



Health management and user protection: an analysis of gamification elements in applications for pregnant women

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ABSTRACT. The objective of the present study is to analyze applications classified in the health category and to identify how they manipulate the evaluation, prescription and management of the physical activity of the users. The exponential growth of interactive technologies brings a differentiated look when the use of services present in mobile devices installed in smartphones as software for the most diverse activities. The health area has been presenting as a promising sector. This is a descriptive research with a qualitative approach using case study method. The considerations point to the difficulty in evaluating the applications directed to the management of physical activities mainly regarding the evaluation of users. There is also a gap regarding the legal authorization of the profession in the case of the physical educator. Another point raised here is about shared responsibility theme linked to the understanding of user protection that use these types of services.

Keywords: user; health; applications; physical activities.

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Introduction

There is an exponential growth in the use of mobile devices around the world. It is believed that interactive technology features, its connections and communications through electronic devices such as mobile phones, notebooks and tablets, among others, or computers connected to the Internet bring many benefits and potential to facilitate access to information and organize processes activities by individuals on day by day. The applications have been gaining several inclusive spaces in the health area.

There are infinities of health-related smartphone apps. Proven study for more advanced applications go beyond content analysis or user satisfaction, which is usually presented on a scale of 1 to 5 and represented by stars (BinDhim, Hawkey, & Trevena, 2015). Other information also needs to be understood, especially when linked to health management.

The utilization of technologies for health monitoring is one of the practices of the World Health Organization. eHealth (mobile health) or the term used in mobile health or simply mHealth, such as various services, voice and short messages, patient monitoring, manipulation of data from other devices through mobile technologies (World Health Organization [WHO], 2011). Many search have presented utilization of platforms digital as a potential for the treatment of certain diseases, by these technologies has a power of penetration between the populations (Ben-Zeev, Davis, Kaiser, Krzsos, & Drake, 2013).

There are today thousands of apps available that have a number of indicators and are classified like fitness in Apple store and Play Store platforms being second that popular in the market. Many users select applications according to perceived design quality and facility of use. Scientific researchers are focused on analyzing aspects of usability or functionality of these applications, proving the need for further research (Bardus, Beurden, Smith, & Abraham, 2016).

Women can use many of these applications during pregnancy. The gestation period is a very special and unique moment in their lives. It's linked to dreams and achievements. This moment is accompanied by many transformations and physiological, psychological, biochemical and anatomical changes (Carvalho, Rocha, & Costa, 2019; Zugaib, 2012). The practice of exercises in this period are used as prevention and maintenance strategies for sludge (Baldo et al., 2020). The number of applications available for smartphones

in the health-related category are diverse. This trend of growth makes clear the difficulty for users and health professionals to identify and evaluate the quality and services available (Tibes, Dias, & Zem-Mascarenhas, 2014; Stoyanov et al., 2015).

Most of the processes in these applications are registered and non-patented. This study seeks to show that the patenting of these processes is the way to present a protection to the user. Since service availability and utilization provides a 'shared responsibility' between the parties involved (develop/inventor and user). Shared responsibility presents as a concept that discusses that both the developer/inventor and the user share responsibilities in the utilization of processes (Lei n. 9.609, 1998; Lei n. 8.078, 1990; Nunes, 2017).

This article presents as a scientific problem that the applications can 'promise' prescription / management in the health area? Therefore, this study aims to analyze applications classified in the health category and identify how they handle the assessment, prescription and management of physical activity for women in pregnancy. This investigation becomes important for the development of a vision of care when the protection of users who make use of this service through applications that have background processes of the gamification type.

Material and methods

This is a descriptive research with qualitative approach (Chizzotti, 2003), for searching a direct valuation of the understanding of the situation studied, using a case study method, since it seeks to carry out a detailed analysis of a situation (Ventura, 2007).

The research was divided into 3 steps. The first was performed a search on the platform of the Play Store, used the word 'exercises for pregnant women'. Given the amount of applications present in the platform were defined as inclusion criteria, rated apps by users with grades ranging from 4 to 5 stars. A sample of 10 applications were chosen with 5 paid applications and 5 free applications. The second step was to define the exclusion criteria. Were excluded the applications: (1) received user ratings below 4, (2) applications that didn't present goals related to pregnant women. The included applications had the data organized into a spreadsheet highlighting their classification, category, classification, description, and information. This organization allowed for better visualization of datas. The sample selection process of the applications for analysis can be seen in summary form in Figure 1.

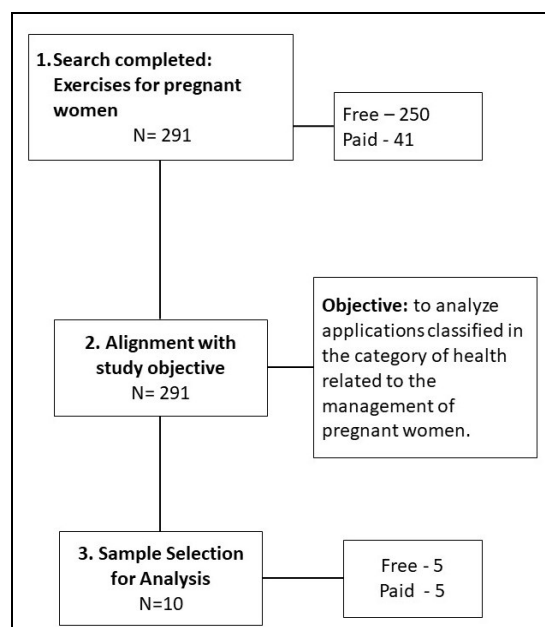


Figure 1. Steps for sample selection.

Ultimately, all content: texts, images and videos of the application were analyzed in a particular of the goal of the application proposal, that is, what problem is it trying to solve? The information available to users, and the description is about the security and protection to the user, it was also analyzed the existence of gamification elements used to change the behavior of users.

Results and discussion

During the pregnancy the woman undergoes several transformations. These modifications are both hormonal, musculoskeletal, cardiovascular, respiratory and psychological changes. It is well known that eating and exercising is important for every phase of life. Besides the basic activities like walking, sitting, climbing, descending, running among others, the practice of exercises is important, because it presents improve the health of individuals. Thus, the realization of exercise beyond the limits established and without professional support may present risks (Castro, Ribeiro, Lima Cordeiro, Lima Cordeiro, & Alves, 2009).

In a structural analysis it is generally perceived that the selected sample of applications seek to solve the practice of exercise and care with food and information for pregnant women. The applications present a kind of persuasive communication seeking to change behavior (Spahn, 2012). Around 50% of the analyzed applications are focused on the practice of exercises, or others are directed to the field of nutrition and the transfer of information necessary for women in this period.

Mobility is the main functionality present in smartphones. As well as a pocket computer, they are available to accompany your user 24 hours a day wherever he is. The processes present in mobile devices are increasingly common, empowering services that causes the user to become more involved with aspects related to their own health (Tibes et al., 2014).

There is a plethora of applications associated with health care in addition to fitness and diet (Krebs & Duncan, 2015), for these authors the category covers other applications such as prevention, lifestyle, self-diagnosis, provider directories, diagnosis, education, prescription and treatment compliance. This field is growing, with several limitations both in the sophistication of the applications themselves and in the knowledge of the consumer profiles. "Most health applications were not designed with information from health professionals and behavior change", the authors Krebs and Duncan (2015:2). It is understood the importance of information so that the user can use the services in the best way possible.

The applications that can be used to promote wellness and physical, psychological and emotional growth. These possible actions for transferring data and information. On the other hand, there is an inherent challenge to the privacy, storage and monitoring of this information. An example of this is the notification actions that is used to pass information to users. Notifications can never ask for personal information like: age, phone number, email addresses, logins, passwords. Data such as these can put a user's privacy at risk. (Jones & Moffitt, 2016).

To analyze the variables present in the objective of the article considered for user protection, namely: evaluation, prescription and management of users' physical activity. A summary frame containing the main information extracted from the applications was presented, as shown in Figure 2.

Analyzed variables	Applications paid	Free applications
Evaluation	Both, paid as well as free applications you can not identify, worry about evaluating physical activities offered in the application interface. Approximately 2% of applications warn users about the care of some symptoms and the need to see a doctor.	
Prescription	In this modality of applications, the prescription is carried out with basic information about the exercise process. Guidance when the executions of the exercises are done through videos and illustration. Features better the importance of performing exercises. The applications also presented care and time for exercises.	In the free apps the basic information about the exercises. Demands are more informative as to the functionality of the application than the execution of the exercises. Did not present information regarding the care that users present the performance of the exercises, as well, do not present information on duration, time for activities.
Management	It is presented more systematically using visual content, creation and profile. Routine creation, progression level monitoring, weekly and monthly exercise time and nutrition information.	There is a greater amount of information more focused on user education issues regarding exercise. The applications do not make clear how much the management, accompaniment and the evolution of the exercises.

Figure 2. Summary of variables present in app descriptions.

The importance of the evaluation of physical activity follows in the same direction to the practice of physical activity. For this evaluation to occur, it is necessary to use accurate and adequate instruments to

measure and assess the level of activity. Accomplish an assessment of physical activity, it is necessary to take into account the frequency, intensity and duration, as well as the type of the modality or activity performed. Thus, it should be understood that the measuring instrument could evaluate an aspect and leave others on the individual from outside, mainly data such as the intensity of physical activity. Another important point is also in relation to the age group, for each age the method of meditation must be different (Cafruni, Valadão, & Mello, 2012; Marques & André, 2014).

Such as is important to perform physical activity, the prescription is even more important. The appropriate prescription of physical activity contemplates variables such as duration of activity, intensity and frequency. The care regarding the prescription should always take into account, the combination between the exercises, the evolution, that is, there is a need to be gradual, its intensity and the care with fatigue (Carvalho et al., 1996).

It is possible to realize that the services made available through an application, becomes a powerful tool to access information about users and any type of data trail left by them. The management part deals with the act of managing, that is, organizing, planning and carrying out activities that facilitate the work process, it is presented here as an action that requires care not only with the security of users' information, but also with its physical and moral integrity (Campos, 2004; Bittar, 2017).

In the analysis it is possible to see how much the technical issues, that is, the availability of the services offered by the applications can be analyzed through technical aspects such as innovation, design, usability, programming language, among others. The aspects of processes that include the proposal to enhance human activity, adapt to the subject's particularity, his experiences, cognition, emotional state and health are not clear in the applications, whether paid or free. Opening a gap with regard to the protection of users who use this type of service.

The concept of shared responsibility helps new people understand relationships between users and integrated systems as processes present in applications. Thus, we understand that both the inventor and the user share development and use responsibilities. The problem is that these services, in many cases, are registered and not patented (Moraes, 2003; Bittar, 2017). This study understands that patenting the processes present in these types of services has the ability to extend protection not only for the inventor, but also for the user, in case he suffers any physical or moral damage (Silva, Rapini, Fernandes, & Verona, 2000; Monte, De-Bortoli, & Lucena, 2018).

Thinking about shared responsibility in devices that promote when modifying human behavior is thinking about taking care of the user. Thus, this study highlights the current need to monitor professionals in the area (technical, legal and health) involved in the development of this type of innovation. In the applications analyzed, only one had the presence of a professional Get BODIED by J - Health & Fitness, signed by the professional instructor Jenelle Butler (information available in the application).

Absence of legal authorization was another point observed in the analysis of application data, this term used to frame individuals who aren't authorized to exercise a certain profession for which they are not competent (Vaz, 2011). In some professions, such as psychologists, physiotherapists or physical educators, even if the individual has a mandatory title (bachelor's degree), they must be duly registered with the Federal Council, and with the Regional Councils (Fabiani, 2009; Conselho Federal de Educação Física [CONFEF], 2010), so as not to answer legally for absence legal authorization.

According CONFEF (2010), expressed in chapter II describing the field and activity of the professional of the physical educator:

[...] coordinate, plan, schedule, prescribe, supervise, direct, organize, guide, teach, administer, implement, analyze, evaluate and execute works, programs, plans and projects, as well as provide audit services, consulting and assistance, drawing of specialized training, attendance of multidisciplinary and interdisciplinary and informative, scientific and pedagogical teams, activities in the areas of physical, sports and similar activities.

The description presented by the CONFEF (2010), stay clear, at least in Brazil that physical education professionals are responsible for processes related to activities involving the health of the body. Thus, there is a need for a more detailed assessment of the security of the prescriptions of such applications, as well as of the responsibility towards the protection of the user, since, most of these applications are developed by professionals who are in the area of physical education (Bardus et al., 2016).

The exchange of information and communication provided by mobile technologies linked to health has been gaining more and more prominence. These devices provide accessible solutions for almost all possible requirements related to this field. Research shows estimates that more than 3,000,000 free downloads and 300,000 paid downloads are made from mobile health applications only in the EUA (Yasini, & Marchand, 2015).

The risks presented in the development of these applications are that they are built from the process of which demand the search engagement, possess persuasive language, thus seeking a change of behavior and the attitude of its users (Spahn, 2012). That is, projected technology that has the goal of guiding the user to change behavior (Hamari, Koivisto, & Pakkanen, 2014).

Final considerations

Every day channels are created and allow people to establish health communication processes with their doctors, caregivers or any other type of health professional. These services have clear, objective languages and serve mostly as 'health management'. The analysis of selectees sample health applications specifically related to physical activity management for women presented some important points.

The mobile application development for healthcare services is on the rise. With the analysis, it is possible to perceive the architecture of the information of the applications some tendencies have been identified as always a communication directed to the defined public, feedback through notifications and efforts of the resources in the search for change of behavior.

Although there is a policy for developers to make the applications available on the platforms (Apple store and Play Store) there are no formal guidelines that address professional complications regarding shared responsibility and lack of legal authorization for these types of services. Therefore, this study shows that one way to protect users is the patentability of the process.

The analyzed variables regarding the evaluation of the exercises, prescription and management present that there is a concern for the users. Evident considerations include issues related to (a) the importance that the assessment must have for each individual, taking into account their characteristics; (b) care of user information; (c) need to present a responsible professional to prescribe the exercises; and (d) guidance and care for users in case any problems happen.

Brazil is one of the main countries that has a tendency to use services available by smartphone. Recent research shows that the number of handsets already exceeds the number of inhabitants. The use of applications is virtually inevitable will continue to grow within the field. Based on this information, it is evidenced the contribution of this research to issues related to the protection of users and the care that services and processes accessed and used of mobile applications.

References

- Baldo, L. O., Ribeiro, P. R. Q., Macedo, A. G., Andrade Lopes, C., Moraes Rocha, R. A., & Oliveira, D. M. (2020). Gestação e exercício físico: recomendações, cuidados e prescrição. *Itinerarius Reflectionis*, 16(3), 1-23. doi: 10.5216/ir.v16i3.62357
- Bardus, M., Beurden, S. B. van, Smith, J. R., & Abraham, C. (2016). A review and content analysis of engagement, functionality, aesthetics, information quality, and change techniques in the most popular commercial apps for weight management. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1), 35. doi: 10.1186/s12966-016-0359-9
- Ben-Zeev, D., Davis, K. E., Kaiser, S., Krzsos, I., & Drake, R. E. (2013). Mobile technologies among people with serious mental illness: opportunities for future services. *Administration and Policy in Mental Health and Mental Health Services Research*, 40(4), 340-343. doi: 10.1007/s10488-012-0424-x
- BinDhim, N. F., Hawkey, A., & Trevena, L. (2015). A systematic review of quality assessment methods for smartphone health apps. *Telemedicine and e-Health*, 21(2), 97-104. doi: 10.1089/tmj.2014.0088
- Bittar, C. A. (2017). *Reparação civil por danos morais*. São Paulo, SP: Saraiva.
- Cafruni, C. B., Valadão, R. D. C. D., & Mello, E. D. D. (2012). Como avaliar a atividade física? *Revista Brasileira de Ciências da Saúde*, 10(33), 61-71. doi: 10.13037/rbcs.vol10n33.1555
- Campos, V. F. (2004). *Gerenciamento da rotina do trabalho do dia-a-dia*. Belo Horizonte, MG: INDG Tecnologia e Serviços.
- Carvalho, J. M. F. R., Rocha, J. R. D. C., & Costa, J. B. B. (2019). Gestação e exercícios físicos: qualidade de vida para a mãe e o bebê. *Diálogos em Saúde*, 2(1), 53-64.
- Carvalho, T. D., Nóbrega, A. D., Lazzoli, J. K., Magni, J. R. T., Rezende, L., Drummond, F. A., & Teixeira, J. A. C. (1996). Posição oficial da Sociedade Brasileira de Medicina do Esporte: atividade física e saúde. *Revista*

- Brasileira de Medicina do Esporte*, 2(4), 79-81. Recovered from <https://bitlybr.com/446dUOT>
- Castro, D. M. S., Ribeiro, A. M., Lima Cordeiro, L., Lima Cordeiro, L. & Alves, A. T. (2009). Exercício físico e gravidez: prescrição, benefícios e contra-indicações. *Universitas: Ciências da Saúde*, 7(1), 91-101. doi: 10.5102/ucs.v7i1.737
- Chizzotti, A. (2003). A pesquisa qualitativa em ciências humanas e sociais: evolução e desafios. *Revista Portuguesa de Educação*, 16(2), 221-236.
- Conselho Federal de Educação Física [CONFEF] (2010). *Estatuto do Conselho Federal de Educação Física*. Recovered from <https://www.confef.org.br/confef/conteudo/471>
- Fabiani, M.T (2009). *O código de ética do profissional de educação física*. Recovered from <http://www.psicologia.pt/artigos/textos/A0482.pdf>
- Hamari, J., Koivisto, J., & Pakkanen, T. (2014). Do persuasive technologies persuade? A review of empirical studies. In *Proceedings of the 9th International Conference, Persuasive technology* (p. 118-136). Padua, IT: Cham.
- Jones, N., & Moffitt, M. (2016). Ethical guidelines for mobile app development within health and mental health fields. *Professional Psychology: Research and Practice*, 47(2), 155. doi: 10.1037/pro0000069
- Krebs, P., & Duncan, D. T. (2015). Health app use among US mobile phone owners: a national survey. *JMIR Mhealth and Uhealth*, 3(4), 101. doi: 10.2196/mhealth.4924
- Lei n. 8.078, de 11 de setembro de 1990 (1990). Dispõe sobre a proteção do consumidor e dá outras providências. Art. 14º, § 4º. Brasília, DF: Casa Civil, Presidência da República.
- Lei n. 9.609, de 19 de fevereiro de 1998 (1998). Dispõe sobre a proteção da propriedade intelectual de programa de computador, sua comercialização no País, e dá outras providências. Brasília, DF: Casa Civil, Presidência da República.
- Marques, A., & André, J. (2014). Avaliação da atividade física: métodos e implicações práticas. *Boletim Sociedade Portuguesa de Educação Física*, 38, 67-75.
- Monte, W. S., De-Bortoli, R., & Lucena, S. E. (2018). Protection of users: an analysis from product and process patents. *International Journal for Innovation Education and Research*, 6(8), 40-54. doi: 10.31686/ijer.vol6.iss8.1116
- Moraes, M. C. B. (2003). *Danos à pessoa humana: uma leitura civil-constitucional dos danos morais*. Rio de Janeiro, RJ: Renovar.
- Nunes, L. A. R. (2017). *Comentários ao código de defesa do consumidor*. São Paulo: Saraiva.
- Silva, L. A., Rapini, M., Fernandes, R., & Verona, A. P. (2000). Estatísticas de patentes e atividades tecnológicas em Minas Gerais. In *Anais do IX Seminário sobre a Economia Minerária*, (p. 517-539). Belo Horizonte, MG: Cedeplar, Universidade Federal de Minas Gerais.
- Spahn, A. (2012). And lead us (not) into persuasion? Persuasive technology and the ethics of communication. *Science and Engineering Ethics*, 18(4), 633-650. doi: 10.1007/s11948-011-9278-y
- Stoyanov, S. R., Hides, L., Kavanagh, D. J., Zelenko, O., Tjondronegoro, D., & Mani, M. (2015). Mobile app rating scale: a new tool for assessing the quality of health mobile apps. *JMIR Mhealth and Uhealth*, 3(1), 27. doi: 10.2196/mhealth.3422
- Tibes, C. M. D. S., Dias, J. D., & Zem-Mascarenhas, S. H. (2014). Aplicativos móveis desenvolvidos para a área da saúde no Brasil: revisão integrativa da literatura. *Revista Mineira de Enfermagem*, 18(2), 471-486. doi: 10.5935/1415-2762.20140035
- Vaz, A. F. (2011). Regulamentação da 'profissão': desejos e mal-estares. *Movimento. Revista de Educação Física da UFRGS*, 7(14), 20-27. doi: 10.22456/1982-8918.2604
- Ventura, M. M. (2007). O Estudo de caso como modalidade de pesquisa. *Rev. SOCERJ*, 20(5) 383-386. Recovered from http://sociedades.cardiol.br/socjerj/revista/2007_05/a2007_v20_n05_art10.pdf
- World Health Organization [WHO]. (2011). *mHealth: new horizons for health through mobile technologies*. *mHealth: new horizons for health through mobile technologies*. Recovered from <https://bitlybr.com/ULr9WkbI>
- Yasini, M., & Marchand, G. (2015). Mobile health applications, in the absence of an authentic regulation, does the usability score correlate with a better medical reliability? *MedInfo*. 216, 127-131. doi: 0.3233/978-1-61499-564-7-127
- Zugaib, M. (2012). *Obstetrícia* (2a ed.). Barueri, SP: Manole.