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Application test for betterment in the self-care of diabetic patients: a study in virtual messages under the NPT perspective

Teste de aplicação para melhoria no autocuidado de pacientes diabéticos: um estudo em mensagens virtuais sob a perspectiva do TNP

Prueba de aplicación para la mejora en el autocuidado de pacientes diabéticos: un estudio en mensajes virtuales bajo la perspectiva del TNP

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ABSTRACT
With the increase in chronic diseases that can be linked to bad habits, communication technologies improve the quality of life and health status of patients. We sought to understand how a digital TV application and Smartphones can improve care for e-Health intervention patients through persuasive content, increasing health literacy levels in people with diabetes through elements of the Normalization Process Theory (NPT). An experimental exploratory study was carried out, through quantitative and qualitative research, in three groups of patients with diabetes (28 in total - 10 in the Control Group, 9 in the Smartphone Group and 9 in the Digital TV Group), in Poços de Caldas, MG, Brazil, including 7 health professionals (4 dentists and 3 nurses) who deal with these patients in the municipality. The application was accepted in both groups by users and professionals, all the while showing a tendency of increasing the literacy and persuasion among the users. From the NPT perspective, the issues of implementing a complex intervention, its incorporation and optimization of systems showed themselves efficient for the betterment of self-care through the use of technology. It was noticed that the users' self-management of the disease and behavior improved; however, it was pointed out that the help and participation of healthcare professionals in needed for better credibility, persuasion, effectiveness and efficacy of the messages. It should be noted that they are content adjustments to improve literacy indicators.

Keywords: diabetes, literacy, NPT, persuasion, application.

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RESUMO

Com o aumento das doenças crônicas que podem estar ligadas a maus hábitos, as tecnologias da comunicação melhoram a qualidade de vida e o estado de saúde dos pacientes. Buscamos entender como um aplicativo de TV digital e Smartphones podem melhorar o atendimento para pacientes com intervenção em saúde eletrônica através de conteúdo persuasivo, aumentando os níveis de alfabetização em saúde em pessoas com diabetes através de elementos da Teoria do Processo de Normalização (TNP). Realizou-se estudo experimental exploratório, por meio de pesquisa quantitativa e qualitativa, em três grupos de pacientes com diabetes (28 no total - 10 no Grupo Controle, 9 no Grupo Smartphone e 9 no Grupo TV Digital), em Poços de Caldas, MG, Brasil, incluindo 7 profissionais de saúde (4 dentistas e 3 enfermeiros) que lidam com esses pacientes no município. O aplicativo foi aceito em ambos os grupos por usuários e profissionais, ao mesmo tempo mostrando uma tendência de aumentar a alfabetização e persuasão entre os usuários. Do ponto de vista do TNP, as questões da implementação de uma intervenção complexa, sua incorporação e otimização de sistemas mostraram-se eficientes para a melhoria do autocuidado através do uso da tecnologia. Observou-se que a autogestão da doença e do comportamento por parte dos usuários melhorou; entretanto, foi apontado que a ajuda e a participação dos profissionais de saúde necessitaram de maior credibilidade, persuasão, eficácia e eficácia das mensagens. Note-se que se trata de ajustamentos de conteúdo para melhorar os indicadores de alfabetização.

Palavras-chave: diabetes, alfabetização, TNP, persuasão, aplicação.

RESUMEN

Con el aumento de enfermedades crónicas que pueden estar relacionadas con malos hábitos, las tecnologías de la comunicación mejoran la calidad de vida y el estado de salud de los pacientes. Buscamos comprender cómo una aplicación de TV digital y Smartphones pueden mejorar la atención a los pacientes con una intervención de e-salud a través de contenidos persuasivos, aumentando los niveles de alfabetización sanitaria en personas con diabetes a través de elementos de la Teoría del Proceso de Normalización (NPT). Se realizó un estudio experimental exploratorio, mediante investigación cuantitativa y cualitativa, en tres grupos de pacientes con diabetes (28 en total - 10 en el Grupo Control, 9 en el Grupo Smartphone y 9 en el Grupo TV Digital), en Poços de Caldas , MG , Brasil, incluyendo 7 profesionales de la salud (4 dentistas y 3 enfermeros) que atienden a estos pacientes en el municipio. La aplicación fue aceptada en ambos grupos por usuarios y profesionales, aunque mostró una tendencia a aumentar la alfabetización y la persuasión entre los usuarios. Desde el punto de vista del TNP, las cuestiones de implementar una intervención compleja, su incorporación y optimización de sistemas demostraron ser eficientes para mejorar el autocuidado mediante el uso de la tecnología. Se observó que mejoró el automanejo de la enfermedad y el comportamiento por parte de los usuarios; sin embargo, se señaló que la ayuda y participación de los profesionales de la salud requirieron mayor credibilidad, persuasión, eficacia y

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efectividad de los mensajes. Tenga en cuenta que estos son ajustes de contenido para mejorar los indicadores de alfabetización.

Palabras clave: diabetes, alfabetización, TNP, persuasión, aplicación.

1 INTRODUCTION

The Chronic Non-Communicable Diseases (CNCDs) are becoming a priority in the health care in most countries, both due to their impact in morbimortality and the elevated costs of the medical assistance. The international debate over chronic diseases has been intense. The United Nations (UN) recognized the importance and impact of CNCDs constitute great challenges to the development in the 21st century, and emphasized the governments' primary role and responsibility in the response to the challenge (WHO, 2020).

Brazil is the only country in the world with over 100 million inhabitants with a public, universal, integral and free health system, constitutionally guaranteed: Unified Public Health System (Sistema Único de Saúde - SUS) (Brasil, 1988). In the last decades, the country has been going through changes in its morbimortality profile, leaving a situation where a prevalence and relevance of infectious diseases and entering a rising curve both in mortality and morbidities through CNCDs, in many cases, marked by their irreversibility. In 2009, for example, CNCDs were the main cause of mortality. According to Schmidt et al. (2011), after the corrections for unclear and under recorded causes, the CNCDs answer for 72.4% of casualties, being that the array of four diseases (cardiovascular, neoplasia, chronic respiratory conditions and diabetes) were responsible for 80.7% of the deaths caused by chronic diseases.

At the same time that they represent a great challenge for SUS, this achievement was possible mainly due to the actions of the public health sector, as vaccination campaigns, the universalization of Primary Care (Atenção Básica - AB), besides the improvement of living conditions and basic sanitation. On the other hand, some infectious diseases still persist in the Brazilian sanitation

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overview, such as acquired immunodeficiency syndrome (AIDS), dengue and tuberculosis, which, together with the emergence of non-communicable diseases, such as DM, obesity and hypertension, configure the current landscape of demographic-epidemiologic transition.

In 2011, the Ministry of Health (Ministério da Saúde - MS) launched its National Plan for Confronting Chronic Non-Communicable Diseases (Brazil, 2021), emphasizing population actions to control more predominant CNCDs, DM among them. However, since the creation of SUS in Brazil, health began to be understood as a right of all and duty of the State (Brasil, 1988). More recently, the MS instituted, as one of their priority strategies (Brasil, 1988), the Communicable Diseases Network (Rede de Atenção às Pessoas com Doenças Crônicas - RAPDC) (Brasil, 2013). This network has the goal of fostering change in the model of healthcare attention, strengthening and guaranteeing the integral care for people with chronic diseases; positively impact the indicators related to these diseases, besides contributing for the promotion of the population's health and prevent the development of these diseases and their complications. One of the main themes for this Health Network (Rede de Atenção à Saúde - RAS) are the renocardiovascular diseases, including hypertension, diabetes mellitus, and chronic renal failure (Brazil, 2014a). All these CNCDs have common and modifiable risk factors, such as tobacco use, harmful consumption of alcoholic beverage, physical inactivity and inadequate eating (Brazil, 2011), emphasizing the necessary engagement of all society's sectors to generate correct responses in the prevention and control of CNCDs (WHO, 2020).

With the rise of chronic diseases connected to bad habits, under the public health perspective, become important to the understanding of how communication mediated by technology may improve the quality of life and well-being of patients.

The knowledge of the factors of promotion of public health and risk factors is decisive in the adoption of healthier behaviors. The interventions in the area of public health can be more effective if they are realized with people who are able to comprehend, identify and take health actions. This capacity is associated to

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the term literacy, which, when low in terms of health, may be considered a risk factor for the treatment of chronic diseases in general, diabetes among them (Santos, 2010), once the treatment of these diseases results in high costs, specially towards the end of one's life, when around 50% of health expenses are made (Alemayehu & Warner, 2004).

In Brazil, according to the *Atlas International Diabetes Federation* (IDF, 2017), there are 12.5 million of people with diabetes, putting the country in the fourth position with the highest number of people afflicted. (Guia da Farmácia, 2018).

It is known that innovations in the healthcare area are of complex nature and there is a vast literature about their implementations in this context. However, the efforts for the implementation of new technologies and practices continue to be problematic and comparative data become fewer (Trindade, 2008). The gap between what the technology companies and professionals in this area strive for and effective practices continues to be big, and the concerns with identifying success factors of these interventions are constantly referred. In this way, this research under the perspective of the Normalization Process Theory (NPT) intends to contribute with this study through further developing the understanding of the role that these two particular instances – literacy and involvement through persuasion –mare successful in the intervention in e-Health and the motivation of patients and professionals for the adoption of these innovations.

Certainly the technological resources, such as the applications, will facilitate the self-management of the health and disease, being able to help increase the patients' communication capabilities, allowing that they make more correct choices, besides making them more participative and active in their treatment. The chain reaction this might generate is also highlighted, influencing other patients (Araújo, 2007).

Considered the aforementioned and the complexity of intervention in health, the objective of this research was to evaluate the efficiency of an application from multiple aspects: the understanding and the level of diabetic patients' literacy, and the perspective of healthcare professionals related to the

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treatment of people with diabetes in the SUS Unified Public Health System under the Normalization Process Theory - NPT. As the secondary objective, the persuasive capacities of the messages of the patients was verified.

The research conducted in Brazil was part of a multicentric study performed in other countries: in Portugal by Universidade Lusófona, and in the United States by the University of Texas. The Universidade Lusófona de Humanidades e Tecnologias (ULHT) provided the materials and the application developed in previous projects free of charge. The resulting studies of this research were:

- Between 2015 and 2018: "Improving Prenatal Health Communication: Engaging Men Via e-Health" by Michael Mackert and colleagues (UT Austin, 2016); Manuel José Damásio (Lusophone University of Humanities and Technologies), funded by COLab UT Austin.
- Between 2011 and 2017: UTA-Est/MAI/0012/2009 - "iDTV-SAÚDE: Inclusive health promotion services via digital means" (project financed by FCT under the collaboration program between the University of Texas at Austin and the Portuguese State).

The speeches were translated into the Brazilian linguistic and cultural context. There was also adaptation for the Brazilian digital television system and the inclusion of videos with subtitles. The application, named "Somos Saúde," is an adaptation for digital TV and Smartphones that provides varied information (nutrition, exercise, tips, technical information, etc.) about diabetes, and also allows the logging of glycemic levels, displaying them in a graph, enabling the user to find places and contacts related to healthcare in their area of residence, and provides technical information about the application.

2 NORMALIZATION PROCESS THEORY (NPT)

NPT is an applied theoretical model developed from a series of qualitative researches about healthcare services to treat the question of relevance to the service users. It provides a structure to comprehend how and if complex

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interventions may become routine and incorporated in healthcare practices, therefore becoming the norm. Besides, it offers a conceptual framework about implementation processes which derives from empirical generalizations developed in implementation studies and integration processes, instead of being derived from possibly useful constructions incorporated in other theories (May et al., 2009; MacFarlane & O'Reilly-de Brún, 2011).

It is a package of sociological tools which may be used to implement, incorporate and integrate a new technology or complex intervention in order to analyze the models and impacts of the alterations stemming from complex technological interventions in the healthcare services. This means that NPT translates formal theory in something that may be used in practice. (MacFarlane & O'Reilly-de Brún, 2011).

NPT was developed between 2000 and 2009 with procedures which conduced to a set of propositions that were capable of justifying the conception of a theory. In this way, NPT is an ensemble of sociological tools that can be used to understand and explain the social processes through which these new or transformed thinking practices articulate with operational work organization in healthcare. (May et al., 2009).

The health intervention is capable of improving professional practices both in individual and organizational practices. NPT incentivizes research through complex intervention trials and projected clinical tests to be used in future studies, or even modify the intervention to support more interactions. (Murray et al., 2010).

It is a useful structure for compressing processes that affect the implementation, incorporation and integration of new technologies in the healthcare system. It may be a primary way to achieve the goal of informing service decisions, how to act, how to broaden the program in the community, even providing insights which would lead to the normalization of the program (McEvoy et al., 2014).

Understanding and evaluating the conditions in which the complex interventions may be introduced and normalized in healthcare is important because the model of this process, which uses trials and other evaluations for

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such interventions, offers a way of conceptualizing complex interventions in practice oriented by a theory inside a qualitative assessment through a primary experiment (May, 2006).

To comprehend the practice, it is also necessary to observe and understand how people work. Innovations spread through their internalization and their relationships to individual actions, intention and behavioral results, making them learning theories and a collective and individual experience. This becomes especially important to solve the gaps in clinical practices, even when the professionals involved are in favor of the tools' implementation (May et al., 2009).

Thus, the NPT theory posits that:

- To accept a practice, it is necessary that it is routinely applied in a social group, both individually and collectively.
- The job of adopting a practice may be promoted or inhibited through generative mechanisms, such as collective action.
- The production and reproduction of practices demand continuous investment.

Morrison and Mair (2011) cite the Normalization Process Theory (NPT), described as a concern with the social organization of work (implementation) of practicing routine element on the day-to-day (incorporation) and sustaining practices embedded in their social contexts (integration). The NPT originated in the Normalization Process Model (NPM) King, Richards and Golden (2007), which proposes that complex interventions be implemented through a process in which the collective action and interaction between patients, professionals and others are directed by fours constructs: interactional workability (ways through with which a media resource helps or hinders a worker in the practice of different aspects of their job); relation integration (trust in the workers about the resource's safety); array of workers' abilities (how the workload and education requisites affected); contextual integrity (questions of resources location, infrastructure and politics).

This served as a way to extend the model for a new medium-range NPT,

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exploring hew coherence domains, in a complex intervention, which maintains itself united and cohesive, inside cognitive participation (work involvement and legitimation of a complex) and reflexive monitoring (the work of comprehension and evaluation of a complex practice intervention) The collective action must be understood as just one of four constructs or types of work that can be categorized when it is considered the intervention of their assessment and implementation Doctors, researchers and managers may be capable of describing and judging this intervention in such ways as to enable improvements and developments before its execution, indicating possible interventions, making it a routine practice. (Morrison and Mair, 2011).

2.1 LITERACY AND PERSUASION

Considering this, it is important to connect NPT to literacy, especially in health and media, besides persuasion. According to Martín-Barbero (2015), contrary to functionalist theory, the focus is not on measuring the distance between the messages and their effects, but to construct a full analysis of consumption, understood as the joining of social processes and product appropriation.

Literacy is a relatively new in the health communication system. Literacy is associated to alphabetization, therefore, not only the capacity to receive and interpret messages, but to act on their understanding. In Brazil, this subject still is not addressed and a more interest arose after the implementation of a National Healthcare Promotion Politics in 2006 (Peres et al., 2017). Thus, healthcare literacy may be defined as "the degree in which individuals are capable of obtaining, processing and understanding information and necessary services to make adequate healthcare decisions for primary care." (Manganello, 2008, p. 840) (Ad Hoc Committee on Health Literacy, 1999; Nielsen-Bohlman; Panzer; Kindig, 2004). This is directly related to the audiences' capabilities regarding reception and effects of the messages under new perspectives. In this regard, Martín-Barbero (1995) says that the reception cannot be treated as a stage in the

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communication process, but must be understood as a new place, from where we have to rethink communication studies.

Even the denomination of receiver is still seen as a device to capture messages, resulting in an audience subjected to two aspects: conditioning, in a cause and effect relation, emphasizing studies referring to answers to violent contents in the media; and modeling, which has model observation learning process as a principle (McQuail, 2000; Nightingale, 1999).

Thanks to the advent of communication technology, people also need to understand about literacy associated to different means of communication. Potter (2021, p. 25) defines media literacy as the "ensemble of perspectives actively used to be exposed through means of communication, as to interpret the meaning of the found messages".

Persuading is a word from Latin ("*per*", through means of, "*Suada*", Roman goddess of persuasion; *Persuadere*) which means manage a relation, speak to someone else's emotion, raising other people's awareness as to make them act like the messenger wishes through a process of strategic communication. People often try to convince each other to assume a certain behavior, however convincing and persuading are different terms. Both are related to the concept of argumentation, but convincing is to demonstrate, prove to other people that something is still correct in the plane of reason (Abreu, 2005).

According to Tonani and Carvalho (2008), persuading is leading someone to be persuaded or conviction, believing, advising, admitting as true, accepting the information.

Corcoran (2013) relates it to marketing and brings the communication/ persuasion model, in which external and internal factors and their dynamics are verified in relation to the behavior and response to the messages are verified. In this theory, the following inputs are important: resources, message, channel, receiver, destination/ objectives; and the following outputs: exposure to the message, attention, liking, compression, cognition, skill development, accordance to the message, memorization of the message, memory of the message when necessary, decision, action, post-action, convincing other people.

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Martín-Barbero (2015) contextualizes the reception question through Latin American technology: saying yes or no to technologies is to say yes or no to development, because the questions shift the technology problems to the means of production they imply, their means of access, acquisition and employment. Martín-Barbero (1995) also says that studying reception implies understanding mediation processes between the system necessities (industrial and commercial strategies, in this case, of the healthcare system) and the demands coming from the cultural fabric and ways of seeing.

3 MATERIALS AND METHODS

In essence, this research was a study with objectives of an exploratory nature with a component of descriptive quantitative and other descriptive qualitative with the aim of obtaining some cause to the research parameters. In a broad and overall context of the study, it may be evaluated as an experimental or causal study (Creswell; Creswell, 2017). The investigation design was adopted in multiple stages, which began in a quantitative descriptive stage, to verify literacy parameters, followed by a second qualitative descriptive exploratory stage, and a third qualitative and quantitative causal comparative stage (Smartphone and digital TV – 9 components of each group, a total of 18 interviewed people). Each interviewed person used the application for about a month on average to answer the last stage of the research.

The research sample was convenient (NOVELLI, 2006) and Mattar, Oliveira and Motta (2014) classify this type of sample only as intentional sample (or by judgement), because there was a selection of people and profiles that answered to a research strategy. Part of the 18 patients (all of them over 18 years old) participating were nominated by the SUS and part participated after an invitation by the researcher through the Association Facebook page. Another part was nominated by the researcher's acquaintances after the solicitation through posts in the Facebook profile. The Municipal Office also nominated some patients, but due to access to the necessary technology for the application test,

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or even cognitive limitation, only one nomination was accepted. The initial intention was to interview the users of the public healthcare sector.

The tools used in the quantitative stage were the *Diabetes Knowledge Scale* (DKN-A) and the *Newest Vital Sign* (NVS) – Portuguese version – (IDTV Health, 2013, with some adaptations for Brazilian Portuguese). The literacy related to means of communication was also evaluated, a script was used for the questions for the focus group and in depth interviews used in Portugal.

The study realized in Brazil was part of a multicentric research made in other countries: in Portugal by the Lusophone University, and in the United States by the University of Texas. The Lusophone University of Humanities and Technologies (Universidade Lusófona de Humanidades e Tecnologias – ULHT) was responsible by the assignment of material and application already developed in previous projects and made available with no cost.

The studies resulting of this research were:

a) Between 2015 and 2018: Improving Prenatal Health Communication: Engaging Men Via e-Health. Michael Mackert and colleagues (UT Austin, 2016); Manuel José Damásio (Lusophone University of Humanities and Technologies). Funding COLab Ut Austin.

b) Between 2011 and 2017: UTA-Est/MAY/0012/2009 - "iDTV-HEALTH: Services included in the promotion of health and well-being through digital means" (project financed by FCT in the scope of the collaboration program between the University of Texas and the Portuguese State).

The text was translated to the Brazilian linguistic and cultural context. There was also the adaptation for the Brazilian digital television system and the insertion of videos with subtitles. The application, called "We are Health" ("Somos Saúde), consists in the adaptation of the application for digital TV and *Smartphone*, which provides varied information (eating, exercising, tips, technical information, etc.) about diabetes, and also allows the registration of glycemic levels, presenting them in a graphic, allowing the user to find places and contacts related to healthcare in their residential area and provides technical information

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about the application. The application was made with the projected text for improving knowledge, self-efficiency, and ensuing disease management and glycemic monitoring, control and access of content related to the maintenance of various rates, as well as recipes, interviews and tips. One of the application screens can be seen in Figure 1.

Besides the seven healthcare professionals from the researched Unified Public Health System (dentists and nurses) that work with people with diabetes, an interview script was used. Due to the difficulty of gathering all the healthcare professionals in the same place, in the following stage after the evaluation of the applications, an in depth interview was chosen.

Everybody tested their application and contents in Smartphones or digital TVs. The research was written in the Brazil Platform (Plataforma Brasil) for the authorization for the application, obtaining the number of Presentation and Ethical Appreciation (Certificado de Apresentação de Apreciação Ética (CAAE) 53352915.3.0000.5137. The patients were classified by socioeconomic class according to the Brazilian Criteria (Critério Brasil), provided by the Brazilian Association of Research Companies (Critério Brasil fornecido pela Associação Brasileira de Empresas de Pesquisa- ABEP). The study started in April 2016 and finalized in July 2017 in the city Poços de Caldas, which is situated in the South of Minas Gerais, Brazil, and has over 169 thousand inhabitants and a Municipal Human Development Index (IDH-M) of 0.779 (2010), being considered one of the best in the State (IBGE, 2022)

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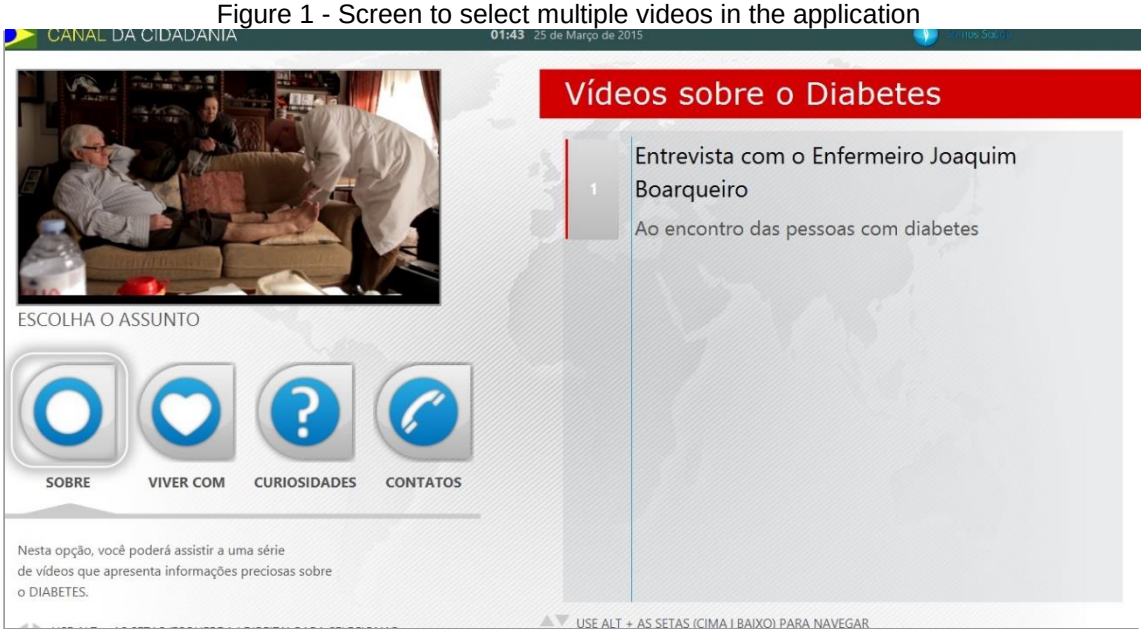
Figure 1 - Screen to select multiple videos in the application



Source: *print screen* of the application on the Windows 10 operational system.

3.1 STATISTICAL AND QUALITATIVE METHODOLOGY

The reliability validation test and coding was made for the analysis of the NVivo 11, besides content analysis.

For most quantitative part was used, Pearson Qui-squared test, or Fisher exact test, in the presence of expected numbers lower than 5. To compare the numeric variables between 2 groups, the Mann-Whitney test was used, and, between 3 groups, the Kurskal-Wallis test was used, due to the absence of normal distribution of the variables.

The analysis of variance for repeated measures (*ANOVA*) was used, followed by the Tukey post-hoc test, with the variables transformed in ranks due to the absence of normal distribution. The significance level adopted for the statistical tests was 5%. The Kappa and Krippendorff rates were used, where 0.6 is considered a substantial confidence. The result was over 0.94.

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4 RESULTS AND DISCUSSION

The items raised by the research show a clear dimension of what must be considered during a personal communication between a healthcare professional and their patients: first, it is important to verify the patient's emotional state. Next, observe in what stage is patient's disease, so the construction of more effective messages can be formulated and confirm the reactance levels (there is a possibility of refraction in relation to the message's reception in the persuasive process). From these elements, it is then verified the resources, or even the patient's stage, for the creation of more persuasive messages that would convince and provoke slow changes in small steps, with the aim of acting in the patient's literacy level, turning it into a base for a more effective message reception, improving the self-management. In this perspective, the importance of understanding that there are groups with different knowledge and literacy levels was detected, and it would be imperative to talk to beginner groups and with those already used to living with diabetes, as the significance of the respective support such as were detected in the measurement of the following rates:

Chart1 - Literacy comparative

Group	Initial literacy	Final literacy	Variation tendencies
Smartphone	3.17 8.44	3.67 8.33	NVS ↑ DKN ↓
Digital TV	3.77 9.11	4.33 9.44	NVS ↑ DKN ↑

Source: data collected by the researcher

In the NPT perspective, the picture that was obtained by the researched groups was completed by the group of healthcare professionals with relevant suggestions so that the messages are more persuasive and effective, as well as making the application a good support: fractionate the histories, putting the glycemic levels in the TV application, as well as dubbing it for Brazilian Portuguese, considering the people that have access to public healthcare. From the interactional workability point of view, the application would help in areas such as prevention, as well as in the contact with possible professionals that would be

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located for communication together with the patients through the application, and by means of registering the glycemic measurements and rates for the relation with healthcare professionals in different areas. However, the application, in the various supports, allows different connections due to their intrinsic distinctions of public and usability. It would be an important media resource, although there would be nuances of use due to the supports and targeted public. It was never considered that the innovation might make the processes of relationship with the patients more difficult. The professionals only punctuated the influence of age in relation to the supports as possible obstacles to the persuasive process – the younger audience prefers Smartphone and the older, digital TV. Through the relation integration, the professionals were confident to the point of asking for the application and, specially, the videos, so they could show their patients, because, according to them, the content has the persuasive ability to help in the prevention and adoption of better habits and living with the disease. They felt safe in relation to the resources and content available, although they requested adjustments.

Besides the security, the group of workability abilities did not have any negative aspect. The application was not seen in any moment as something that would represent a burden in everyday work of the professionals, or even the patients. Conversely, it represents a new level of relation to the knowledge of some professionals, which highlighted the efficiency and efficacy of the messages' persuasion abilities. In relation to the formation, maintenance, and doubts regarding the information, besides their own basic education, when the professionals have common and punctual questions, they usually consult the indications and materials from the Ministry of Health - both printed and online. This behavior certainly can be used for the creation of a version of the application for healthcare professionals. About the application in Smart TV, or at least part of the content (the videos, in this case), it characterizes something important in the totalization of the information that may be available in the patients' reception environment, considering that the Brazilian Ministry of Health allocates Smart TVs for the waiting rooms as a form of support of comfort and entertainment, besides all the promotion, and already established politics, for chronic non-communicable

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diseases. Therefore, there is the technical resource, the infrastructure and even the governmental politics assumes a connection with TV channels about health (there is also the channel Saúde no Brazil [Health in Brazil], which may show the available contents).

It is possible to say that the application, in the general evaluation after the research, finds itself in a conceptual start point as presumed by NPT, allowing other derived practices, as appointed by suggestions and possible uses detected in the research. And about the possible daily effectiveness and use by the patients there is, in this final considerations, notes about what may happen. In relation to the premises of NPT, the professionals believe in the importance of the application and, thus, it is believed that it may become a routine practice, as the disease's own needs, impacting the patients' lives.

In the NPT precepts and contextual integration, no question that might be a problem in the implementation of the application to the public system and the national politics was reported. On the contrary, the patients themselves complimented the Unified Public Health System (SUS), and the professionals available in the public system. The only issue pointed out by the professionals is related to the lack of advertisement campaigns, beside the difficulties some patient profiles might have regarding technology, such as the elderly (people over 60 years old) and people with low level of education, who could not participate in the research.

Overall, the application contributed to the communication that has been lacking to help the work of the professionals through the conveniences the technology proposes. Regarding the abilities and workability, the professionals would be important in the marking of information and maintenance base for the dialogue through the application and the persuasive power of the messages. In this case, the patients themselves understand the identity of the professionals and their relevance in the short and long term treatment, and the application must have them as a source of consultation, news and interaction. In this same item, the relation integration is made evident through the role of the professionals, as is the interactional workability, in which the patient already defined the roles of

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the actors in behavior formation and self-management. Thus, there is the possibility of self-management with the application and its improvements, but it would be better if there was e-health moderation and support (through electronic means) by the professionals.

Concerning the persuasion, under the NPT perspective, it is important to reaffirm that the support and approval of healthcare professionals will help in the credibility for the persuasion and effectiveness of the message and use of the application. The interviewed diabetes patients openly declared their trust and belief in information coming from professionals. As detected, the professionals are essential in the directing and administration of self-management, as instructors and sources of information, and, consequently, important persuasion elements of the messages. In the context involving professionals and patients, the application and its contents may increase and assist the information reception, as well as how to make them more effective in persuading, specially if there is a direct contact application with direct contact with a professional that moderates a possible social network suggested by the patient. In any case, the presence of a healthcare professional in the various application content also helps the question of persuasion, reception and literacy improvement.

Regarding the professionals, it is suggested that the messages, in some moments, may be more aggressive, negative, so the patients feel "shaken". For the patients, on the other hand, "aggressive" information is seen as negative for the convincing and are rejected. On this perspective, statements of this nature, according to the prospect theory, may be used to awaken the perception in relation to treatment methods and care at the moment the disease is discovered. Overall, from the persuasion point of view, NPT and literacy, there will be an increase in the literacy in an environment more conductible to the message reception and the use of an application to serve as support for the treatments adopted indicated by the professionals. And, there being a favorable intervention in a health context, the messages are also more persuasive, because the professionals' approval of the system will serve as support for a more effective persuasion in an even more conductive way. The research showed a reasonable

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level of technological engagement between the groups that tested two support and convenience in the use of the e-Health application, besides the consulted professionals' compliments. In the NPT perspective, the application would have adherence stemming from the suggested adjustment to become closer to the reality of what would be necessary in all the areas of use, improving the disease's self-management. The mobility and information through the application were very complimented and considered important, besides the possibility of being suggested to other diabetes patients by the research participants. It was noticed that the transformation of known information in an e-Health instrument changed the perception of what was already understood and generated an appreciation of the contents, considered how the importance of the knowledge and valuable information are received.

The communication intervention in health emphasize the information control may offer the users a better support satisfaction, allowing a better learning. This satisfaction was verified with one of the application's functionality, which was the control of glycemic gate, which was solicited as a development and registering comparisons, besides the possibility of the application be established as e-health and be connected to healthcare professionals. The motivation, which may be critical in the literacy development, in the everyday use of the application has not been so elevated with the patients, but, as was said before, if some of the features would be added and improved, the motivation would be better with the possibility of there being an improvement of literacy and, as a consequent, of the self-management in the environment verified by the NPT.

The use of the application is motivated in both groups of the tested patients, but there was a higher score in the Smart TV, as well as higher literacy rates, which shows a more direct involvement related to the information in this support. The adoption of technology in healthcare will be a big step to a virtuous cycle of advances for the people who would bring more contributions and improvements for the applications. As the literacy levels are increased by the education, the content available in the applications (e-health) will certainly help due to the availability, the possibility of repetition and access to information to

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develop the levels of literacy and self-management, keeping in mind the complex nature of the intervention and the results will certainly be achieved step by step over time.

5 CONCLUDING REMARKS

In relation to the main objective of this study, it was possible to verify the efficiency of the message reception through an application, from the point of view of persuasion theories, NPT and literacy. Specially under the NPT perspective, it is possible to understand the interrelation and interdependence between the patients and healthcare professionals in the context of digital connection to the patients. They will continue to be important in the mediation of information, treatments, and in the development of message comprehension, and the application may have a channel to connect to those professionals. In the professionals' perspective, the availability to work with the application, and the necessary supports to this intervention were possible to observe as relevant to the success, and they will interfere in the mediation and persuasion together with the patients.

The professionals participating in the research stated that the tool will be welcome to be implemented and used. Aspects concerning the patients' oral health also have to be considered according to the people interviewed, along with adjustments in the discourse to the stage of the disease of each patient. Each phase will entail a predisposition to a literacy and comprehension level of the messages, implying the use of determined persuasive resources, as well as the determination of patients' access to certain information levels.

Considering the complexity of intervention on professional practices, such as informational support and disease control (recording the measurements), under the NPT perspective, there were no questions about the safety of the resource or the collected information, which were evaluated as trustworthy. In the evaluation made by the professionals, there were no negative aspects regarding the adoption of the tools in their practices, workloads, and education.

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Still considering this perspective, concerning the resources, infrastructure and policies, the applications would be welcome, because there will be, on the part of the Government, the channel Saúde, and in the health clinics there are TVs that will show the produced content. Therefore, the aspects of interactional workability, relation and contextual integration will not have specific problems and this type of application would be an intervention that may become a routine practice. Besides the contextual and political questions, the only difficulty pointed out is the age of some patients (specially the elderly – over 60 years old – in the case of type 2 diabetes) and the lack of access to Smartphones and digital TV by some of the patients.

The access, the acquisition, and employment of this type of application in this complex context will go through a cultural background, which, in turn, is able to adopt this feature. Therefore, in interventions of complex characters, persuasive techniques are not enough, well-constructed messages sent to their target audiences are also necessary. It is possible to understand the logic behind these connections, mediations, reception and interconnection possibilities set by NPT to allow an actual behavioral modification and/or improvement, and an innovation in the intake of information about diabetes, which will be incorporated and assimilated to a better self-care.

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