SPECIAL COLLABORATION

Received: September 27th 2019
Accepted: November 18th 2019
Published: March 5th 2020

HEALTHY JEART: ADOLESCENT HEALTH PROMOTION THROUGH MOBILE DEVICES(*)

Mª Soledad Palacios-Gálvez (1,2), Carmen Yot-Domínguez (3,4) and Ángeles Merino-Godoy (5)

(1) Departamento de Psicología Social, Evolutiva y de la Educación. Universidad de Huelva. Huelva. Spain.

(2) Centro para la investigación del pensamiento contemporáneo e innovación para el desarrollo social (COIDESO). Universidad de Huelva. Huelva. Spain.

(3) Departamento de Didáctica y Organización Educativa. Universidad de Sevilla. Sevilla. Spain.

(4) Facultad de Humanidades y Ciencias Sociales. Universidad Isabel I. Burgos. Spain.

(5) Departamento de Enfermería. Universidad de Huelva. Huelva. Spain.

Authors declare that there is no conflict of interest.

(*) This project was financed by the Ministry of Health of the Junta de Andalucía, according to Resolution of December 20, 2016 of the General Secretariat for Research, Development and Innovation in Health, in the call for subsidies for the financing of Research, Development and Biomedical and Health Sciences Innovation in Andalucía for 2016, with file number PIN-0445-2016 and a duration of 36 months.

ABSTRACT

To make health promotion campaigns more effective, the motivation of the people to whom they are directed is required, what can be achieved by gamification through electronic devices. There are no known experiences in Spanish that address the promotion of health from a generalist perspective and not only focused on very specific issues. For this reason Healthy Jeart is created. It is an app for smartphones and tablets, aimed at a population between 8 and 16 years old, whose objective is the promotion of healthy habits on a physical, social and psychological level. Its content has been designed by professors from the universities of Huelva and Seville (Spain). The thematic areas that comprise it are: physical exercise, nutrition, physical well-being, psychological well-being, affective-sexual relationships, use of new technologies and toxic substances and addictions. In 2018 it achieved a certification granted by the Agency of Sanitary Quality of Andalusia as a healthy app.

Key words: Health promotion, Adolescence, Gamification, App, Innovation, Healthy habits.

RESUMEN

Healthy Jeart: promoción de la salud en la adolescencia a través de dispositivos móviles.

Para que las campañas de promoción de la salud sean más efectivas se necesita la motivación de las personas a quienes van dirigidas, la cual puede incrementarse mediante la gamificación a través de dispositivos móviles. No se conocen experiencias en español que aborden la promoción de la salud desde una perspectiva lúdica generalista. Por ello se crea *Healthy Jeart*, una aplicación para teléfonos inteligentes y tabletas, destinada preferentemente a una población de entre 8 y 16 años, que tiene como objetivo la promoción de hábitos saludables a nivel físico, social y psicológico. Su contenido ha sido diseñado por profesores de las universidades de Huelva y Sevilla. Las áreas temáticas que la conforman son: ejercicio físico, alimentación, bienestar físico, bienestar psicológico, relaciones afectivo-sexuales, uso de nuevas tecnologías y tóxicos-adicciones. En 2018 consiguió la certificación de aplicación saludable, otorgada por la Agencia de Calidad Sanitaria de Andalucía (ACSA).

Palabras clave: Promoción de la salud, Adolescencia, Gamificación, Aplicación móvil, Innovación, Hábitos saludables.

Correspondencia:
Carmen Yot-Domínguez
Facultad de Ciencias de la Educación
C/ Pirotecnia, s/n.
41013 Sevilla, Spain
carmenyot@us.es

Suggested citation: Palacios-Gálvez MS, Yot-Domínguez C, Merino-Godoy A. Healthy Jeart: adolescent health promotion through mobile devices. Rev Esp Salud Pública. 2020; 94: March 5th e202003010.

INTRODUCTION

Even when teenagers are healthier today than those of past generations, there are many factors that can put their health at risk, affecting through their lives[1]. In this time when they undergo important changes, the health habits and behaviors they adopt will be extended to adulthood[2]. Adolescence is presented as an ideal stage to educate in a healthy lifestyle and to correct unhealthy habits from the childhood[3]. Currently, there is a huge amount of different health mobile applications about health[4,5,6]. Mobile gadget is any small-light and light device, therefore easily transportable, capable of connecting to the internet[7]. An application is known as all the specific program created for mobile devices (in smart phones or tablets) and, consequently, adapted to its technical requirements[8].

Educational experiences based on this kind of app have been found to be beneficial[9,10,11,12]. Mobile app-based interventions are an effective health promotion strategy among the general disease-free population[13] and, especially among teenagers. Mobile devices, so widespread among the youth population, are a way of reaching them and increasing their knowledge and producing a behavioral modification[14].

Different systematic reviews[15,16] have dealt with analyzing the incidence of electronic media in awakening the children's knowledge and adolescents about health, promoting behavior change and encouraging a healthy lifestyle. It is evident from them that there is statistically significant progress among those who use electronic media. In health education programs for children and teens, therefore, activities based on the use of information and communication technologies must be incorporated[17].

Technology can contribute to promote healthy lifestyle habits in this population relying on funny works[18]. However, the widely shared perception is that existing applications are boring[19]. Gamification would be an element of encouragement[20] capable of increasing immersion in the app[21]. Gamifying consist in incorporating game's elements and dynamics into an educational resource or experience. However, the reality is that few apps put it into practice[22].

Participation is the key to achieve effectivity using health promotion campaigns[23], which is only obtained if there is motivation among young people[24]. One way to enhance it is the aforementioned gamification[25]. Currently, there is already evidence that supports the positive role that it plays in the modification and promotion of beneficial behaviors for health[26,27], and part of the development of the idea of gamification applied to public health, has been done through smartphone applications (later, smartphones)[27].

MOBILE APPLICATION'S DESCRIPTION

Despite the fact that there are a lot of apps designed for health-related purposes (adoption of healthy lifestyles, improvement of the adherence to treatment, etc.), so far, none of these are known in Spanish directed specifically to promote healthy lifestyle habits, in general, among young people.

Despite the increasing number of applications related to health on the market, many of them lack of scientific rigor, few are dedicated exclusively to youth, and none promote healthy behaviors and habits related to different areas of health. In order to offer a resource that follows these characteristics, Healthy Jeart was

Figure 1
Healthy Jeart logo.

designed and produced. The objective pursued with this mobile application was to promote healthy attitudes and behaviors in teenagers, taking into account the physical, social and psychological dimension of health.

It is an application targeted to smartphones and tablets, preferably intended for a population between 8 and 16 years old. It is also addressed to its teachers. The app is friendly and easy to handle. It allows learning by playing and socializing health-related experiences. It can be used within or outside the educational center and home as well.

Those who have devised the format and provided the content that is worked from the application are professors from Huelva and Seville Universities. All of them are specialists in health education and educational technology.

When accessing the application, you will be asked to sign in with a username and password. The application for registration is available on the same screen. The most important field which must be completed is the educational center where the teen is studying. Despite the fact that it is optional, if you do not provide a reference to a specific center, you will not allow to participate in the "Challenges" activity.

Access can be done as a guest, but in this case, the functionality of the application will be limited. You will not be able to participate in activities such as the "Forum" or "Challenges". Through the application you can participate in four different but inter-connected activities, which are described below: "game", "ideas forum", health tips (later, "tips") and "challenges".

The game. The first item is a fast-paced platform game, a subgenre of action games. In it, the avatar of Jeart, a cute alien with the shape of a heart, has to jump on the blocks on which he leans. This task that could seem simple is not such because there are many dangers that Jeart runs. First, the blocks can play tricks. Some of them are moving unstoppably while others break. So Jeart can easily fall. Secondly, in the environment there are some danger and damaging elements for health that you must avoid since they may lose part of your life force (such as sugar, snacks or soft drinks), or directly, life (such as tobacco or drugs) by rubbing them. In addition, it plays against the fact that the life force of the character will decrease while time is running.

Consequently, the avatar has to avoid falling or touch products and harmful activities to

Figure 2
Jeart, the main character.

health, at the same time that he must keep its life bar full. The game ends if Jeart's health is depleted because of the effects of harmful elements, the waste of time or if Jeart falls. However, continuing the game is possible. To do this, the player must correctly answer a health question against the clock. This chance to retake the game is offered up to three times per game. Gamer can share the points obtained by the social media.

Jeart can also touch elements that promote health (sports, fruit, vegetables, fish, water, etc.). In fact, it must be done to add points. From the points obtained, a classification of players is established.

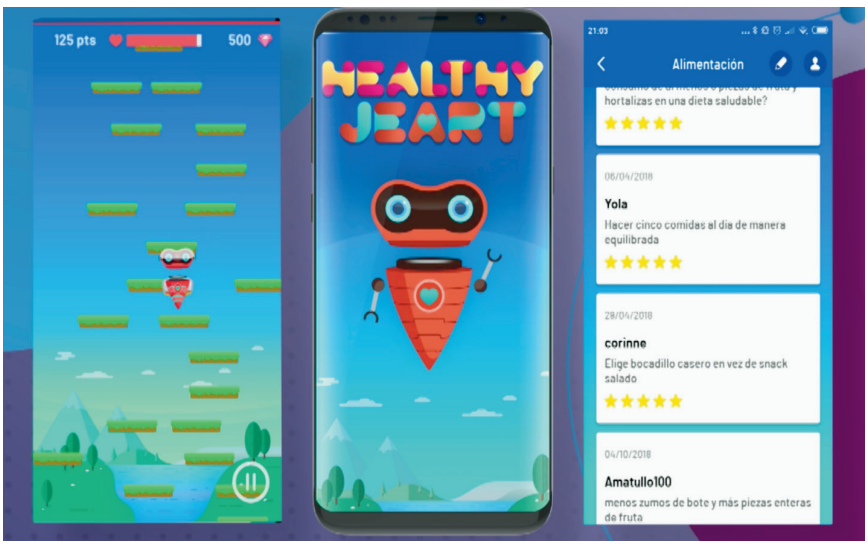
The points achieved in each game are not accumulative. However, the gems that are also found throughout the journey, are saved in the profile.

The appearance of Jeart is modified at the beginning of the game. In the "Character Gallery" you can determine how it looks before you start. Although it is true that this is not possible in the first games because gems are required to change its appearance. Gems can also be obtained by participating in the "Ideas Forum" activity.

Forum. Along with the game, a forum is accessible in the application so that young people can exchange healthy ideas. These have to be approved by the administrators before being published, who also submit them for evaluation. Rating can be exchanged for gems for the game.

Tips. The tips are short, simple and easy to understand phrases, often written in rhyme to encourage teenagers to be retained more easily. For example, "*si quieres mejorar tu movilidad y sentirte mejor, sube y baja por las escaleras evitando el ascensor*" ("if you want to improve your mobility and feel better, go up and down the stairs avoiding the elevator", también tiene rima). With them, knowledge is increased and

Figure 3
Game and forum.



young people's awareness of different areas of health is promoted. There are different contents within the tips. The "Physical Activity" area refers to physical exercise and sports, sedentary lifestyle, etc. In the "Food" area, we try to debunking some myths and false beliefs related to it, as well as suggesting healthy habits. "Physical well-being" encompasses behaviors related to rest, sleep, personal hygiene, time organization, etc. In "Psychological well-being", topics related to self-esteem, interpersonal skills and emotional intelligence, among others.

The "Sexual-affective" area focuses on the topic of intimate relationships, delving into the myths of romantic love and promoting healthy relationships. The "Toxic and addictions" area talks about the consequences of alcohol, tobacco, cannabis, hookahs, etc., as well as trying to dismantle the false information that is spread regarding these or other substances. Lastly, the "New technologies" area refers, above all, the use and abuse of internet and social media, promoting a protective behavior on the networks, good use of them, etc.

Along with these tips, the teachers find suggestions for learning activities classified depending on areas and academic levels, which can be implemented in the classroom to work and deepen on the advices. The work is thus extended to the classroom under the guidance and advice of the teacher.

The challenges. Finally, the challenges section allows interaction and competition with other users of the application. The challenges are therefore group. Teachers of the educational centers are the responsible who must register to participate as a group-class or as a center. An example of a challenge would be: "For a week, do 5 minutes of relaxation exercises through breathing when you return from lunch." Teachers must report on its development. Administrators will certify participation and reward the winner group.

Figure 4
Game tips.

Healthy Jeart is available on iOs and Android operating systems. With more than 1,600 downloads between both platforms, the score received by users to date of writing this article is 4.9 out of 5.

People can find more information related to the project by the website https://www.healthyjeart.com/. It provides information on the genesis of the initiative and on the application (its structure, content, etc.). In addition, this resource has a training purpose by including didactic proposals, organized by areas, so that the application can be integrated into teaching practice for educational purposes. A coherent and organized methodological proposal is presented around all thematic areas, under didactic planning developed by professionals and specialized experts.

DESIGN AND PRODUCTION PROCEDURE

Production process has gone through different phases. The first of them had the objective of knowing the target population, elucidating how they would conceive the application and determining the contents to be included in the app. Through eight nominal groups held in different public and concerted educational centers for basic education and post-compulsory education in Huelva, as well as one at the University of Huelva, interesting information Healthy Jeart's design was collected. Specifically, from the analysis of the content, the seven areas were created.

The nominal groups began offering information to the young participants about the research project and what was intended with the development of the mobile app. From there, they were asked to think about the factors (behaviors, elements, etc.) that they considered to be influencing their health (physical, psychological and social) and their relatives and closest friends. Based on this, they had to answer writing and individually, the following key question: "What habits do you consider most interesting to include in the mobile application about how to improve your health, physically, psychologically and socially?". After an individual reflection, they continued with a discussion in which all of them had to indicate the answers they had written. Finally, the students voted the five factors that they personally considered most important of all the ones they had expressed themselves.

Three nominal groups were made with students from the sixth grade of Primary Education (26 participants), 2 groups with students from Compulsory Secondary Education (28 participants), 2 groups with students from Baccalaureate (29 participants) and 1 group with students from university (9 participants). The students consulted were finally 92. All of them required the written consent of one of the parents or the legal guardian.

Subsequently, an interdisciplinary team of researchers from the universities of Huelva and Seville undertook to devise the application: establish its functionality, define its appearance and provide content. For content validation, there was a panel of experts on this subject at the national level.

The technical development of Healthy Jeart was entrusted to an external entity, which carried out its work with continuous supervision by the research group. Once a first prototype was available, it was tested with a sample of 69 students. The youth came from the same centers that participated in the nominal groups. The pilot test took place in the classroom. The students were asked to answer a questionnaire through which they had to evaluate the application.

In this questionnaire, they were asked to rate on a scale of 1 (very bad) to 5 (very good) different aspects of the app, such as its management or the clarity of the content it shows, to assess the overall satisfaction of managing the app from 0 to 10, pointing out their strengths, sharing the flaws found and making suggestions for improvement. They were also asked to express their opinion on whether the app helps maintain healthy lifestyle habits. The questionnaire was written expressly for information collection.

Overall satisfaction reached the average score of 7.19. The best valued aspect of the app was the visibility. 58% of the students rated this aspect as good and 34.8% as very good. Functionality and handling were considered good by 53.6% and 52.2%, respectively. The clarity of the content was good or very good for more than 50% of the students, but 29% indicated that it was fair.

Thus, among the strong points they pointed out were "easy handling" or that "the design is attractive and [the app] is very interactive". The information contained was understood practical and useful. The app "is very entertaining and contains useful information." But the suggestion for improvement was widely shared: "it would increase advice, challenges ... etc." Others pointed out that there were limited lives in the game and make more varied in type and content questions to save the game.

Suggestions for improvement provided were taken into account, including establishing a period of time for questions to save the game or allowing gems to be obtained in the game.

It is for that reason that improvements to the application were necessary before achieving its current version. These are those derived from the accreditation procedure as "AppSaludable".

ACCREDITATION PROCEDURE

In 2018, Healthy Jeart obtained the "AppSaludable" label awarded by the Andalusian Health Quality Agency. This is an exclusive recognition, being the first in Spain to guarantee the quality and safety of health applications. With it, mobile applications with very varied content are recognized, but always with evidence based information and objectives related to health. In addition, the "AppSaludable" label ensures that health applications meet the necessary quality and safety measures, and that, therefore, they can be used by citizens reliably and minimizing risks. Health applications with the "AppSaludable" logo are part of a directory of applications that stand out for their quality and safety.

The ACSA accreditation process is based mainly on the self-evaluation of the application, according to the recommendations of the guide published in the "Strategy for quality and safety in mobile health applications" and the subsequent evaluation by an expert committee of the Health Quality Agency.

Between the recommendations that were not complied, and which were worked on, were those relating to specifying the applicable legislation on data protection and privacy. A legal cabinet took care of it. And the audit of the University of Huelva verified that the application did not incur problems related to this request. Thus, the privacy policy was included, and the necessary tool was provided for users to confirm that they have read the privacy policy and indicate that they agree with it.

To obtain the subsequent favorable assessment, other improvements were suggested, and the following modifications were made:

i) The information contained in the section "About this app" was restructured. The express allusion was added to the fact that the available content does not replace the doctor-patient relationship under any circumstances.

ii) A schedule for reviewing and updating the contents of the app was defined.

iii) A procedure was included so that registered users can retrieve their passwords. Likewise, a contact tool was incorporated with those responsible for the app through which users can provide suggestions.

CONCLUSIONS

Healthy Jeart is a mobile application specifically designed for young people. It aims to promote healthy lifestyle habits in adolescence. It remains to check its incidence in a controlled way. This line is currently being worked on.

Healthy Jeart is intuitive and friendly. Its appearance is attractive, but more so are the activities it incorporates. A set of simple characteristics allows young people to learn the information that is provided about habits, through brief "tips". A "forum" promotes social exchange and support in acquiring and changing habits.

Healthy Jeart pretends young people to adopt a healthy lifestyle. For this, teachers are also involved. In this way, the work that begins in the application itself is extended to the classroom. Through "challenges," teachers can model desired behaviors.

Healthy Jeart is currently active. The team of researchers continues to make it known in different forums, seeking to make its use extensive among the youth population.

By the same time, continue working on it. Healthy Jeart requires maintenance, as well as the constant updating of content, activities and challenges, including the game itself, to maintain the interest of the app, especially among the population and users.

The design of Healthy Jeart is endorsed by a continued scientific work. The project was undertaken without profit and the delivery of the team of researchers was essential. In addition, it should be noted that Healthy Jeart was produced at low cost but thanks to the support and financing from public administrations.

REFERENCES

1. UNICEF. La adolescencia. Una época de oportunidades. Nueva York, EEUU: Fondo de las Naciones Unidas para la Infancia; 2011.

2. Salmeron MA, Casas, J. Problemas de salud en la adolescencia. Pediatr. Integral 2013; XVII(2): 94-100.

3. Organización Mundial de la Salud. Resumen: Salud para los adolescentes del mundo. Una segunda oportunidad en la segunda década. Ginebra: OMS; 2014.

4. Dute DJ, Bemelmans WJE, Breda J. Using Mobile Apps to Promote a Healthy Lifestyle Among Adolescents and Students: A Review of the Theoretical Basis and Lessons Learned. JMIR Mhealth Uhealth 2016; 4(2):e39. DOI: 10.2196/mhealth.3559.

5. Brannon EE, Cushing CC. A Systematic Review: Is There an App for That? Translational Science of Pediatric Behavior Change for Physical Activity and Dietary Interventions. Journal of Pediatric Psychology 2015; 40(4):373-84. DOI: 10.1093/jpepsy/jsu108.

6. Schoeppe S, Alley S, Rebar AL, Hayman M, Bray NA, Lippevelde WV et al. Apps to improve diet, physical activity and sedentary behaviour in children and adolescents: a review of quality, features and behaviour change techniques. International Journal of Behavioral Nutrition and Physical Activity 2017; 14:83. DOI: 10.1186/s12966-017-0538-3.

7. Livingston A. Smartphones and other mobile devices: The Swiss army knives of the 21st century. EDUCAUSE Quarterly 2004; 2: 48-52.

8. Brazuelo F, Gallego D. Mobile learning: los dispositivos móviles como recurso educativo. Sevilla: MAD; 2011.

9. Carrà G, Crocamo C, Bartoli F, Carretta D, Schivalocchi A, Bebbington PE et al. Impact of a Mobile E-Health Intervention on Binge Drinking in Young People: The Digital-Alcohol Risk Alertness Notifying Network for Adolescents and Young Adults Project. Journal of Adolescent Health 2016; 58(5):520-6. DOI: 10.1016/j.jadohealth.2016.01.008.

10. Lee AM, Chavez S, Bian J, Thompson LA, Gurka, MJ, Williamson VG et al. Efficacy and Effectiveness of Mobile Health Technologies for Facilitating Physical Activity in Adolescents: Scoping Review. JMIR mHealth and uHealth 2019; 7(2):e11847. DOI: 10.2196/11847.

11. Lucas Thompson RG, Broderick PC, Coatsworth JD, Smyth JM. New Avenues for Promoting Mindfulness in Adolescence using mHealth. Journal of Child and Family Studies, 2019; 28(1):131-139. DOI: 10.1007/s10826-018-1256-4.

12. Šmahel D, Macháčková H, Šmahelová M, Čevelíček M, Almenara CA, Holubčíková J. Using Mobile Technology in Eating Behaviors. In: Šmahel D, et al., editors. Digital Technology, Eating Behaviors, and Eating Disorders. Cham, Suiza: Springer; 2018. pp 101-118.

13. Lee M, Lee H, Kim Y, Kim J, Cho M, Jang J et al. Mobile App-Based Health Promotion Programs: A Systematic Review of the Literature. Int. J. Environ. Res. Public Health 2018; 15:1-13. DOI: 10.3390/ijerph15122838.

14. Ippoliti NB, L'Engle K. Meet us on the phone: mobile phone programs for adolescent sexual and reproductive health in low-to-middle income countries. Reproductive Health, 2017; 14(1):11. DOI: 10.1186/s12978-016-0276-z.

15. Hieftje K, Edelman EJ, Camenga DR, Fiellin LE. Electronic media¬based health interventions promoting behavior change in youth: a systematic review. JAMA Pediatr. 2013 Jun; 167(6):574-80. DOI: 10.1001/jamapediatrics.2013.1095.

16. Peng W, Crouse, JC, Lin JH. Using active video games for physical activity promotion: a systematic review of the current state of research. Health Educ. Behav. 2013 Apr; 40(2):171-192. DOI: 10.1177/1090198112444956.

17. Diego-Cordero R, Fernández-García E, Badanta-Romero B. Uso de las TIC para fomentar estilos de vida saludables en niños/as y adolescentes: el caso del sobrepeso. Rev. Esp. Comun. Salud 2017; 8(1):79-91. DOI: 10.20318/recs.2017.3607.

18. Carrión C, Arroyo Moliner L, Castell C, Puigdomènech E, Gómez SF, Domingo L, Espallargues M. Utilización del teléfono móvil para el fomento de hábitos saludables en adolescentes. Rev. Esp. Salud Pública, 2016; 90:1-11.

19. Chan A, Kow R, Cheng, JK. Adolescents' perceptions on smartphone applications (apps) for health management. Journal of mobile technology in medicine, 2017; 6(2):47–55. DOI: 10.7309/jmtm.6.2.6.

20. Lee C, Lee K, Lee D. Mobile Healthcare Applications and Gamification for Sustained Health Maintenance. Sustainability, 2017; 9(5):772. DOI:10.3390/su9050772.

21. Sardi L, Idri A, Fernández-Alemán JL. A systematic review of gamification in e-Health. Journal of Biomedical Informatics, 2017; 71:31-48. DOI:10.1016/j.jbi.2017.05.011.

22. Edwards EA, Lumsden J, Rivas C, Steed L, Edwards LA, Thiyagarajan A et al. Gamification for health promotion: systematic review of behaviour change techniques

in smartphone apps. BMJ Open, 2016; 6(10): 1-9. DOI: 10.1136/bmjopen-2016-012447.

23. Qiu CS. The utility of gamification in public health. Indian J Public Health 2017; 61(4):314. DOI: 10.4103/ijph.IJPH_393_16.

24. Cugelman B. Gamification: What It Is and Why It Matters to Digital Health Behavior Change Developers. JMIR Serious Games 2013; 1(1):e3. DOI: 10.2196/games.3139.

25. Deterding S, Dixon D, Khaled R, Nacke L. From game design elements to gamefulness: defining gamification. Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments (MindTrek '11); 2011 Oct 28-30. New York (NY, USA): ACM; 2011. DOI: 10.1145/2181037.2181040.

26. Alahäivälä T, Oinas-Kukkonen H. Understanding persuasion contexts in health gamification: A systematic analysis of gamified health behavior change support systems literature. Int J Med Inform. 2016 Dec; 96:62-70. DOI: 10.1016/j.ijmedinf.2016.02.006.

27. Johnson D, Deterding S, Kuhn KA, Staneva A, Stoyanov S, Hides L. Gamification for health and wellbeing: A systematic review of the literature. Internet interventions 2016; 6:89-106. DOI: 10.1016/j.invent.2016.10.002.