



Prototype: An application that can change the physical activity levels of children and adolescents

Protótipo: um aplicativo que pode mudar os níveis de atividade física de crianças e adolescentes

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ABSTRACT

In the challenge of making children and young people more physically active, possibilities of uniting knowledge between digital games and physical activity and, as a product, the exergames have emerged. Using this method as a possibility of behavior change, the present study aimed to present a prototype of an exergame that stimulates the increase of physical activity levels in adolescents. In order for the user to be able to use the exergame as a mobile application, it is necessary to register initially with personal and anthropometric data, establish goals by time, and then start using it. The proposal is to make the application available to schools and students for research, evaluating the influence of the exergame on the level of habitual physical activity, displacement, participation in physical education classes, motivation and interest for changing behavior of physical activity throughout the day, among other parameters. Equipping Physical Education professionals with these new healthcare tools is necessary, and they can be pedagogical for the paradigm shift on how to contribute to a healthier aging and with more quality of life.

Keywords: Computer software; Mobile applications; Public health; Physical activity.

RESUMO

No desafio de tornar crianças e jovens mais fisicamente ativas, surgem possibilidades de união de conhecimentos entre jogos digitais e atividade física e como produto os exergames. Utilizando este método como possibilidade de mudanças de comportamento, o presente estudo teve como objetivo apresentar um protótipo de exergame que estimule o aumento dos níveis de atividade física em adolescentes. Para que o usuário possa utilizar o exergame em formato de aplicativo móvel, se faz necessário fazer inscrição inicial com seus dados pessoais e antropométricos estabelecimento de objetivos por tempo para na sequência possa iniciar a utilização. A proposta é disponibilizar o aplicativo para as escolas e estudantes para realização de pesquisas, avaliando a influência do exergame sobre o nível de atividade física habitual, de deslocamento, participação nas aulas de educação física, motivação e interesse para a mudança de comportamento de atividade física durante todo o dia, entre outros parâmetros. Instrumentalizar os professores de Educação Física sobre o cuidado com a saúde, através destas novas ferramentas é necessário e podem ser pedagógicas para mudança de paradigmas sobre como contribuir para um envelhecimento mais saudável e com mais qualidade de vida.

Palavras-chave: Software; Aplicativos móveis; Saúde coletiva; Atividade física.

Introduction

Great health benefits from physical activity have been noted for individuals, even if the activity is light, moderate, or vigorous¹. These benefits also translate into improved cognitive outcomes² and motor skills³. In this same aspect, we can notice that individuals are increasingly adapting to new habits, replacing physical practices in open environments such as streets, parks, and squares, for hours sitting in front of smartphone, tablet, and computer screens, causing a consequent decrease in the level of physical activity of the population, since most electro-

nic games require a minimum of physical interaction⁴.

Health professionals have been facing constant challenges to find ways to overlap the time in minutes of physical activity per day to reach the necessary time for it to obtain satisfactory results for the health of individuals⁵⁻⁷. With a different view of digital tools, and aiming to change the scenario of physical inactivity among young people, authors such as Vaghetti and Botelho⁸; Finco & Fraga⁹, describe as a scientific nomenclature identified by “exergames”, considered as a new aspect for digital games, where young people in-

teract socially, practice physical activities, and perform challenges from this platform.

Therefore, the principle of the exergame is the union of digital games with physical exercise and the motor and sensory activities performed increase caloric expenditure and the level of daily physical activity¹⁰. As a form of entertainment and leisure, they are developed to achieve a result beyond playing, focusing on improving the health condition, showing positive results^{10,11}.

It is necessary to build new gaming platforms, resignify the view about videogames, as no longer the great villains of the increase in sedentary behavior in adolescence, but as a public health ally. For that, it is necessary to build devices for health care and prevention, and it should be used as an important strategy for school Physical Education classes and increase the levels of daily physical activity, in a pleasurable and attractive way, a healthier lifestyle with fewer risks of comorbidity¹².

Taking into consideration all the positive aspects provided by “exergames”, the present study presents a prototype of an exergame in mobile application format (cell phone, tablets), demonstrating its usefulness in changing the behavior of young people, considering the significantly decrease in the level of physical activity from childhood to adolescence. The proposal presented is constituted to encourage healthy habits through daily physical activity with care strategies of the game characters with goals and stages to be advanced, thus establishing a teaching-learning process in psychomotor, cognitive development of children, youth and adolescents.

Methods

The game prototype was built in a multiprofessional approach, between the students of the Digital Games course, and the Physical Education professional resident in the Multiprofessional Residency Program in Public Health, from the University of Extremo Sul Catarinense (UNESCO). The developers had as inspiration the care game of an avatar from the 90's, the tamagotchi and has as its primary objective the construction of the application that promotes health care through the game, stimulating the increase of daily physical activity and consequently the awareness of the importance of being physically active, changing the status quo, and promoting the incorporation of this habit beyond the game.

To make the prototype with agility in the process were used software and assets stores purchased exclu-

sively for the development of the exergame in digital platform, specifically save game pro-gold update, easy IAP (In App Purchase), Simple UI, Life System, 2D Cartoon Interior Set, I2 MiniGames, Daily Rewards, Very Simple Ads Monetization & Mediation, Virtual Pet Game Pack, Android Sensor. From the acquisition of the apps, the developers were able to deepen their working time into other functions for the app such as licensing ready-made graphics. The platform was developed from March 20, 2019 to June 21, 2019.

Functionality design

To stimulate the use of the mobile application, the users of the platform should feed their avatar with different types of food, such as: water, soda, juice, virtual ultra-processed, processed and in natura foods, which reveal the real kilocalorie intake according to the platform¹³.

In addition to the calorie intake data, users will aim to increase energy expenditure through physical activity goals by walking, running, playing, commuting, in leisure time, commuting, and in physical education classes. As they increase their daily physical activity, they receive an incentive with coins and trophies, which are acquired by performing the activities. At this moment the game has as its main focus the children's audience, but as sedentary lifestyles are a problem for many, it has no limitations, so it can be used by anyone who is interested.

The game was named “HEALTHY LIFE” for the mobile application, and it was created in its first version for the Android operating system, which has pedometer technology in its system (for example: Galaxy J4 Core, Galaxy J4+, Galaxy J6, Galaxy M10). The user of the mobile application is first instructed with his or her personal and anthropometric data, so that the application can perform the necessary calculations according to its objectives. During the usage process the user receives extra information about healthy habits and tips on simple methods that can make a difference in their routine.

The mobile application sends notifications to the users as their activities are developed, and as they reach their goals, new information is established so that they have more engagement and motivation to complete their new goals. As this is a prototype, the testing stage, with the correction of flaws and implementation of improvements, must be carried out before being made available for download on internet repositories and application stores for mobile devices (Google Play), and will later be adjusted for the IOs operating system

(App Store).

When installing the mobile application and registering, the user will have to feed the platform with some personal information. The following data will be required: height (centimeter); weight (kilogram); age (years); gender. By filling in this data the program will calculate the Body Mass Index (BMI).

The platform also has a health bar, represented by a heart icon and numbered with a percentage. Over the time that the application is open, this bar will decrease, approximately 1% every 10 seconds. This represents the avatar's life span.

To increase the value of this bar, and thus extend the avatar's life time, it is necessary that the user offers food at the right times and in the right quantities, because they will have varying prices and caloric value. The higher the price of the food, the greater the amount in percentage that will increase in the health bar.

The bar will indicate the amount of daily calories consumed, determined by the foods that have been selected, using a calculation estimating the amount of calories that should be ingested per day. If this amount is exceeded, there will be a warning alerting the player and as a consequence the avatar's health will decrease and if he is not careful he will speed up. To reduce the values of this bar, the user needs to practice walking or running. The more you practice the exercise, the faster this bar will decrease.

In the food selection button, there is a slider bar with tabs, in which the user can select the type of food, there are 34 different types of food, divided into drinks, fruits, foods, vegetables, and sweets. In each food there is a specific and detailed description, showing the caloric amount it has (represented in green), amount of coins to buy it (represented in white with the coin icon) and percentage of hunger increase (represented in yellow). To select any food, just click on the drawing you want.

As already described, the game is driven by its own economy represented by coins, which come from practicing physical activities and will have to be spent when buying food to keep the health bar high. With them you can also buy cosmetic items to customize your avatar. Initially the user will have an amount of 500 coins to spend. After that, the way the user walks, coins are acquired along the time and distance of the walks. In the store section the user can spend his coins on cosmetics, clothing, wigs, accessories, furniture, and scenery. It is also possible to acquire "rays" by buying with real money by selecting package options. It is through

these that you can buy boosters. All items purchased from the store will be available in the Closet option.

To encourage users who want a greater challenge, the mobile app releases quests, which will change daily and will have a quest released weekly. These consist, for example, of walking a certain distance in a stipulated time, or even achieving a certain average speed while walking. Those who manage to accomplish these challenges will earn extra coins, medals, and trophies. An online ranking will be implemented where users can check and compare their status with other users.

The game has a metrics screen, which will contain all the information provided to the user during its use resulting from their activities: the total number of steps throughout the use of the application, the calculated BMI, the total distance traveled and the daily intake goal according to the selected option: lose weight, maintain weight or gain weight.

In the settings session the user can organize his platform with the features he finds necessary, such as: turning on and off the music and sound effects (FXs); changing the volume of music and FXs; turning on and off the tips windows, besides having access to editing the information about weight, height, age and sex (previously registered the first time he uses the application), which facilitates and gives greater veracity to the data when the individual has changes in his weight.

Within the mobile application there will be a bonus that the user can access once a day, with rewards in the form of coins. To access this reward it is necessary to watch a video made available by a sponsor. The application's graphics have a 2D cartoon style. The animations and expressions of the avatars vary according to the silhouette of the individuals, estimated subjectively through the BMI classification, and these values will be changed according to updates made by the user himself, in the platform settings. Their state of health is also reported with happy or sad facial expressions. Aesthetic items add further customization in the visual part.

As you go through the levels, new items are unlocked (clothes, accessories, etc.), when you reach these new levels, when these devices are released, or when you have achieved a goal, you will be alerted with visual animations in flashy colors. For example, when you manage to earn coins, shiny coins will appear on the screen, or when you acquire a trophy, it will be represented by a festive screen¹⁴.

The app will provide audible feedback when buttons are pressed and when an event that needs the us-

er's attention occurs. The following are some of these actions and their duration: daily reward achievement (1"); challenge completion (8"); character feeding (6"); FX buttons (1"); buying item (4"); changing clothes (4"); hungry character (2").

Results

Due to the high rate of sedentary behaviors and the increasing use of static mobile devices, which leads to a high rate of physical inactivity, mobile applications can unite the use of technology with the practice of physical activity, through daily goals to be achieved by users.

Mobile apps are also a smart innovation as didactic material complementary to physical education classes in schools for the young teenager audience, who can use the platform outside school, when they are in their after-school activities, at home, on weekend outings, and in several other places and occasions. The use of mobile applications as challenge games, at this moment in healthcare systems, should be evaluated with more specificity about its true potential, measuring its impact on improving healthy habits and practices, compared to individuals who do not use the platform.

Conclusion

The mobile application, which was developed in this study, aims to provide benefits in relation to lifestyle habits, whether they are eating behaviors and/or the level of physical activity. The result with the use of the application directs help to the users themselves as well as parents, physical education professionals, and health professionals in general. It is believed that this is a strategy that can influence the change of habitual behaviors, promoting health and causing a reduction of harm and health problems that could occur in adulthood.

Conflict of interest

The authors declare no conflict of interest.

Authors' contribution

Pereira EV, participated in the conception of the manuscript, search for a team to develop the prototype, analysis of the outcomes to be modified to improve the application. Nunes RZS, collaborated in the finalization and literature review. Farias JM, participated in the orientation and conception of the manuscript.

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