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Original Article

CONTRIBUTIONS FROM THE POPULATION IN THE DESIGN OF A MOBILE APP ABOUT COVID-19

CONTRIBUIÇÕES DA POPULAÇÃO NA IDEALIZAÇÃO DE UM APLICATIVO MÓVEL ACERCA DA COVID-19

CONTRIBUCIONES DE LA POBLACIÓN EN LA CREACIÓN DE UNA APLICACIÓN MÓVIL SOBRE EL COVID-19

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Objective: to describe the population's doubts about COVID-19 as a contribution to the design of a mobile application. Method: qualitative research, carried out with 142 adults through an online form, between July 23 and 30, 2020, whose data was processed in the software *R Interface pour Analyses Multidimensionnelles de Textes et de Questionnaires* and interpreted according to the assumptions of Thematic Analysis. Results: the population's doubts about COVID-19, which contributed to the construction of the educational technology in health, dealt with transmission, signs and symptoms, notification of cases and death, treatment, vaccine, protective measures, care for the infected patient, reinfection, and the dissemination of untrue and scientific information about COVID-19. Final Considerations: when designing the mobile app, the population's doubts were incorporated as a resource for mediating the learning process in times of pandemic, with the aim of promoting acceptability, adherence and compliance with COVID-19 prevention and control measures.

Descriptors: Communication. Nursing. Coronavirus infections. Educational technology. Population.

Objetivo: descrever as dúvidas da população acerca da COVID-19 como contribuição para a idealização de um aplicativo móvel. Método: pesquisa qualitativa, desenvolvida com 142 adultos por meio de formulário online, entre 23 e 30 de julho de 2020, cujos dados foram processados no software Interface de R pour Analyses Multidimensionnelles de Textes Et de Questionnaires e interpretados segundo os pressupostos da Análise Temática. Resultados: as dúvidas da população acerca da COVID-19, que contribuíram na construção da tecnologia educacional em saúde, versavam sobre transmissão, sinais e sintomas, notificação de casos e de morte, tratamento, vacina, medidas protetivas, cuidados com o paciente infectado, reinfecção, veiculação de informações inverídicas e científicas sobre a COVID-19. Considerações Finais: para idealização do aplicativo móvel, as dúvidas da população foram incorporadas como

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recurso para mediação do processo de aprendizagem em tempos de pandemia, visando promover aceitabilidade, adesão e cumprimento das medidas de prevenção e controle da COVID-19.

Descritores: Comunicação. Enfermagem. Infecções por coronavírus. Tecnologia educacional. População.

Objetivo: describir las dudas de la población sobre el COVID-19 como aporte a la creación de una aplicación móvil. Método: investigación cualitativa, desarrollada con 142 adultos mediante formulario en línea, entre el 23 y el 30 de julio de 2020, cuyos datos fueron procesados en el software Interface de R pour Analyse Multidimensionnelles de Textes et de Questionnaires e interpretados según los supuestos del Análisis Temático. Resultados: las dudas de la población sobre el COVID-19, que contribuyeron a la construcción de tecnología educativa en salud, versaron sobre transmisión, signos y síntomas, notificación de casos y muertes, tratamiento, vacuna, medidas de protección, atención a pacientes infectados, reinfección, difusión de Información no verdadera y científica sobre el COVID-19. Consideraciones Finales: para la creación de la aplicación móvil se incorporaron las dudas de la población como recurso para mediar el proceso de aprendizaje en tiempos de pandemia, con el objetivo de promover la aceptabilidad, adherencia y cumplimiento de las medidas de prevención y control del COVID-19.

Descriptores: Comunicación. Enfermería. Infecciones por coronavirus. Tecnología educativa. Población.

Introduction

The current pandemic caused by the new coronavirus Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), identified as the etiological agent of coronavirus disease (COVID-19), has been one of the biggest health challenges in Brazil and worldwide. Its great impact is due not only to the incipient scientific knowledge about the antigenic characteristics of this new virus, but also to its high transmissibility and lethality, especially in more vulnerable groups, resulting in great uncertainty about the best course of action to be adopted to control this disease and its consequences[1].

In this way, given the risk of infection by the new coronavirus, it is important to act on ways of articulating scientific knowledge and ways of preventing transmission to the population, in order to mitigate the harm caused by COVID-19 and promote quality of life[2]. Thus, information about the disease has been disseminated as a form of health education, aiming to enlighten the population about prevention measures, as well as scientific advances and discoveries about the current scenario.

In this context, for the population to be educated about appropriate preventive and behavioral measures, access to qualified information emerges as a relevant strategy for coping with the current pandemic, where access to the internet via mobile devices is an important ally in the search for and obtaining of information[3]. In view of this, there is a growing number of educational technologies being produced and disseminated in nursing publications, since the availability of this type of technology enables the construction of new healthcare models[4]. However, there is a great shortage of this type of technology on COVID-19.

Considering the information spreading, as well as Fake News, regarding COVID-19, it is believed that the idealization of an educational technology in health, such as a mobile application, based on the real doubts and needs pointed out by the population about this disease, could contribute to autonomous and safe decision-making to deal with this situation. In this way, people's knowledge will be expanded in a practical and accessible way, since the use of these technologies helps to optimize individuals' skills by offering new information, through which they acquire knowledge and transform themselves[5].

It should also be noted that no study was found on the construction and validation of this type of educational technology. One study pointed to an important gap in knowledge, regarding the need for nurses to develop scientific studies, with a theoretical framework in nursing science, which take into account

the production of applications in times of pandemic[6]. However, in order for an app to include qualified information about the prevention and control of COVID-19-related diseases, it is necessary to first raise the doubts of the target population, so that the educational technology developed is suited to the real needs of its users.

In this sense, the aim of the study was to describe the population's doubts about COVID-19 as a contribution to the design of a mobile application.

Method

This is a descriptive and exploratory study with a qualitative approach, whose preparation and description met the recommendations of the Consolidated Criteria for Reporting Qualitative Research (COREQ)[7]. It should be noted that this study is an integral part of the following research: "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", developed in the state of Rio de Janeiro, Brazil.

Adults aged 18 or over from the state of Rio de Janeiro took part, and these were the study's inclusion criteria. Health professionals and academics were excluded. Data was collected between July 23 and 30, 2020, using a semi-structured online form, built on the Google Forms virtual platform and sent via social media. A link was sent to the would-be participants, allowing them to access the Informed Consent Form (ICF), whether or not they agreed to take part in the research. If so, the internet user was directed to the form to fill it in. The snowball sampling technique[8] was used to attract participants, where the first participants were invited by the research team itself and then made referrals.

The data collection form, drawn up by the researchers, contained two parts: 1) Objective questions, including gender, age, profession, marital status, education level, pre-existing illness and whether they had COVID-19; 2) Questions about the study object, namely: Do you have any doubts about COVID-19? What doubts do you have about COVID-19? What information about COVID-19 do you think is important to obtain through a mobile app? The form was previously qualitatively assessed by experts in the field for face and content validity.

The data was processed using the *Interface de R pour Analyses Multidimensionnelles de Textes Et de Questionnaires* (IRAMUTEQ) software, using the Word Cloud and Descending Hierarchical Classification (DHC) methods[9]. The data was interpreted according to the assumptions of Thematic Analysis, which seeks to find the nuclei of meaning that make up a communication, which leads to an understanding of the analytical object[10].

To this end, using the DHC, active forms (nouns, adjectives, adverbs and unrecognized forms) were retrieved from each class of text segments that obtained a chi-square test (χ^2) value of ≥3.84, highlighting those with a p-value <0.0001, which reveals a very strong association between the words (lexicons) in their respective class. From this survey, we sought to reach the core of understanding of the text segments in each class, based on the most significant words, carrying out an interpretative analysis in line with the best evidence related to the subject, in order to identify the doubts of the target population and thus the content of the idealized application, ROBOVID.

Ethical aspects were considered in accordance with Resolution No. 466 of 2012 of the National Health Council, and all participants were assured of the secrecy, anonymity and confidentiality of their information, by accepting the ICF. The study was approved under number 4.132.385 on July 3, 2020.

Results

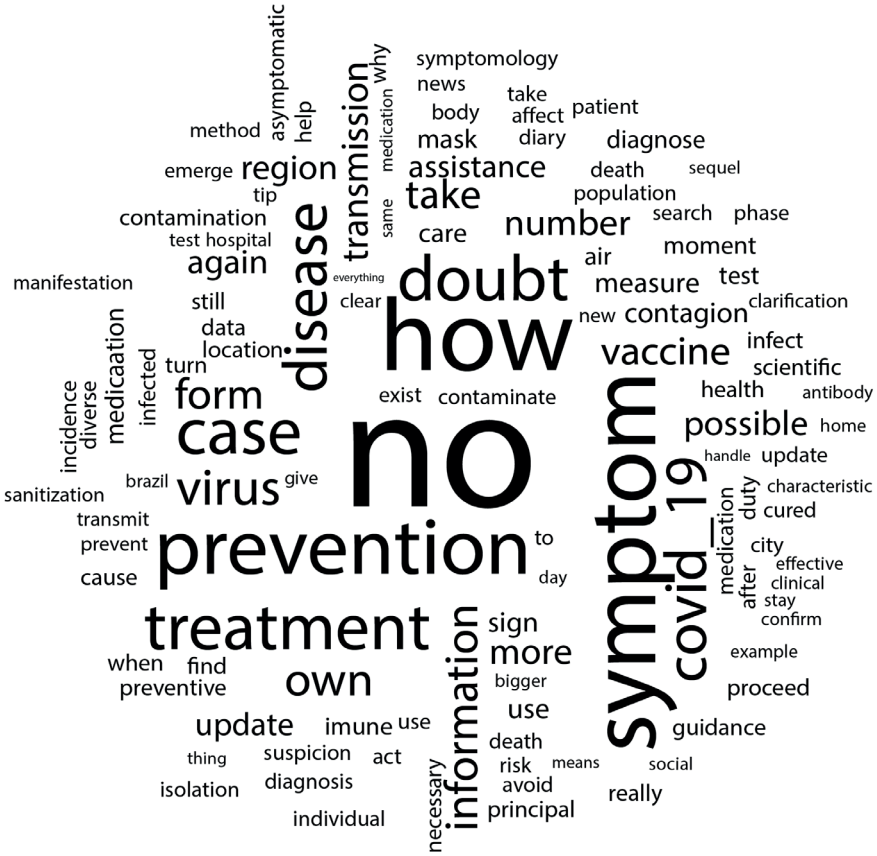
A total of 142 (100%) adults took part in the study, of whom 101 (71.1%) were female. The mean age was 34 years (SD=13.9), ranging from 18 to 73 years. In relation to marital status, the majority were single, 80 (56.3%), and 64 (45%) participants reported having incomplete higher education, followed by complete higher education, 53 (37.3%).

When processing the data, the corpus consisted of 142 texts, 2434 words, with 457

active forms and 445 hapax (single occurrence). In order to identify the population's doubts about COVID-19, the Word Cloud method was initially adopted, which allowed the lexicons to be grouped and organized graphically according to their frequency of appearance, making it possible to identify the most recurrent keywords, which helped in the organization of the application's topics in its different interfaces.

With this method, each word has a size proportional to its frequency, making it easier to identify the terms that were predominant in the set of terms analyzed, so capturing these most frequent words allowed us to recognize the main doubts of the participants about COVID-19, as shown in Figure 1, which will be explored later.

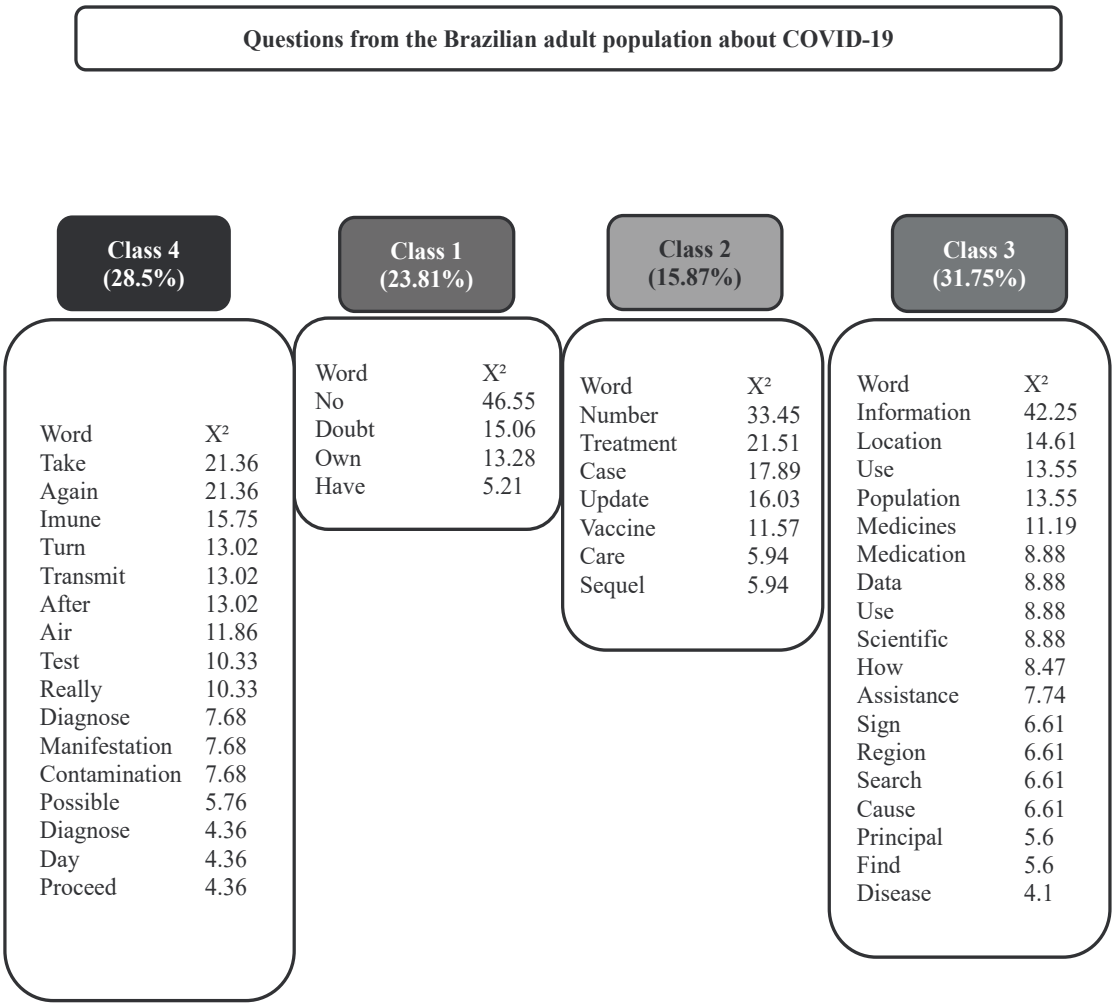
Figure 1- Word cloud. Rio de Janeiro, RJ, Brazil, 2020.



Source: software IRAMUTEQ (2020).

Using the DHC, a total of 152 text segments were obtained, 126 of which were classified (82.8%). These were broken down according to the frequency of reduced forms (lemmas), through similarities between the vocabulary of the same class, while differences between the other classes, which generated four distinct clusters. The dendrogram shows words with associative strength confirmed by the results of the chi-squared test ($Qui^2 \geq 3.84$), as shown in figure 2.

Figure 2- Descending Hierarchical Classification dendrogram with the significant words. Rio de Janeiro, RJ, Brazil, 2020.



Source: software IRAMUTEQ (2020).

Through the dendrogram, it was possible to identify that the corpus was initially divided into two subcorpuses: the first consisting of Class 4 (28.6%) and the second by a subdivision forming Class 3 (31.8%), as well as Class 1 (23.8%) and Class 2 (15.9%). After processing the corpus using the software, it is possible to understand that Classes 1 and 2 are associated with each other, and Class 4 is lexically opposed to Classes 1, 2 and 3. The text segments in each cluster were interpreted in terms of their core meanings and given a name, as described below.

Class 1 - Transmission, signs and symptoms, notification of cases and deaths, and biosafety measures

In class 1, the active forms that showed a high significant association ($Qui^2 \geq 3.84$ and $p<0.0001$) in descending order were: "no" and "doubt", being the central terms in this class. However, other words also showed a connection between these terms ($Qui^2 \geq 3.84$,) among them: possess and have.

The entry "no" was the most significant among the words, followed by the word "doubt", when the population was asked about their uncertainties about COVID-19. The use of the adverb was used essentially when some participants indicated that they had no doubts about this disease, however, when the doubts were exposed, it was possible to observe that the population was interested in obtaining information related to the transmission of the virus and the main signs and symptoms of the disease:

What to do if you have symptoms? (Part.125).

Transmission, risks and prevention (Part.45).

What is the virus, transmission and care (Part.129).

In addition, the participants reported the urgent need to obtain information on the notification of cases and deaths, including regional statistics, as well as biosafety measures, as a way of helping to tackle the pandemic.

Reporting on the number of cases and deaths (Part. 125).

Notifications on biosecurity measures (Part. 134).

Number of people affected worldwide and in my home state (Part. 128).

Class 2 - Treatment, vaccine, protective measures, infected patient care and clinical manifestations

In class 2, the active forms that showed a strong significant association ($Qui^2 \geq 3.84$ and $p < 0.0001$) in descending order were: number, treatment, case and update, which are central terms in this class; however, other words also show a connection between these terms ($Qui^2 \geq 3.84$), including: vaccine, sequela, care and transmission.

In this class, it was possible to observe that in the face of an ongoing disease, with a high risk of contamination and serious cases, the population has doubts about the treatment and vaccine production:

Government measures on the vaccine (Part. 73).

Treatment news (Part. 94).

Development of effective vaccines and drugs for immunization and treatment of symptoms (Part. 133).

Another aspect pointed out by the population refers to the prevention of COVID-19, whose clinical spectrum is diverse, there is no full information about the disease, and there is concern about protective measures against COVID-19.

Preventive measures (Part. 5).

Care not to get infected (Part. 43).

Prevention protocol (Part. 97).

Also in this class, there were many doubts related to the care of infected patients, the activity of the virus in fomites, specifications about the virus, as well as clinical manifestations, which still persisted among the population, as the text fragments show:

Virus residence time on a surface and specifications on SARS-COV-2 (Part. 197).

Is it true that COVID-19 affects brain cells? (Part. 130).

From the basics, to explaining what immunity/antibodies are (Part. 54).

Class 3 - Wearing a mask, scientific information, up-to-date COVID-19 data and spreading Fake News

In class 3, the active forms that showed a significant associatio ($Qui^2 \geq 3.84$ and $p < 0.0001$) in descending order were: information and about, being central terms in this class, however, other words also show a connection between these terms ($Qui^2 \geq 3.84$), among them: place, population, use, medicine, scientific, use, data, medication, how, care, thing, cause, search, region, sign, find, main and disease.

This class encompassed the population's pressing need to obtain information that they consider latent in the health context, about medicines and mask use, among others, as support for coping with COVID-19.

Necessary information for people who suspect the disease, on the disease management to support the entire population (Part. 99).

How to wear a mask, because the population is a bit lost (Part. 88).

Whether it is possible to manufacture a medication to prevent more deaths, about the use of medications and how the virus acts in the body (Part. 10).

Still from the perspective of information, the population reports a lack of other types of information in the face of the countless uncertainties brought about by COVID-19, such as scientific information, up-to-date data and places of care in the face of the pandemic:

Scientific information on COVID-19 (Part.81).

Treatments used based on scientific evidence (Part.9).

Up-to-date information on the disease in the city where I live and directions to hospitals and clinics if I have symptoms (Part.60).

The textual fragments also show concern about the dissemination of false information in various formats, spreading misinformation and making the population even more fearful of COVID-19:

Controlling Fake News and other meaningless things being shared (Part. 81).

Real information about treatment and prevention (Part. 31).

Warning about Fake News circulating daily (Part. 113).

Class 4 - Transmission by asymptomatic patients, immune response, reinfection, contagion and reliability of the COVID-19 test

In class 4, the active forms that showed a significant association (Qui2 ≥3.84 and p< 0.0001) in descending order were: if, again, catch and immune, these terms being central in this class, however other words also show a connection between these terms (Qui2 ≥3.84), among them: after, transmit, time, air, can, really, test, person, contaminate, manifestation, diagnose, COVID-19, contamination and already.

This category covers issues related to the transmission of the disease, immunity, re-infection with the new coronavirus, transmission by asymptomatic patients, the difference between asymptomatic and symptomatic patients and the forms of infection, as represented in the text fragments.

Once cured, are people immune? (Part. 91).

Difference between asymptomatic and pre-symptomatic patients (Part. 98).

Can asymptomatic infected people really transmit the disease? (Part. 20).

It was also possible to observe in this class that the population made sense of other doubts regarding the behavior to be adopted when breastfeeding, the immune response after infection and the reliability of the rapid test.

After twenty days of infection, I'm cured, I'm immune, I've already developed COVID-19 antibodies, do I still transmit the disease? (Part. 29).

Can women diagnosed with COVID-19 breastfeed? (Part. 73).

Are rapid tests really effective? (Part. 20).

Discussion

The population's various doubts about COVID-19, which contributed to the construction of the health education technology, concerned transmission, signs and symptoms, notification of cases and deaths, treatment, vaccine, protective measures, care for the infected patient, reinfection, and the dissemination of untrue and scientific information about COVID-19. This disease is highly transmissible between humans, especially by respiratory droplets exhaled by an infected person during breathing, coughing, sneezing and speaking to a person free of the infection, although there is evidence of transmission by aerosols, contact with contaminated surfaces and objects or via the fecal-oral route[11].

On a median, the incubation period is 5-6 days and can vary from zero to 24 days[11]. Symptoms include fever, dry cough, dyspnea, myalgia or fatigue, upper respiratory symptoms and, more rarely, gastrointestinal symptoms[12]. Early recognition of symptoms helps to reduce complications and deaths, including by encouraging the immediate isolation of infected people, thus avoiding the contamination of new individuals[11].

Another aspect highlighted by the population was the possibility of transmission of the new coronavirus between symptomatic and/or asymptomatic individuals. In this respect, it is estimated that approximately 40% to 45% of people infected with SARS-CoV-2 remain

asymptomatic, however, they can transmit the virus for an estimated period of more than 14 days depending on the disease's severity[13]. A study carried out in Nanjing, China, confirmed typical asymptomatic transmission among individuals who have had close contact with infected patients[14]. This finding constitutes an important topic in the construction of the mobile application.

Participants highlighted the importance of obtaining information on local and regional numbers of cases and deaths, as well as protective measures. The development of indicators to assess the evolution of the epidemic and the systematic dissemination of notification data, broken down by municipality and region, are essential strategies to support decision-making on social distancing measures and their relaxation[11].

As for protective measures, doubts about this issue were still evident in the class analysis. However, the WHO has pointed out that reducing the speed at which the virus circulates depends precisely on the mass adoption of fundamental measures that include hand hygiene, the use of hand sanitizer, respiratory etiquette, the use of masks, the cleaning of surfaces, the avoidance of crowds and social distancing[15].

The use of masks was also pointed out as a relevant point by the population, since this practice corresponds to the most effective prevention measure in relation to person-to-person transmission, especially when associated with other protective measures, contributing to the flattening of the transmission curve[16]. Therefore, this educational need, evident in the findings, implies the urgency of constantly educating the population about protective measures, based on up-to-date scientific information.

This fact confirms the contribution made by the population to the creation of a mobile application, since in order to build an educational technology, it is first necessary to know the context of the population it is aimed at, which implies a participatory, communicative and collective approach in order to better define care strategies[17]. In this way, this study focused on the contribution of the population as a target audience to support the design of the mobile application about COVID-19.

The treatment and development of vaccines, which are also addressed in the app, were recurring doubts raised by the population, referring to concerns about protection/immunity against COVID-19. So far, it is known that the development of vaccines is the most effective protection measure to contain the increase in cases. According to the World Health Organization (WHO), given the current scenario of great global health complexity, an effective and safe vaccine is recognized as a potential solution for controlling the pandemic, combined with maintaining the prevention measures already established[18].

On the other hand, the use of medications to protect against COVID-19, and thus reduce the number of cases and deaths, also emerged among the participants. Currently, there are no medications or other specific therapies that have been scientifically proven to prevent or treat COVID-19, and only drugs that provide therapeutic support for the symptoms presented are used. However, several studies have been carried out in this regard, as well as evaluating the efficacy of medications already used[19] for other purposes.

It was possible to testify to concerns about the dissemination of untrue information about COVID-19. Just like the disease's transmission, the dissemination of various news items occurs in parallel, leading to misinformation about the population's health. A lot of information and news is posted on social media, quickly among the population, creating a network with false content, called Fake News, which in many cases leads to the adoption of measures and behaviors contrary to the guidelines of the health authorities[20].

Therefore, in times of COVID-19, mobile apps have become instruments that enable the delivery of reliable and up-to-date information, as well as monitoring information and encouraging self-care for people in social isolation, and also have the possibility of presenting themselves as a resource to be used

by health professionals[7], including to minimize the harmful effects caused by Fake News.

Another contribution identified from the questions asked by the population to make up the mobile app was in relation to reinfection as a relevant issue. According to the Pan American Health Organization (PAHO), cases of reinfection by SARS-CoV-2 have been documented worldwide[21], because according to the information available so far, there is not enough evidence that people who have recovered from COVID-19 have generated neutralizing antibodies that can protect them from reinfection[22]. However, PAHO recommends following certain criteria and the need for periodic review of suspected and confirmed cases of reinfection by SARS-CoV-2, which reiterates the participation of the target audience in this process of idealizing an educational technology, given the contributions on the content for the composition of the mobile application[23].

Therefore, it is important to consider the concerns and emerging issues presented by the target audience when constructing educational health technologies, which need to be qualified and have the capacity to stimulate self-care, interest and behavioral change, as well as helping health professionals who work with the subject in terms of standardizing information and providing health guidance to the population[24].

In this directive, it should be noted that the application for mobile devices, called "ROBOVID", was developed in accordance with the methodological criteria recommended in the scientific literature, in addition to aspects that contributed to the improvement and quality of the material, considering the need of the public for which it is intended, in this case, individuals living with COVID-19 and health professionals[25], atifying the contribution of this study in relation to the orientation of health professionals and individuals about the acceptability, adherence and compliance with COVID-19 prevention and control measures[26].

Limitations of the study include the objectivity of the answers compared to recorded interviews, which are common in qualitative studies, and not knowing the circumstances in which the form was answered, so it is possible that there are doubts among the target population that were not uncovered in this research.

Final Considerations

In designing the mobile app, the population's doubts were identified and incorporated as a resource for mediating the learning process in times of pandemic, with the aim of promoting acceptability, adherence and compliance with preventive measures to control COVID-19. Thus, participants contributed to this process by raising questions about the transmission of SARS-CoV-2, biosafety measures to prevent infection, clinical manifestations, the vaccine, the use of medication and reinfection.

This study endorses the fundamental participation of the target audience in the design of a mobile application, through up-to-date information from the best scientific evidence on the subject, to be made available in the mobile application called ROBOVID, already validated by expert judges and the target audience, registered with the National Institute of Industrial Property, under the number BR 512021001882-6 and indexed in the Apple Store for IOs devices, free of charge to download, which can be accessed via the Qr Code below. It should be noted that the application is awaiting publication in the Google Play store.

Collaborations:

1 – Conception and planning of the project: Layanne Fonseca Pinto; Aline Cerqueira Santos Santana da Silva; Michelly Cristynne Souza Bonifácio e Yasminn Canella Cabral Banjar Coelho;

2 – Analysis and interpretation of data: Layanne Fonseca Pinto; Aline Cerqueira Santos Santana da Silva; Michelly Cristynne Souza Bonifácio e Yasminn Canella Cabral Banjar Coelho;

3 – Writing and/or critical review: Layanne Fonseca Pinto; Aline Cerqueira Santos Santana da Silva; Michelly Cristynne Souza Bonifácio; Yasminn Canella Cabral Banjar Coelho; Fernanda Garcia Bezerra Góes e Fernanda Maria Vieira Pereira Ávila;

4 – Approval of the final version: Layanne Fonseca Pinto; Aline Cerqueira Santos Santana da Silva; Michelly Cristynne Souza Bonifácio; Yasminn Canella Cabral Banjar Coelho; Fernanda Garcia Bezerra Góes e Fernanda Maria Vieira Pereira Ávila.

Conflicts of interests

There is no conflict of interest.

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