Medicação®: A Study of Self-Management of Medications in the Elderly

Medicação®: Um estudo sobre o Autogerenciamento de Medicamentos em idosos

Medicação®: un estudio sobre autogestión de medicamentos en ancianos

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REVISA

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RESUMO

Objetivo: Avaliar autogestão de medicamentos em idosos, por meio de um aplicativo. **Método:** Pesquisa aplicada, transversal e mista, realizada com 15 idosos com idade igual a 69,45 (DP=6,55). As coletas ocorreram pré e após 60 dias de uso do aplicativo, sendo avaliados por meio do MEEM, questionário de pré-uso, questionário pós-uso e questionário sobre aspectos relativos à usabilidade do aplicativo. Para análise dos dados quantitativos, utilizaram-se análises descritivas do SPSS e, para os dados qualitativos, utilizou-se o software IRaMuTeQ. **Resultados:** Quanto à categorização da amostra, majoritariamente do sexo feminino (66,66%) e com baixa usabilidade (59,04). Os dados qualitativos no momento pré-uso apresentaram sete classes e a prevalência das palavras "Tomar" e "Medicamento". No momento pós-uso, foram observadas outras sete classes e a prevalência das palavras "Não" e "Aplicativo", indicando dificuldades no uso. **Conclusão:** Sugere-se que haja mais estudos que abordem questões relativas à interatividade, sobretudo acessibilidade e usabilidade, de forma a subsidiar a concepção e a construção de melhores aplicativos voltados para o público idoso.
Descritores: Aplicativo; Autogestão; Idoso; Medicamento; Usabilidade.

ABSTRACT

Objective: To evaluate a self-administered drug in elderly, by an application. **Method:** Applied, cross and mixed research, performed with 15 elderly people with age equal to 69.45 (SD = 6.55). The collections occurred before and after 60 days of use of the application, being evaluated through the MMSE, pre-use questionnaire, post-use questionnaire and questionnaire on aspects related to the usability of the application. To analyze the quantitative data, SPSS descriptive analyzes were used, and for the qualitative data the software IRaMuTeQ was used. **Results:** Regarding the categorization of the sample, mostly female (66.66%) and with low usability (59.04). Qualitative data at the pre-use time presented seven classes and the prevalence of the words "take" and "Medication". At the post-use point, seven other classes and the prevalence of the words "No" and "Application" were observed, indicating difficulty in use. **Conclusion**: It is suggested that there be more studies that address issues related to interactivity, especially accessibility and usability, in order to subsidize the design and construction of better applications aimed at the elderly public.
Descriptors: Application; Self-management; Elderly; Medication; Usability.

RESUMEN

Objetivo: evaluar el autocontrol de los medicamentos en los ancianos, utilizando una aplicación. **Método:** Investigación aplicada, transversal y mixta, realizada con 15 personas mayores de 69,45 años (DE = 6,55). Las recolecciones se realizaron antes y después de 60 días de uso de la aplicación, y se evaluaron mediante el MMSE, el cuestionario previo al uso, el cuestionario posterior al uso y el cuestionario sobre aspectos relacionados con la usabilidad de la aplicación. Para el análisis de los datos cuantitativos, se utilizaron análisis descriptivos del SPSS y, para los datos cualitativos, se utilizó el software IRaMuTeQ. **Resultados**: Respecto a la categorización de la muestra, mayoritariamente femenina (66,66%) y con baja usabilidad (59,04). Los datos cualitativos en el momento previo al uso presentaron siete clases y la prevalencia de las palabras "Tomar" y "Medicamento". En el momento posterior al uso, se observaron otras siete clases y la prevalencia de las palabras "No" y "Aplicación", lo que indica dificultades de uso. **Conclusión:** Se sugiere que haya más estudios que aborden temas relacionados con la interactividad, especialmente la accesibilidad y la usabilidad, para apoyar el diseño y la construcción de mejores aplicaciones dirigidas a las personas mayores.
Descriptores: Aplicación; Autogestión; Ancianos; Medicina; Usabilidad.

ORIGINAL

Introduction

Statistical projections from the Brazilian Institute of Geography and Statistics (IBGE)[1] prove the increase in the proportion of elderly people in relation to the Brazilian population. According to these projections, in 2030, the number of people aged 60 and over will be greater than that of children up to 14 years of age; in 2055, the elderly population will be larger than that of children and young people. This brings enormous political, socio-cultural, economic and technological challenges in order to serve this population.

According to Amorim et al.[2], several studies point to the need for investment on several fronts, including technologies and, in particular, Information and Communication Technologies (ICT). However, although access to the internet and the use of technologies by the elderly are on the rise, they can still be considered a digitally excluded population range, and consequently, with some difficulties that must be resolved.

In this sense, the theory of Ageing in Place, presents itself as an important contribution to this need, insofar as it aims to promote the ability of the elderly to continue to live at home and in the community over time, safely and in a way independent. This concept requires an interdisciplinary approach led by gerontology, valuing interventions at different scales and focused on health care for the elderly, including within technological aspects.[3]

There is an increasing number of discussions on health care policies aimed at the aging of the population[4], especially with regard to the need for better specialized public services with regard to the deterioration of the central nervous system, associated with chronic diseases such as diabetes, systemic arterial hypertension, cardiovascular diseases, among others.[5]

With the emergence of m-Health, that is, mobile health services, more and more technological tools are available and being used by all audiences, especially the elderly, helping them in their self-care strategies, in preserving autonomy and independence, preventing and delaying its functional decline.[2] The increase in the incidence of chronic diseases associated with old age is directly related to the demand for the use of medicines to combat or delay the deterioration process of the organism, contributing to polymedication.[6]

Low adherence to medication, in this audience, is still a problem that affects between 50% and 60% of patients with chronic diseases, and applications on mobile or web platforms could play a fundamental role in mitigating such problems, as long as such services consider designs focused on these users, in order to allow interaction between the patient and the professional, with a view to increasing the viability and the ability to accept these resources.[7]

Drug adherence by the elderly is a complex problem, which requires not only a good doctor-patient relationship, but also a multidisciplinary approach and the use of technology in favor of the elderly to deal with polypharmacy.[8] Some authors also point to the potential of using ICT in the health context, especially in the field of Geriatrics and Gerontology.[9] In this context, applications for mobile devices can be useful not only for self-management of the evolution of chronic diseases, such as diabetes and high blood pressure, but also for better medication and / or treatment adherence.[10]

In this sense, the objective of this study was to evaluate an application built for the elderly who use two or more medications, in order to verify whether it can enhance therapeutic adherence and, consequently, improve the

elderly person's perception of health. Thus, the following research question emerges: can ICTs contribute to the improvement of medication adherence in our elderly today?

Method

Design, study location and period

As for its nature, this is an applied research, motivated by the need to verify the use of an artifact (App Medicação®). It is noteworthy that this study had two stages, the first being already carried out and inserted in the proposal to build an application.[11] The second stage, refers to the study to be presented, which seeks the evaluation (a pilot test) of the application , being of a transversal and mixed nature (for carrying out quantitative and qualitative analyzes).

In the present research, quantitative procedures were used for the description, characterization of the sample and objective evaluations regarding the use of the application, and qualitative measures for obtaining, analyzing and interpreting, through subjective evaluations, the elderly regarding access to the application for self-management of medicines.

Sample

Convenience sample was initially composed of 29 elderly people, with 15 elderly people remaining for the final sample in line with the inclusion and exclusion criteria of the study. The inclusion criteria: *(i)* have access to an Android platform smartphone; (ii) make use of at least two drugs with different active ingredients in the day; (iii) being 60 years of age or older, of both sexes; (iv) perform the Mini Mental State Examination (MMSE) and be able to handle the application and, consequently, (v) do not have any dementia syndrome.

We excluded those who: (i) had physical impediments to the use of the device; (ii) did not use the application for self-management of medications during the research period; (iii) refused to be interviewed or answer the questionnaire before using the application.

Study Protocol

Instruments

The instruments used were: 1) MMSE, cognitive screening test and used to assess cognitive function in the following domains: temporal, spatial orientation, immediate and evocation memory, calculation, language-naming, repetition, comprehension, writing and drawing copy. It is one of the few tests validated and adapted for the Brazilian population[12]; 2) Application Pre-use Questionnaire, where the socio-demographic conditions (age, sex, education and marital status) of the elderly participant were raised and three more questions, in order to identify the strategies used for medicines use management; 3) Post-use questionnaire composed of three questions, to be applied: (i) impressions about the application, (ii) the impact of using the application on a daily basis; and (iii) whether the use has given it greater

autonomy; 4) Questionnaire on aspects related with the application usability, adapted from Gresse von Wangenheim et al.[13] and composed of 31 questions, having also been applied after using the application, in order to evaluate it, in order to raise elements that support its reformulation for a future version of the application. The subjects' responses followed a Likert-type scale, ranging from 0 (strongly disagree) to 5 (strongly agree).

In its first version, the Medicação® application, developed in 2018 by Teixeira, Linhares and Lameirão[11], was based on the requirements defined according to the relevant literature. Note that this application was developed for the Android platform, considering that the vast majority of smartphones sold (95.1%) have this system.[14]

Methodological Procedures

This evaluation stage consisted of four moments, carried out in groups, with an average duration of 1h30 for each meeting, with the help of students from the Psychology and Computer Science Undergraduate courses, described below:

- Presentation: a presentation was made to the elderly selected from the project through an introduction script, so that they were motivated to collaborate with the project, showing the research objectives, as well as the way to obtain the data, and, including the possible benefits and risks for the volunteers, as described in the Informed Consent Form (ICF). After this presentation, it was found that 29 elderly people met the criteria for conducting the study. Then, another date was set with the probable participants selected to confirm their consent by signing the informed consent form.
- Pre-use meeting: an explanation and signature of the informed consent form was given to all interested elderly people, and a questionnaire was applied to collect socio-demographic data and their strategies for correctly taking their medications. Even then, all the elderly were instructed and helped to download and use the application for two months.
- Use of the application: it was carried out for two months, and the elderly should use it daily, without the help of third parties, and noting, when necessary, the positive points or limitations of the application to present in the post-use meeting.
- Post-use meeting: the questions regarding the strategies for the correct use of medicines, the usability test and a survey on the positive points and the limitations observed were once again asked.

Ethical Aspects

The collection of these data was approved by the Research Ethics Committee (CAAE nº 58197216.6.0000.0029), which also approved the IC. All methodological procedures previously presented were only performed after submission and accepted by the Committee.

Analysis of results and statistics

Following the example of some authors[15-17], who analyzed textual data collected in their research in the field of Gerontology, the software IRaMuTeQ (Interface of R pour les Analyzes Multidimensionnelles de Textes et de Questionnaires) was used for the qualitative analysis of the questionnaires, through a content analysis. This software is licensed and free, which enables different types of analysis of textual data. These analyzes made it possible to explore the responses of the forms, once they were transcribed. Each interview generated a text and the set of these texts constituted the corpus of analysis. The processing and analysis of textual data was done by descending hierarchical classification (grouping the segment of texts and vocabularies), correlating them by content, by theme, by similarity or frequency of words or word cloud present in the analyzed responses. [18-19] For the quantitative data, the Statistical Package for the Social Sciences (SPSS) software, version 24.0, was used, with the evaluation of descriptive measures, such as frequency, percentage, means and standard deviation.

Results

The results presented refer to the 15 elderly people evaluated in the two moments of use (pre-use and post-use) of the application, answering the questionnaire on the strategies used to take their medications and having installed the application on their cell phones. We stand out that the sample loss of 14 elderly people, from the pre-use moment to the post-use moment, was due to the fact that six elderly people did not have the operational system necessary for the participation of the project, two left the project for personal reasons during that time and six preferred not to answer, as they indicated difficulties in the usability of the application. Initially, quantitative results will be presented for the characterization and choice of the sample (through calculations performed by SPSS) and, later, qualitative results (through textual analysis by IRaMuTeQ). Quantitative data will be presented for the characterization of the sample (Table 1).

Table 1 - Sociodemographic and Mini-Mental State Examination variables. Federal District, Brazil, 2018.

Variable	Mean (Standard Deviation)
Age	**69,45 (±6,55)**
Mini-Mental State Examination	25,47(±1,60)
Sex	
Female	10 (66,66%)
Male	05 (3,33%)
Education Level	
Complete primary education	04 (26,66%)
Incomplete High School	03 (20,00%)
Complete High School	02 (13,33%)
Incomplete higher education	03 (20,00%)
Complete higher education	03 (20,00%)

Note. Age variable and Mini Mental State Examination represented by means and standard deviation in parentheses, and gender and education variables represented by their frequencies, with percentage in parentheses.

As shown in Table 1, the sociodemographic profile has an average age of 69.45 (± 6.55), with a prevalence of females (66.66%). As for education, the category with the highest incidence was complete elementary school (26.66%), but, in general, the education variable was fairly evenly distributed. As for the MMSE, the elderly have good cognitive function in all aspects (temporal, spatial orientation, immediate and evocation memory, calculation, naming language, repetition, comprehension, writing and drawing copy), since, despite elderly people with low schooling, the MMSE average remained high with an average of 25.47 (± 1.60). All the elderly people who participated in the research used, at least, two medications, daily.

Regarding the qualitative assessments regarding the strategies used to remember to take their medications and the perception of using the application, the corpus formed by the responses to the questionnaires was analyzed using the IRaMuTeQ software. The set of answers given by each elderly person generated a text and the set of these texts constituted the corpus of analysis.

In both moments (pre-use and post-use), two analysis techniques were applied: (i) Descending Hierarchical Classification Method (CHD), which classifies segments of text "according to their respective vocabularies, and the set of them is divided according to the frequency of the reduced forms ", and (ii) Word Cloud, a lexical analysis according to the frequency.[18]

Pre-use moment of the application

The application of CHD in the questionnaire related to the pre-use of the application generated the dendogram shown in Figure 1, which identified seven classes of words.

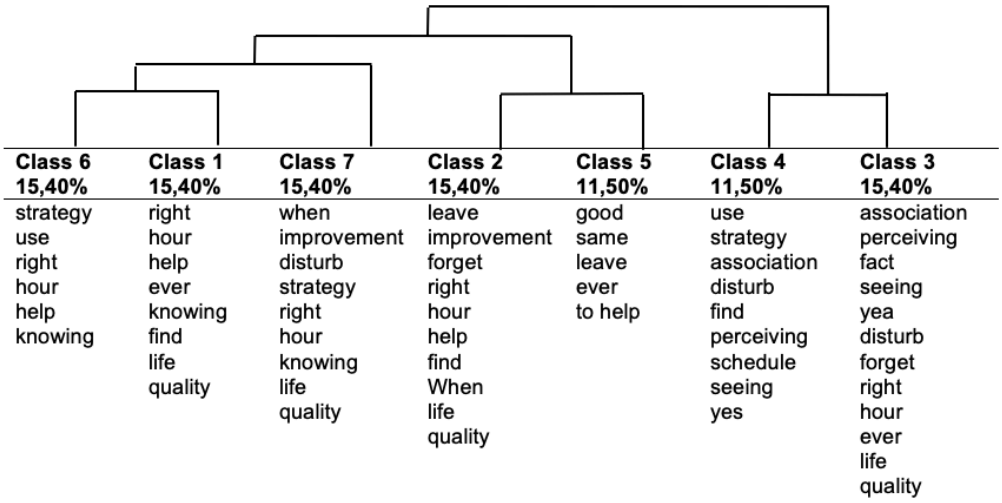

Figure 1 - Dendogram of classes and frequency of words from the pre-intervention moment of the elderly. Federal District, Brazil, 2018.

According to Figure 1, the seven classes were classified as: Class 1 (Remembrance), which reported the importance of mechanisms to remember to take the medication; Class 2 (Improvement), which reported the importance of not forgetting to take the medication as an aid to improve health; Class 3 (Perception), who reported that forgetting to take the medication can interfere with quality of life; Class 4 (Usability), which reported the importance of using mechanisms to remember the right time to take the drugs; Class 5 (Expectation), which reported the expectation of having help with the application; Class 6 (Strategy), which reported the importance of having strategies to remember the correct time and medications; and, finally, the Class 7 (Time), who reported that forgetting the medication schedule has consequences on quality of life.

Corroborating the data previously presented, the analysis by word cloud in the pre-use moment (Figure 2) presented as central axes the words "Tomar" and "Medicament", followed in the periphery of the words: remember, quality, right, time, life, no and familiar. The word cloud made it possible to identify the keyword, that is, the most frequent word, which was "Medicament", the most powerful and frequent word, and some associations can be identified, such as: remembering to take the medication, take medicine, do not take etc. It is important to emphasize the word "No" at this moment, even if it is of low frequency. In short, it was reported, at that moment, the importance of remembering the right time to take the medications and the importance in this regard.

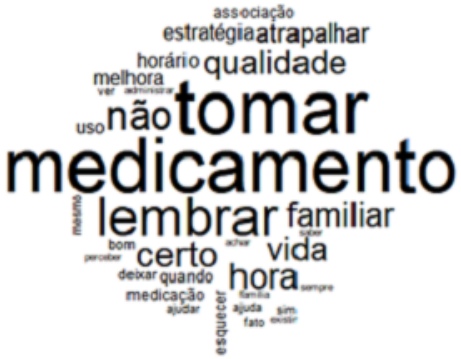

Figure 2 - Frequency of words analyzed from the pre-intervention moment of the elderly. Federal District, Brazil, 2018.
Note: taking; medicines; remembering; quality; correct; time; life; parents.

To characterize the pre-use moment, some corpus will be presented:

- I don't have many strategies to remember to take the medication, I use meal times to remember, sometimes not remembering to take the medication at the right time is very stressful. (Elderly, 60 years old)
- I take my medication at the right time and according to the doctor's guidance, even so my family members guide me. (Elderly, 77 years old)
- I don't use any strategy to take my medications, so I forget. Certainly if I remembered to take the medication at the right time, I would have a better quality of life. (Elderly, 73 years old)

The difficulty of remembering to take medications at the right time reported by these elderly people corroborates the relevance of support mechanisms and the construction of applications to assist them in this task, which will be discussed below.

Post-use moment of the application

The application of CHD in the questionnaire related to the post-use of the application generated the dendogram presented in Figure 3, which identified seven classes of words, in proportions categorized in different ways from the pre-use moment.

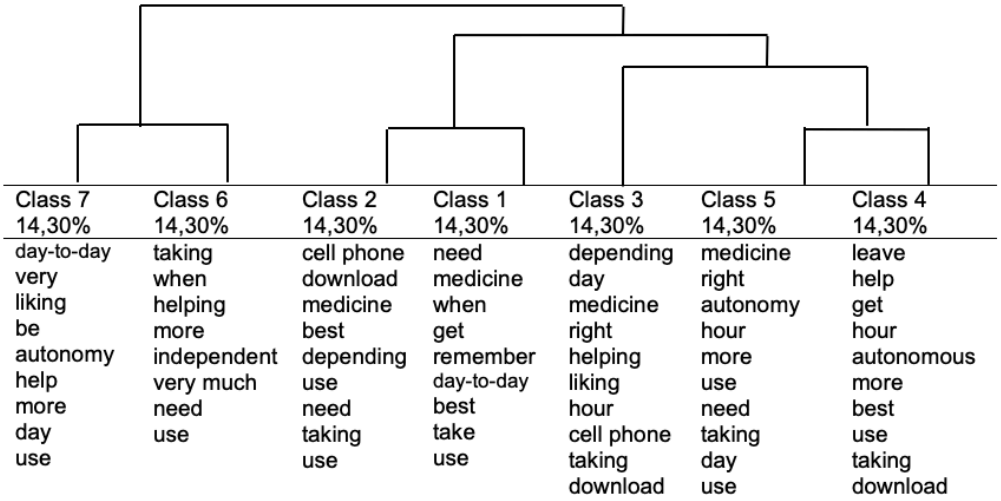

Figure 3 - Dendogram of the classes and frequency of words of the Moment after intervention of the elderly. Federal District, Brazil, 2018.

According to Figure 3, the seven classes were classified as: Class 1 (Necessity), which reported the need and importance of the elderly to remember their medications; Class 2 (Technology), which reported the importance of cell phones for self-management of medicines; Class 3 (Dependency), which reported negative aspects of depending on someone for medication management; Class 4 (Help), which reported important aids to remember and be able to take the drugs; Class 5 (Medication), which reported the expectation of having autonomy to take the medication correctly; Class 6 (Autonomy), which reported the importance of having autonomy for self-management of medicines; and, finally, Class 7 (Day by day), which reported the importance of having help mechanisms for the day.

Corroborating the previously presented data, the analysis by word cloud in the post-use moment (Figure 4) presented as central axes the words "No" and "Application", followed in the periphery of the words: use, take, medicine, medicine and autonomous.

The word cloud made it possible to identify the keyword, that is, the most frequent word that was "Application", the most powerful and frequent word, and some associations can be identified, such as: not using an application, not taking the medicine and don't take it on time etc. It is important to emphasize the word "No" at this point, it increased in frequency, compared to the pre-use moment. In short, it was reported, at that moment, the difficulty of using the application and remaining autonomous with regard to this procedure. Being able to refer to a greater knowledge and adequacy regarding the use of the application, now better known, they perceive the importance of the application, but still feel difficulty in handling it.

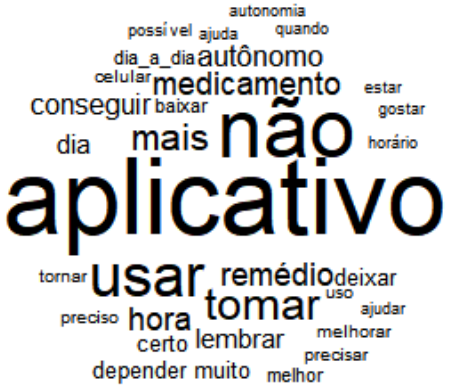

Figure 4 - Frequency of words analyzed from the moment post-intervention of the elderly. Federal District, Brazil, 2018.
Note: No; Application; Take; Medicines And Autonomous.

To characterize the post-use moment, some corpus will be presented:

- I was unable to download the application, I always have difficulty taking the medication at the right time. I believe that the app would help a lot. (Elderly, 77 years old)

- I was unable to use the application. I still take the medications normally, but it would be much better if I had an application. (Elderly, 73 years old)

- I thought the app was wonderful, I learned fast, it improved a lot myself remembering to take the medication with the app, I found that using the app greatly improved my autonomy. (Elderly, 60 years old)

In addition to the analyzes cited in the post-use moment, a 5-point Likert scale was also applied, ranging from 0 (strongly disagree) to 5 (strongly agree). The scale referred to a usability questionnaire for the elderly in the post-intervention moment, with a mean of 59.04 (SD = 54.60). The questionnaire consisted of 31 items, in which the results were divided into three ranges, where low usability can be understood with results between the values 0-51, medium usability values between 52-103 and high usability between 104-155. The analyzed value was on average usability, but, by the standard deviation, a very significant variability was always understood in the analyzed group, ranging from low to high usability.

Discussion

Based on the results presented, it is possible to verify an expectation on the part of the elderly to use the application, however, several limitations were verified that made autonomy impossible. On the other hand, it was observed that many elderly people were very interested in using the application, but the difficulty in handling it was evidenced. Methodological care carried out in making the application is very similar to previous studies, which indicated aspects such as ease of use, font size, images, application functionality, motivation for use, primary issues to be considered when building an application[20], and whose results point out a considerable interest of these learners in mobile learning applications and indicate the importance of developing this type of application with specific characteristics, paying special attention to the need to be intuitive.[21]

During the research, no specific jobs or applications were found for this group of elderly people, which corroborates the studies by Souza and Sales[21] who report that there are few studies on smartphones for the elderly, configuring a problem, given that this public has advanced in number and are interested in this tool, but have encountered difficulties due to lack of knowledge in handling it, which promotes the digital exclusion of the elderly and less social participation.

According to these authors, more research on accessibility of applications and smartphone hardware for the elderly is imperative, reducing social exclusion, offering comfort, safety and valuing it before society. We also observed that future work will be necessary, taking into account the sociodemographic factors, since these presented here were quite varied. Sociodemographic factors are believed to be associated with access to and use of health applications[2], such as education level and having a medical insurance, due to the fact that people with a higher level of education and medical insurance have more access to these applications.

More and more technology should be encouraged for the elderly. Aspects related to the sociability and the interaction of the elderly with their children and grandchildren facilitate digital inclusion - intergenerational sociability[23], as they help with their digital skills, as well as courses at universities open to maturity, because, due to the fact that, currently, they have more elderly people who are less literate, it increases the need to democratize access to information, through digital literacy strategies that combat technophobia and increase the socialization of the elderly, although it is somewhat challenging for the elderly who were not socialized with the use of such technologies.

Some problems were also reported by the elderly and should be considered in future research, such as: difficulties in handling and controlling the application's alarm, since the sound is from the cell phone itself (would there be no other possibility of using a device inside the device application itself?), and the fact that there is no list of homeopathic medicines (since only those recommended by the National Health Surveillance Agency (Anvisa) were listed, without the possibility of adding medicines). We also verified limitations in the sample size, educational variability and the predominance of females, and these controls are indicated in future studies.

Conclusion

At the end of this work, the most important reflection refers to the difficulty of using the analyzed elderly, understanding that it is important to continue with the proposals presented here, but also adapting to "older" operating systems and within the needs of elderly people who, in are not yet digitally literate. It is essential to invest in applications that have a more accessible interface for the elderly, that takes into account the ergonomics, such as the font size and type, the icons, a favorable color contrast with more intuitive interaction, but that also understand the needs of this public even with technological advances and adaptations.

Few elderly people said it was an innovative proposal for those with memory and hearing problems, easy to install, with a video tutorial that explained how to use the application and that the fact that relatives and / or caregivers can accompany the administration of the medicine with a photo of the elderly, making it possible for this caregiver or family member to accompany several elderly people at the same time.

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