the use of alcohol and/or other drugs among adolescents, motivations, consequences, risk and protective factors. Furthermore, the textual content was enriched with information on why to avoid alcohol and/or other drugs with an emphasis on dependence and coping skills; concept and general guidelines for harm reduction; myths and truths about alcohol and other drugs explored through questions that require interactive "true" or "false" answers (myth); and a video with the testimony of a young man who developed drug dependence during his adolescence. In Figure 2, it is possible to view illustrations regarding the interactive "myths and truths" session.

Figure 1 – Illustration of the icon, home screen (screenshot) that gives access to content and main screen with themed icons. João Pessoa, PB, Brazil, 2021.
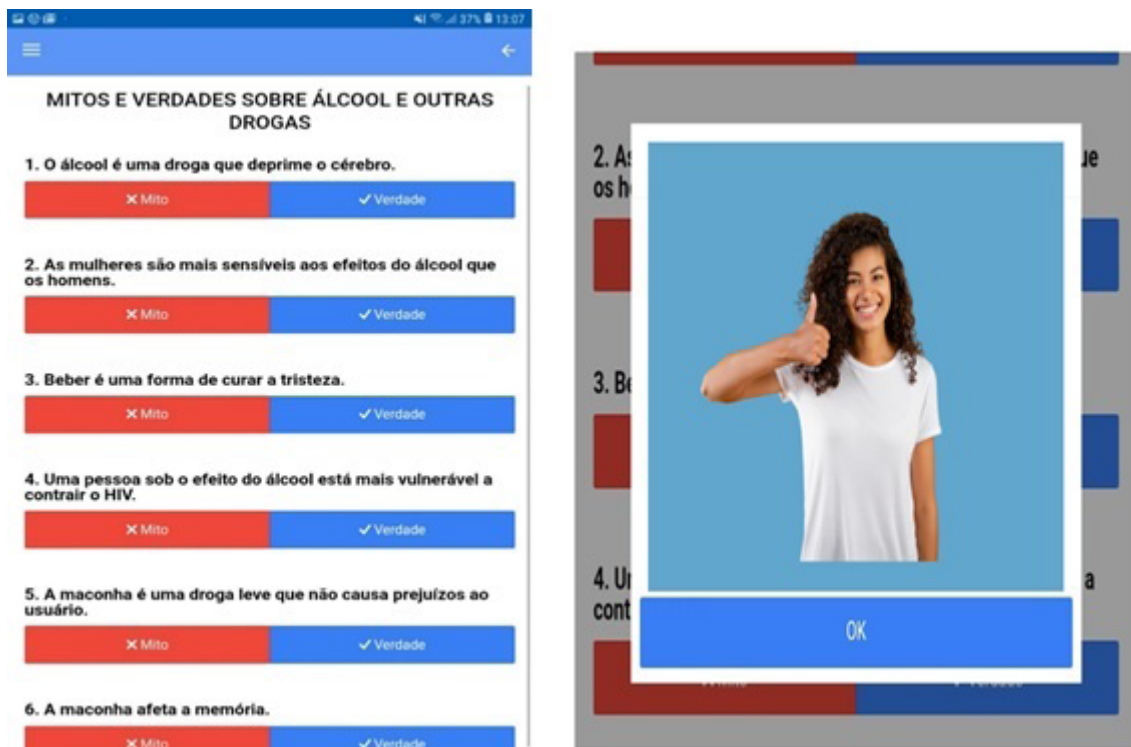
Figure 2 – Screen illustration (*screenshots*) regarding the theme "myths and truths about alcohol and other drugs". João Pessoa, PB, Brazil, 2021.

Content evaluation by experts

Regarding the characterization of the 22 experts, there was a predominance of females (86.36%) with an average age of 43.95 years (SD: 10.77), all with a master's degree, 63.64% with a doctorate degree and 36.36% with a post-doctorate degree. Most participants worked in the field of nursing (40.91%), followed by psychology (31.82%), pedagogy and social work, both with the same percentage (9%). The fields of medicine and occupational therapy were represented by one participant (4.55% each). The average training time was 20.18 years (SD: 11.2). The Cronbach's Alpha coefficient found for the experts' responses was α=0.93, showing high reliability in this assessment.

The CVI was greater than 0.78 for most items, except: Encourages or instigates changes in behavior and attitudes; the illustrations are expressive and sufficient; the illustrations are consistent with the explanatory text (if any); and the themes portray key aspects about preventing the use of alcohol and/or other drugs among adolescents that must be reinforced. The average CVI was 0.87. The items that failed to show significance in the binomial test were the following: Encourages or instigates changes in behavior and attitudes, and the illustrations are expressive and sufficient. Other details are shown in Table 1.

Table 1 – Content evaluation measures carried out by the experts (n=22). João Pessoa, PB, Brazil, 2021.

Evaluation indicators	n*	I-CVI†	p-value‡	P§
Objective				
The information/content is or is currently consistent with the learning objectives proposed to the target audience	22	1.000	<0.001	1
The information/content is important for the life quality of this educational technology's target audience	21	0.955	<0.001	0.95
Encourages or instigates changes in behavior and attitudes	12	0.545	0.8318	0.54
Meets the educational objectives of institutions that work with the referred target audience	21	0.955	<0.001	0.95
Mean	19	0.864		
Structure and presentation				
The educational technology is appropriate for the target audience	20	0.909	<0.001	0.91
The messages are presented in a clear and objective way	20	0.909	<0.001	0.91
The information presented is scientifically correct.	18	0.818	0.004	0.82
The material suits the sociocultural level of the target audience of this educational technology	18	0.818	0.004	0.82
The writing style matches the level of knowledge of the target audience	18	0.818	0.004	0.82
The *software* presentation details are consistent	21	0.955	<0.001	0.95
The size of titles and topics is adequate	21	0.955	<0.001	0.95
The illustrations are expressive and sufficient	16	0.727	0.0525	0.73
The illustrations are consistent with the explanatory text (if any)	17	0.773	0.0169	0.77
Content size on the screen is appropriate	21	0.955	<0.001	0.95
The number of screens or modules is adequate	21	0.955	<0.001	0.95
Mean	19.2	0.872		
Relevance				
The themes portray key aspects about preventing the use of alcohol and/or other drugs among adolescents that should be reinforced	17	0.773	0.0169	0.77

<div align="center">**Table 1** – Cont.</div>

Evaluation indicators	n*	I-CVI†	p-value‡	P§
The educational technology makes it possible to generalize and transfer the learning process to different contexts	19	0.864	<0.001	0.86
The educational technology aims to build knowledge	19	0.864	<0.001	0.86
The educational technology covers themes necessary to build the knowledge of the target audience on the topic	20	0.909	<0.001	0.91
The educational technology is suitable for use by any person/professional with the target audience	21	0.955	<0.001	0.95
Mean	19.2	0.870		
Total CVI		**0.870**		

*n: Number of evaluations considered relevant or very relevant (grades 3 and 4) by the experts; †I-CVI: Content Validity Index; ‡Probability value for the binomial test; §Binomial test value, represents the probability of success.

The analysis of the results and experts' comments revealed that some items related to changes in the adolescents' behavior and attitudes in the process of preventing substance use were considered complex. Furthermore, the need for the application to be more interactive to achieve this objective was highlighted. The inclusion of more realistic images was recommended, replacing the artwork used in the initial version with others that can illustrate both the negative and pleasurable sensations associated with the use of the referred substances. The experts' suggestions were accepted and implemented in the version intended for evaluation by the target audience.

Evaluation of the graphic design and usability of the application by the target audience

The sample consisted of 13 adolescents, predominantly male (n=10, 76.9%) and self-identified as mixed-race individuals (n=6, 46.2%), aged between 15 and 19 years old, and an average of 16.6 years old (±1.137). Most were in the 1st year of high school (n=7, 53.8%), lived with their parents (n=10, 76.9%) and belonged to families who received one minimum wage (n=8, 61.5%). The same percentage of participants identified as Catholics or with no religion (n=5, 38.5% for each group). Regarding substance use, all participants denied using tobacco (n=13, 100%) and illicit drugs (n=13, 100%), and the majority also did not consume alcohol (n=11, 84.6%); however, two participants admitted that they drink alcohol occasionally (15.4%). The time spent using the mobile application ranged from 10 to 30 minutes, with an average of 17 minutes (±5.50).

In the evaluation carried out by the adolescents (Table 2), of the 25 items analyzed, the lowest score (84.6%) referred to the following items: satisfaction with the information about alcohol and other drugs provided by the application (objective); easy-to-read content showed on the main screen (organization); and the teenager's autonomy to use the application without needing assistance (usability).

The adolescents' comments and suggestions showed their desire to access further information that would enable them to learn more about strategies found in the education model based on life skills, especially regarding psychosocial aspects, in addition to having guidance on how to deal with addiction. They also suggested that the app's main screen should be more expressive, have more images and use more neutral colors.

The index of agreement of 96.6% showed that the mobile application for preventing the use of alcohol and other drugs among adolescents was considered valid by representatives of the target audience. This result is reinforced by comments that highlighted the technology's ability to stimulate reflections on the topic, emphasizing the damage, the consequences and the importance of prevention.

Table 2 – Level of agreement among adolescents regarding the items that evaluate the graphic design and the usability of the *software* developed for the mobile technology (n=13). João Pessoa, PB, Brazil, 2021.

Evaluation criteria	Level of Agreement (%)
Objectives	
You were satisfied with the information about alcohol and other drugs presented by the application	84.6
The application can help teenagers reflect and change their behavior on the topic	100.0
The app can be used by a teacher or healthcare professional to discuss alcohol and other drugs with teenagers	100.0
Organization	
The app's main screen shows the content addressed by it	84.6
The size of the letters and content is good	100.0
The colors of the app caught your attention	100.0
The content sequence is adequate	92.3
The way the application was structured is adequate	92.3
Writing style	
The sentences are easy to understand	100.0
The text is interesting	100.0
The content is simple and clear	100.0
Graphic design	
The images are simple	92.3
Images help understand the text	100.0
The number of images is good	92.3
The screens or modules appear to be well organized	100.0
Motivation	
Any teenager who uses the app will understand what it's about	100.0
You felt motivated to use the application all the way through	100.0
The application addresses the topics necessary for teenagers to reflect on the use of alcohol and other drugs	100.0
The app encouraged you to take action or think about not using alcohol and other drugs	100.0
Usability	
I think I would like to use this app often	92.3
I found the app easy to use	100.0
I can use the app without anyone's assistance	84.6
I think the app's functions are well organized	100.0
I think adolescents will learn how to use this app quickly	100.0
I felt prepared to use the app	100.0
Index of Agreement	**96.6**

DISCUSSION

The "*EPP: Educação Para Prevenção*" [Education For Prevention] application, based on the experts' perspective, was considered valid to represent the prevention of alcohol and/or other drugs use among adolescents, taking into account most of the indicators evaluated. In the evaluation by the target audience, all items showed a high percentage of agreement regarding the graphic design

and usability of the application. The development of mobile applications aimed at healthcare requires compliance with well-defined steps and must be based in scientific research. Adapting scientific content to an application demands creativity and mastery of the topic since digital versions bring challenges associated with the features of the mobile device (screen size, keyboard, processing capacity) and the particularities of using information in a different format[22].

Including the user in the development stages of educational technologies makes it easier to come up with resources that align with the purpose and educational context of the application. However, in practice, adolescents are rarely consulted during the development of health education programs. Their participation is crucial to enrich the educational offer, enabling the formulation of more relevant and effective interventions and improving technology acceptance[23].

In the present study, while exploring the interests of teenagers regarding the application's content, it was found that they value themes that are in line with evidence found in scientific literature which also support the development of Brazilian public policies aimed at preventing the use of alcohol and/or other drugs by this audience[24]. Adolescents showed interest in learning more about the consequences and effects of substance use, as well as strategies for prevention and harm reduction. Furthermore, they showed interest in testimonials from people who had already tried psychoactive substances. These preferences highlight the importance of content that not only informs, but also encourages reflection through personal narratives and real contexts, thus facilitating an emotional and cognitive connection with the topic.

The results obtained from the *App Review* highlighted a worrying scarcity of applications aimed at preventing the use of alcohol and other drugs among adolescents. This gap is particularly concerning considering that adolescence is a critical period for promoting preventive interventions, given the fact that early substance use may compromise neurological development and increase the risk of future dependence[25]. Authors argue that information technology-based interventions can be an effective response to this challenge, as they have a wider reach, are more easily implemented and have greater consistency than traditional face-to-face interventions[26]. Furthermore, developing interfaces and content that are attractive and accessible to adolescents is crucial to increasing adherence to these digital interventions and improving their effectiveness[27].

Although platforms such as iTunes and Google Play offer more than 45,000 *m-Health* apps, a systematic review of scientific evidence revealed that only a small fraction of these apps is based on robust scientific foundations. Studies on the development of these applications are still in the early stages and there is an urgent need for investigations that apply methodological rigor and clearly demonstrate the effectiveness of these digital tools. This situation highlights the importance of prioritizing quality and effectiveness in the creation of new mHealth technologies, especially those aimed at adolescents[28].

Regarding the application's layout, elements such as simple and accessible language, color scheme, appropriate illustrations and interactivity were considered. The use of illustrations in educational materials for teenagers poses challenges, as they are not always compatible with the text and language used; Often, the use of technical terms makes it difficult for people with lower literacy to understand the content[29].

The development of *m-health* applications requires collaboration between professionals with scientific knowledge in healthcare and technical expertise in computing and design. It is essential to overcome barriers between these disciplines to ensure the successful implementation of new technologies in healthcare given the need for integrated knowledge in the fields of design and IT[30]. Such interdisciplinarity improves involvement and coordination in the field of ICTs related to health challenges, improving the quality of products developed with the contribution of various areas of knowledge[31].

Evaluation by experts represents a crucial stage to improve the quality of research resources and instruments. As experts in the area in question, they offer their experience and critical perspective, refining the proposal and increasing the effectiveness of an instrument or, in this case, of the referred technology[32]. Although its validity was confirmed by high CVI values, the experts' comments and suggestions were also considered, especially those related to the items with lower scores such as the application's ability to induce behavioral changes, the quality of the illustrations and the themes presented.

The literature suggests that mobile app-based interventions should be designed to influence attitudes, subjective norms, and perceived behavioral control, all of which are essential to motivating change[33]. Implementing interactive strategies like personalized feedback can increase the app's effectiveness in this regard[34]. However, achieving behavioral changes among teenagers is not an easy task. For some authors, the use of educational technologies in the field of health can better assess their knowledge shifts, even in relation to topics that they already understand. These resources are promising, especially for expanding information on treatment and prevention[35]. As for the illustrations, expressiveness and consistency with the text are essential to retain teenagers' attention and facilitate their understanding. Alignment between text and image improves understanding and content retention[36].

After receiving comments and suggestions from the experts, the technology underwent adjustments, and a new version was submitted for evaluation by the teenagers. The results indicated that the application was also considered valid by the target audience, based on criteria such as objectives, organization, ease of understanding, motivation for use and usability. An agreement rate of 96.6% was achieved, demonstrating high level of agreement. Assessment by the target audience makes it possible to verify the level of understanding of the content and its suitability to the educational and cultural level of the population assessed, establishing a link between the empirical and theoretical perspectives of the educational technology developed[37].

Authors highlight that, following the development stage of the application, it is imperative to proceed with its empirical evaluation, and this step is called "testing". During this process, it is essential to identify demands in order to make critical adjustments to the prototype. Based on the analysis of the collected data, changes that lead to the completion and deployment of the application are implemented[30]. In this sense, the preliminary results of this study suggest that the application fulfills its initial purpose; however, feedback obtained from both teenage users and experts indicates the need to include additional content. These suggestions highlight the importance of not only providing information about alcohol and other drugs, but also including strategies based on the life skills model. This expansion is justified by the complexities of substance use, a problem deeply influenced by socioeconomic, cultural, environmental and political factors that shape usage behaviors among adolescents[38].

Regarding the application's layout, some suggestions referred to a more expressive main screen, an increase in the number of images, the adoption of more neutral colors in the display and an increase in the font size in some sections. These comments are similar to those found in a study that developed and validated an educational booklet aimed at preventing excess weight among adolescents[37]. There is growing interest in digital technologies aimed at improving the mental health of children and adolescents, and evidence of the effectiveness of these approaches is expanding. However, there are concerns about the levels of user involvement, acceptance and adherence[39].

User involvement is essential for the creation and implementation of digital interventions, as it ensures that the tools developed are more aligned with the real needs, preferences and behaviors of end users[40]. Specifically in the case of teenagers, involving them in the development of applications aimed at preventing the use of alcohol and other drugs can significantly increase the effectiveness of these resources. Adolescents, as target audience, can provide valuable contributions about what is

culturally relevant and technically accessible, thus contributing to a more attractive and functional design that promotes greater adherence to preventive interventions, in addition to greater effectiveness[41].

Among the limitations of the study, we can highlight the fact that the exploratory research aimed at defining the content and evaluating the application was carried out with teenagers from a single school, thus limiting the generalization of the results. Furthermore, the application failed to address some important factors related to the use of alcohol and/or other drugs such as life skills, an aspect that was highlighted both in the evaluations made by the experts and by the adolescents.

Despite these limitations, nurses can incorporate the application into regular appointments, using it as an interactive tool to discuss prevention in an engaging and educational way. This makes it possible to personalize care based on the specific needs of adolescents, in addition to strengthening communication, thus leading to the establishment of a relationship of trust which is essential for the effectiveness of preventive care.

Integrating this type of tool into broader programs involving schools, families and communities may expand the support network aimed at adolescents, promoting a community approach to prevention and ensuring more modern and accessible healthcare practices. The use of alcohol and/or other drugs is a complex phenomenon often surrounded by taboos, and many healthcare and education professionals lack adequate training to address the subject. Nurses, often responsible for educational actions, may use this resource as an ally in their actions.

CONCLUSION

The "*EPP: Educação Para Prevenção*" [Education for Prevention] application was developed with a solid scientific basis, meeting the interests and needs of the adolescent audience. The evaluation carried out by the experts revealed that most of the application's content was considered valid and appropriate to represent the prevention of substance use, corroborating the relevance of the educational content included in the application. Additionally, the evaluation by the target audience highlighted a high level of agreement regarding the graphic design and usability of the application, suggesting that its interface is suitable and friendly for adolescents.

These results indicate that the "*EPP: Educação Para Prevenção*" [Education for Prevention] application can be used as a support tool to prevent the use of illicit substances and alcohol among adolescent students, serving as an important resource in both educational and community contexts. It is recommended that additional studies be carried out to evaluate the effects of the "*EPP: Educação Para Prevenção*" [Education for Prevention] application on the prevention and/or reduction of alcohol and drug use; furthermore, it is important to add factors that can positively contribute to this subject in a more emphatic way, in addition to including visual improvements that can complement and reinforce the text in future app updates.

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NOTES

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CONFLICT OF INTEREST
There is no conflict of interest.

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