Original article

"ROBOVID" mobile application about COVID-19 and target population: semantic validation study

Aplicativo móvel "ROBOVID" acerca da COVID-19 junto à população-alvo: estudo de validação semântica

Aplicación móvil "ROBOVID" sobre COVID-19 con población objetivo: estudio de validación semántica

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Abstract

Objective: to semantically validate the "ROBOVID" mobile application with the target population. **Method:** methodological study, presenting the seventh stage of the matrix project, developed between October 2021 and January 2022, with 21 adults residing in the state of Rio de Janeiro, using a semi-structured electronic form. The Concordance Index was used in the data analysis, being considered a validated item that presented a value equal to or greater than 80%. **Results:** the ROBOVID mobile application was validated, reaching satisfactory individual agreement rates ranging from 95% to 100% and global 98.8%. **Conclusion:** the mobile application "ROBOVID" was semantically validated in terms of content and appearance by the target population, indicating that this educational technology is understandable, relevant and pertinent, and can be used by the population as a tool for the prevention and control of serious sequelae resulting from covid-19.
Descriptors: Validation Study; COVID-19; Nursing; Mobile Applications; Health education

Resumo

Objetivo: validar semanticamente o aplicativo móvel "ROBOVID" com a população-alvo. **Método:** estudo metodológico, apresentando a sétima etapa do projeto matricial, desenvolvido entre outubro de 2021 e janeiro de 2022, com 21 adultos residentes do estado do Rio de Janeiro, por meio de formulário semiestruturado eletrônico. Utilizou-se o Índice de Concordância na análise dos dados, sendo considerado item validado o que apresentasse valor igual ou superior a 80%. **Resultados:** o aplicativo móvel ROBOVID foi validado, alcançando índices de concordância individuais satisfatórios com variação entre 95% e 100% e global de 98,8%. **Conclusão:** o aplicativo móvel "ROBOVID" foi validado semanticamente quanto ao conteúdo e à aparência pela população-alvo de forma satisfatória, indicando que essa tecnologia educacional é compreensível, relevante e pertinente, podendo ser utilizada pela população como uma ferramenta para a prevenção e o controle de agravos da covid-19.
Descritores: Estudo de Validação; COVID-19; Enfermagem; Aplicativos Móveis; Educação em Saúde

Resumen

Objetivo: validar semánticamente la aplicación móvil "ROBOVID" con la población objetivo. **Método:** estudio metodológico, que presenta la séptima etapa del proyecto matriz, desarrollado entre octubre de 2021 y enero de 2022, con 21 adultos residentes en el estado de Río de Janeiro, utilizando un formulario electrónico semiestructurado. El Índice de Concordancia fue utilizado en el análisis de los datos, siendo considerado un ítem validado que presentó un valor igual o superior al 80%. **Resultados:** se validó la aplicación móvil ROBOVID, alcanzando índices satisfactorios de acuerdo individual que van del 95% al 100% y global del 98,8%. **Conclusión:** la aplicación móvil "ROBOVID" fue validada semánticamente en cuanto a contenido y apariencia por la población objetivo, indicando que esta tecnología educativa es comprensible, pertinente y pertinente, pudiendo ser utilizada por la población como herramienta de prevención y control. de enfermedades covid-19.
Descriptores: Estudio de Validación; COVID-19; Enfermería; Aplicaciones móviles; Educación en Salud

Introduction

At the beginning of 2020, the world was confronted with the Coronavirus Disease 2019 (covid-19), an emerging and infectious disease caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), which sometimes it is related to more severe conditions of Severe Acute Respiratory Syndrome (SARS).[1] Although the new coronavirus is less lethal than the previous ones, it has a greater potential for dissemination, since, except for the possibility of some rare natural protection, the world's population has proved to be universally susceptible to acquiring covid-19.[2]

This fact made the situation complex and heterogeneous, since decision-making, especially in the discovery of the disease, was based on protocols that changed according to the dynamic contours presented by the origin and distribution of the virus among different individuals and groups. In addition to a still incipient scientific knowledge, especially about the role played by asymptomatic carriers, risk groups and the relationship between infection and immunity, the development of serious complications and the emergence of new variants were factors that made it difficult to manage the pandemic.[3-4]

In this context of uncertainties, access to information through the use of educational technologies in health emerged as a relevant strategy for coping with the current pandemic, thus helping the teaching-learning process of individuals. Such technologies are allied in the activities carried out by health professionals and in the implementation of public policies to combat the virus, serving as one of the main support elements, given the possibility of fast and safe communication.[5]

When considering that the use of educational technologies contributes to the success of health education, the feasibility of using a mobile application developed by nurses stands out; an application that shares qualified health guidelines, aimed especially at the population, with the purpose of mitigating transmission rates, hospitalizations and deaths from covid-19. It should be noted that these technologies have been widely used for health education, being vehicles for sharing knowledge, with the aim of contributing to the improvement of people's living and health conditions.[6]

In view of this, in a previous study, the mobile application called "ROBOVID" was developed and validated by expert judges, containing scientific and reliable information about the prevention and control of covid-19.[7] This application allows the multiplication of knowledge from one individual to another, population awareness and apprehension of shared knowledge, in a safe and qualified manner, since ROBOVID can be consulted as many times as necessary at any place and time.

Therefore, it became essential to carry out semantic validation with the target population about the content and appearance of this technology in order to verify that it is understandable, relevant and pertinent from the perspective of the intended audience. This type of validation is a crucial aspect for the effective implementation of

this educational technology as a readily available resource for direct use by individuals and health professionals in serving the population at different levels of health care.

Although research has described a variety of educational materials as an educational tool in different scenarios and purposes, there is still a need to validate mobile applications about covid-19 developed by nurses with the target population, given the scarcity of studies of this nature. Thus, the expansion of knowledge will be sought in a practical and accessible way, through colloquial language, strengthening decision-making aimed at achieving the prevention and control of covid-19 and its serious sequelae. Based on the above, the objective was to semantically validate the mobile application "ROBOVID" with the target population.

Method

Methodological study,[8] which presents the seventh stage of the matrix project entitled: "Development and validation of a mobile application in the process of interaction and communication with the population in the face of the covid-19 pandemic".

For the creation and validation of ROBOVID, in the previous investigation,[6] the recommendations for the construction and evaluation of educational materials were followed, according to surveys of this nature,[9] based on six stages, namely: 1st) survey of the population's doubts; 2nd) literature review; 3rd) construction of the mobile application; 4th) application validation by expert judges; 5th) suitability of the application after evaluation by expert judges; 6th) application indexing in the Play Store for Android and Apple Store for IOS. The synthesis of these developed stages is presented in Box 1.

Box 1 - Summary of the stages of construction and validation by expert judges of the mobile application "ROBOVID". Rio de Janeiro, RJ, Brazil, 2022.

Stage of study	Summary presentation of the stages	Result of each stage
1st Stage	Survey of population doubts about covid-19, carried out in July 2020, with 20 Brazilian adult individuals, of both sexes and residing in the state of Rio de Janeiro,	The data from this stage were analyzed by the IRAMUTEQ software, in the light of the thematic analysis, resulting in the understanding cores of the text segments and in the identification of

	using a semi-structured electronic form on the Google Forms Virtual Platform.	doubts of the population about covid-19, namely: prevention, treatment, virus, vaccine, transmission, signs and symptoms, mask use, social isolation and population at risk.
2nd Stage	Integrative Literature Review in information resources: Latin American and Caribbean Literature in Health Sciences (LILACS), Medical Literature Analysis and Retrieval System Online (MEDLINE) and US National Library of Medicine National Institutes of Health (PUBMED); using Health Science Descriptors (DeCS) and Medical Subject Headings (MeSH), in Portuguese, English and Spanish, associated in pairs and in trio through the Boolean operator "AND". Search strategy: (tw: ("SARS-CoV-2 infection")) AND (tw: ("Severe acute respiratory syndrome")) AND (tw: ("Safety measures")) AND (tw: ("Health education")) AND (tw: ("Disease from the new coronavirus")) AND (tw: ("covid-19")).	Twenty publications were selected and, after analysis and use of inclusion criteria, 8 studies were listed. Thus, through the convergence of subjects, the results were categorized into two units of analysis: 1- Characteristics of the new coronavirus; 2- Promotion of acceptability, adherence, and compliance with measures to prevent and control covid-19 in the population. In view of this, the information that made up the application was organized into themes that included guidance on covid-19, including: characteristics of the new coronavirus; transmission; diagnosis; prevention/protection; signs and symptoms; social isolation; use of mask; hygiene of hands, products and surfaces; groups of risk; medication use; and vaccines.
3rd Stage	Construction of the mobile application with the developer by defining items related to the application's interface; media selection; videos and prints; visual identity; attractiveness, animation and arrangement of theoretical contents in the form of "themes"; and idealization of the application name.	The home screen displays information in the form of "themes" in the bottom bar, in addition to a side menu with a description of how to use it, privacy policy, term of use, contact us and a space for evaluating the usability of the application. The name "ROBOVID" came from a combination of the word robot, which refers to technology, with the term COVID, the disease of the current pandemic context.
4th Stage	Validation of the application with 20 specialists based on the criteria adapted from Fehring, combined with the inclusion criteria: health professionals with professional and/or academic experience in the topic of covid-19, using a semi-structured electronic form (Google Forms). For the evaluation, a Likert-type scale was used with four response options that varied between: 1- strongly disagree, 2- slightly disagree, 3- slightly agree and 4- strongly agree.	The Content Validity Index (CVI) was calculated using the following formula: sum of responses 3 and 4 divided by the total number of responses. The overall CVI obtained for content and appearance was 97%.
5th Stage	Adequacy of the application after evaluation by the expert judges, in which it was suggested to add content related to warning signs for possible injuries related	All suggestions were accepted, except those related to the application's interface that required high financial resources.

	to covid-19. Other suggestions turned to the app's interface, typography, and font size.	
6th Stage	Application indexing in the Apple Store for IOS. Awaiting indexing on the Play Store.	The ROBOVID mobile application is currently only available for download at the Apple Store for IOS and can be accessed through the QR Code.

The seventh stage of the matrix project, the focus of this study, was developed in two stages: 1) semantic validation of the mobile application by the target population; 2) adequacy of the application after evaluation by the target population. Adults aged 18 years or over and residents of the state of Rio de Janeiro participated in this stage, these being the inclusion criteria.

In order to attract participants, a "snowball sampling" strategy was used,[10] which consists of a non-probabilistic sampling method, through reference chains of possible members, who were initially invited by the researchers and, later, from the indication of the participants themselves, respecting the inclusion criteria. Thus, from the first person contacted, the indication of other people to compose the sample was requested. Thus, 21 individuals participated in this study, in line with analyses that indicate a variation between 7 and 30 evaluators for the validation of instructional materials.[11]

The first moment was the assessment of the mobile application by the target population. Thus, a semi-structured form with 18 questions was sent by email, which sought to apprehend their opinions regarding the organization, writing style, appearance and content for learning provided by the mobile application. In addition, at the end of the instrument, there was a space for suggestions and comments for improving the application.

After consenting to participate in the research, an invitation letter was sent by email to the would-be participants, clearly detailing the study, its objectives, confidentiality, in addition to the necessary instructions to download and access the application for both iOS and Android devices, with a link that gave access to the semi-structured form, also created on the Google Forms Platform for application validation.

In this way, when clicking on the link, the participant was directed to the Google platform with access to the first page of the online form that contained a filter question, namely: 1) If the participant was over 18 years old. If the person involved was a minor, a message of thanks and termination of participation was displayed. If the constituent was of legal age, the second page of the form was displayed, giving access to the Informed Consent Form (ICF) for acceptance and download. An average period of 20 minutes was estimated to answer the form.

The form had three parts, namely: 1) Characterization of the target population; 2) Questions regarding the content and appearance of the application according to the domains: content, language, illustration, presentation and cultural adequacy; 3) Space for suggestions and comments to improve the application. A period of seven days was stipulated for the return of the completed form. It is noteworthy that none of the initially invited participants withdraw from the study.

It should be noted that the form was prepared and qualitatively evaluated by the research team composed of professors and PhDs in nursing with expertise in terms of face and content validity. Furthermore, it should be noted that the form was previously tested by applying it with four individuals who did not make up the sample, which would make it possible to identify possible weaknesses and necessary adaptations, however there was no need for adjustments.

The second moment was aimed at adapting the application, through an evaluation that the target population considered relevant for the improvement of the mobile application. The items indicated in need of adjustments were reviewed by the researchers and adapted to the suggestions whenever possible.

For the evaluation by the target population regarding the content and appearance of the application, a Likert-type scale was used with four response options ranging from 1 to 4, being: 1- strongly disagree, 2- slightly disagree, 3- slightly agree and 4 - strongly agree, in which the participant chose the best classification for his answers, informing his degree of agreement or disagreement for each evaluated item. In this analysis, to verify the proportion of participants in agreement on each item evaluated in the instrument, the Agreement Index (AI) was calculated by means of the sum of the answers that were marked by "3" or "4", divided by the total number of responses per item. It is noteworthy that the global AI was measured by the general average of the individual concordance indexes. According to the literature, the evaluated items must have a AI greater than or equal to 80%, therefore, items with an index lower than this limit should be readjusted according to the suggestions.[12]

Ethical aspects were met in accordance with Resolution number 466, of 2012, of the National Health Council, and all participants were assured about the secrecy, anonymity and confidentiality of their information, upon acceptance of the Informed Consent Term in an online form. The study was submitted to the Ethics and Research Committee of Federal University Fluminense and had its opinion approved under number 4,132,385, on July 3, 2020.

Results

They will be presented according to the moments used for the semantic validation of the ROBOVID mobile application regarding content and appearance by the target population.

First moment: semantic validation of the mobile application by the target population

The validation of the mobile application by the target population was carried out by 21 adults aged between 18 and 61 years, average age of 37 years, residing in the state of Rio de Janeiro, the majority, 16 (76.2%), being female, and 8 (38.1%) self-declared white and 7 (33.3%) black. With regard to education, 10 (47.6%) had completed

higher education, followed by complete secondary education, with 7 (33.3%). As for occupation, housewives accounted for the highest percentage, 12 (57.1%).

The agreement between the evaluators regarding the evaluative items of the mobile application obtained a global AI of 0.99 (99%), and the AI of each item evaluated individually varied between 0.95 (95%) and 1.00 (100%) for all domains, indicating clarity, relevance and pertinence of educational technology in health. Table 1 shows the individual and global indexes achieved in validation by the target population.

Table 1- Validation of the ROBOVID application by the target population in terms of content, language, illustrations, presentation and cultural adequacy. Rio de Janeiro, RJ, Brazil, 2022.

Domains	Strongly Disagree/ Slightly Disagree	Slightly agree/ Strongly agree	AI
As for the content			
1-Does the mobile application clarify doubts about transmission, protective measures, signs and symptoms, social isolation and vaccines about covid-19?	-	21	1.00
2-Does the information in the application allow you to understand and adopt preventive measures to control covid-19?	-	21	1.00
3-Does the application make clear the understanding about transmission, pre-existing disease, severe acute respiratory syndrome, risk groups, among others?	-	21	1.00
4-Does the information contained in the application make it possible to understand the risks of covid-19?	-	21	1.00
5-Is the application containing information about covid-19 appropriate for the population?	-	21	1.00
As for the language			
1-Is the reading adequate for the reader's comprehension?	-	21	1.00
2-Is the information presented clearly?	-	21	1.00
3-Is the text clear and objective?	-	21	1.00
4- Is the distribution of information facilitated through the thematic axes?	-	21	1.00
As for the illustrations			
1-Does the layout used in the application attract the reader's attention?	1	20	0.95
2-Does the use of self-explanatory video facilitate	-	21	1.00

learning?			
3-Are the application illustrations expressive and sufficient?	1	20	0.95
As for the presentation			
1-Does the distribution of information in the application follow an appropriate order for understanding covid-19?	-	20	1.00
2-Is the font size and type easy to read?	1	20	0.95
3-Is the application attractive to the general population?	1	20	0.95
4-Does the interface used in the application encourage reading and enable learning?	-	21	1.00
Regarding the cultural adequacy			
1-Does the application address necessary subjects about covid-19 for the general population?	-	21	1.00
2-Is the application suitable for use by the general population?	-	21	1.00
AI Global		0.99	

Second moment: adequacy of the application after evaluation by the target population

A synthesis of the qualitative analysis of the recommendations was carried out, as well as the due justification when a suggestion or recommendation cannot be accepted. Among the items to be improved, the participants made occasional suggestions regarding the presentation of larger graphics and images to draw the reader's attention, in addition to the use of stronger and more colorful strokes of the images/figures included in the application. However, it should be noted that all media used have their own source from documents such as protocols, manuals and guidelines, therefore, it is not possible to change the layout.

Other suggestions turned to the reformulation of some information, such as replacing technical terms, font size and type, revising and including illustrations as a way of making the understanding of certain topics in the illustration and presentation domains even clearer. These requests were met, with the exception of increasing the font size, as the size 16 used in this study respected the system standard, as defined by good interaction practices on Google and Apple platforms and on social networks such as Twitter, Facebook, among others.

As for the suggestion to allocate an area for the readers to post about their experience with the disease (covid-19), it was not possible to comply, since the creation of the application is aimed at health education, with the purpose of guiding the population about the prevention of the disease and its aggravations, in view of the

recommendations of health bodies and authorities. Finally, it was suggested the rapid dissemination of the application to the population and that other health approaches could be carried out. It is noteworthy that the suggestions contributed to improvements in functionality, the inclusion of new illustrations and the improvement of the final version of the ROBOVID application, as shown in Figure 1.

Figure 1 - Distribution of ROBOVID application images. Rio de Janeiro, RJ, Brazil, 2022.

Discussion

Mobile technologies have emerged as important tools to support learning activities in society. The insertion of these resources in the teaching and learning processes can provide different benefits, configuring a new profile of information delivery and interactivity with their users.[13]

We sought to semantically validate the content and appearance of the "ROBOVID" mobile application, aimed at health education in the face of the pandemic context, through a methodology that would allow the effective participation of the target population. The evaluation was positive in relation to the domains: content, language, illustration, presentation and cultural adequacy, reaching satisfactory individual AI for each item analyzed and global AI of 99%, all above the average recommended in validation studies of this nature.[14]

"ROBOVID" was developed in accordance with the methodological criteria indicated in the scientific literature, in addition to aspects that contributed to the improvement and quality of the material, considering the needs of the target population, in this case, individuals living with covid-19. Thus, the contribution of the validated application is ratified in view of the importance of guiding the general population and health professionals about the acceptability, adherence and compliance with prevention and control measures for this disease.[15]

Health education is a key element for achieving health promotion objectives, as it sensitizes individuals, transforming their life habits and stimulating their self-care, considering the right to choose in the face of the adversities imposed by the new daily life in the face of covid-19.[16] This need reinforces the relevance of educational technology semantically validated by the target population in this study.

In order to build an educational material, it is necessary to know the context of the population for which it is intended, through a participatory, communicative and collective approach, with the aim of defining care strategies.[17] The matrix project considered the contribution of the target population essential, in order to subsidize the construction of the educational tool, by raising its doubts. In addition, in the current study, the semantic validation of the application made it possible to verify whether it used colloquial language and whether it had illustrations and easy-to-understand media, as recommended in the literature.[18]

The validation of educational materials is a fundamental aspect to make them complete, with greater scientific rigor and guarantee their reliability, legitimacy and credibility. To this end, validation with the population that experiences, in some way, the topic addressed in it needs to be considered in the development of educational technologies,[18-19] as was the case of ROBOVID, which sought to include relevant content, coherent structure and appropriate language to facilitate the teaching-learning of individuals in the face of covid-19.

This type of validation has been widely considered in the scientific literature, as it makes it possible to verify whether ideas are being shared in a clear, objective and adequate way, considering the individual and his context. This action ensures effective understanding and avoids dubious interpretations that motivate inappropriate actions on the part of those using the technology.[9] Therefore, the evaluation of the application by the target population in this study showed that the content and appearance were understandable and appropriate to its purpose, in view of the positive evaluation it made of the technology.

Faced with the evaluation of the individual and global AI, the application domains always presented a score higher than the value determined in the literature, similar to a study that presented the construction of an educational technology for the prevention of congenital syphilis,[20] suggesting that the application is relevant regarding the content and appearance. Furthermore, a part was added at the end of the instrument in which the participant could include suggestions and comments about the application, as free final questions are suggested as a possible supplement, since users appreciate describing adjectives in an evaluation.[21]

The suggestions registered regarding the content and appearance helped to the reformulation of some information and images and, in this sense, such suggestions were essential for the improvement of the educational technology in its final version. In addition, it was suggested a quick dissemination of the ROBOVID application and that new health approaches, aimed at health education, be carried out, demonstrating the relevance of applications of this nature.

Compliance with several recommendations, including the replacement of terms considered technical, was necessary, since the present technology is configured as a

mobile platform in educational support for civil society and health professionals. In view of the adjustments, ROBOVID thus assumes relevance and pertinence to health education, permeating information about symptoms, prevention, transmission, in addition to the adoption of protective measures against covid-19, based on the satisfactory assessment of the population to which it is intended.

As a limitation, the existence, at the time of its preparation and analysis, of little research on validating applications about covid-19 developed by nurses limited the discussion and dialogue with investigations of a similar nature. In this way, its dissemination can help to reduce this gap. Furthermore, it is necessary to evaluate its usability, which implies the continuity of new studies.

In view of this, the importance of developing educational technologies is understood, which are presented as a critical component to transform practice and education in the health area, including nursing, anchored in a device at no cost to the users, with easy installation and portability.

Conclusion

The "ROBOVID" mobile application was semantically validated in terms of content and appearance by the target population, indicating that this educational technology is understandable, important and relevant, and can be used by the population as a tool for the prevention and control of severe sequelae of covid-19.

The application is configured as an educational technology in health that facilitates autonomous decision-making by the Brazilian population in the face of covid-19, by expanding their knowledge in a practical and accessible way.

This application becomes relevant both for scientific and technological development and innovation in the country, as it aims to disseminate information quickly and simply, through the adoption of colloquial language to enable its safe implementation in the face of the international public health emergency related to the SARS-CoV-2.

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