Chapter 8
Gamification and New Technologies to Promote Healthy Lifestyles and Its Role in Creative Industries

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Abstract The aim of the current study was to develop a mobile application implementing gamification design principles to promote healthy lifestyles and enhance overall wellbeing as a possible health strategy in the workplace for creative industries. GameMyHealth is a mobile application (App) designed to help users record and monitor lifestyle-related outcomes. By using associated wearable sensors, the information relating to users' eating (Food Frequency Questionnaire) and activity habits can be recorded (e.g., number of steps, sleep, energy consumption). Therefore, by means of the implementation of gamification mechanics, badges, classification tables, points and levels, challenges and quests, as well as social engagement, were provided. For example, meeting activity or nutrition goals (e.g., greater number of individual steps (ten points); photo eating seasonal fruit (ten points)) can attain badges. Then a classification table will dynamically rank individual/group user progress and achievements as compared to their peers. Challenges are updated daily to provide the user options to keep them motivated, furthermore, "lifestyle quests" are also provided.

Keywords Gamification · Mobile applications · Wearable technologies · Healthy lifestyles · Creative industries

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8.1 Introduction

Sedentary behaviours (i.e., sitting or reclining postures) is a potential risk factor for many chronic conditions and they have been linked to an increased risk of all-cause mortality and this relationship has been reported to be independent of other risk factors such as smoking, high blood pressure, cholesterol, diet, and waist circumference (Dunstan et al., 2010). Furthermore, unhealthy lifestyles have great economic consequences for society, not only in terms of rehabilitation, but also due to sick leave or reduced productivity (Arena, McNeil, Sagner, & Hills, 2017). Unfortunately, these behaviours have become ubiquitous in modern society and one may question why people of today are more sedentary than those of previous generations. One possible explanation to this question can be the increase in sitting time.

Nobody doubts that previous jobs were notoriously physical; however, in urban settings, active time was changed for sedentary work. It is interesting to note how International Organizations such as the American Heart Association have shown an increase in sedentary work (83%) since 1950, which was accompanied by a drop of at least 20% of active jobs (Mozaffarian et al., 2015). It was highlighted that the majority of time that adults are awake is spent being sedentary (Hansen, Kolle, Dyrstad, Holme, & Anderssen, 2012) and a recent study showed that those adults who spent 8 or more hours per day sitting had a 62% higher probability of being obese (Bullock, Griffiths, Sherar, & Clemes, 2017). It was speculated that this association between sitting time and obesity can be related to the fact that sedentary behaviours displace physical activities, thus causing a reduction in energy expenditure (Mansoubi, Pearson, Biddle, & Clemes, 2014); in fact, physical activity was inversely associated with sitting time (Bullock et al., 2017). Furthermore, while physical activity was inversely related to all-cause mortality, a higher amount of TV viewing was associated with higher all-cause mortality. It is paradoxical to think that even in people who exercise regularly, sedentary activities (e.g., watching TV) can contribute to the development of cardiovascular or metabolic diseases such as obesity or type 2 diabetes, and even cancer risk (Dunstan et al., 2010). Additionally, it was demonstrated that prolonged sitting time was associated with increased risks of non-communicable diseases regardless of the physical activity level. Another important consequence of these behaviours to take into account is the development of low back pain, which can also lead to increased obesity and morbidity risk.

Fortunately, it has been suggested that those who are active (e.g., about 60–75 min/day of moderate-intensity physical activity) seem to have no increased risk of mortality, even if they sit for more than 8 h a day (Ekelund et al., 2016). These results show the importance that in those cases where long periods of sitting time cannot be avoided due to commuting or work, periods of time being physically active are important. Despite the completeness of this data and that many observational studies have shown that lack of physical activity is a major risk factor for morbidity and premature mortality (Lee et al., 2012), only 10–15% of adults in Europe, USA, or Canada comply with the recommended levels of 150 min/week of moderate to vigorous physical activity (Weed, 2016).

The reality is that we are immersed in an increasingly sedentary society, where increasing numbers of people have to sit for long hours for work or transport; therefore, strategies that contribute to diminish these behaviours are necessary. In a recent study, Benatti and Ried-Larsen (2015) suggested that those individuals that break up their sitting time more frequently during work seems to be beneficial for various cardio-metabolic risk factors (Benatti & Ried-Larsen, 2015). The importance of breaking up sedentary time has long been acknowledged and recent workplace guidelines stating that workers should aim to reduce their sitting time by at least 2 h/day (Buckley et al., 2015). It has been shown that even short periods of physical activity, performed throughout the day, are capable of triggering positive changes in cellular energy metabolism, suggesting that physical activity does not have to be adjusted exclusively to a specific moment of the day, but rather on incorporating movement into all aspects of our life (Latouche et al., 2013).

What has been defined as "movement breaks"in the literature can be an effective countermeasure to prolonged sitting and fortunately, at present, new technologies offer us an opportunity to become more active.

8.2 New Technologies and the Promotion of Healthy Lifestyles

There is evidence suggesting that mobile phone use is related to sedentary behaviour and that technological advances can even play a role in reducing our physical activity (Barkley & Lepp, 2016). However, we are now seeing technological solutions to the inactivity problem. As recently reviewed by Stephenson, McDonough, Murphy, Nugent, and Mair (2017), wearable technologies can provide a means to change health behaviours, although their role in reducing sedentary behaviours is still debated. Interventions using wearable technologies were able to reduce sedentary time (approximately 45 min/day), what has previously been reported (if reallocated to light physical activity) to result in a 2–4% improvement in triglycerides, insulin or certain biomarkers (Stephenson et al., 2017).

Based on the aforementioned data and together with the increasing adoption of smart devices and the continued development of mHealth applications, wearable technology has recently become a key area for the development of health-related behavioural change interventions. According to the Mobile Health Market Report by Research Guidance, a mobile applications market analysis firm, it is projected that this year there will be 3.4 billion smartphone users, of whom about 50% will have downloaded at least one mHealth application. Some studies have reported that these mobile health applications are an effective channel for the delivery of health interventions designed to study various health topics such as physical activity, energy intake, smoking cessation or nutrition habits. These interventions have also had an impact on sitting time, at least in the short term as results usually decrease over time (Stephenson et al., 2017).

These wearables allow for the monitoring of clinical and behavioural outcomes in real time. Numerous researchers have integrated these technologies into different interventions to increase levels of physical activity and adherence to these programs thanks to relevant feedback to set goals, social support (professionals or the family), the possibility of individualizing programs or the capacity to track other health behaviours. An important line of work investigates physical activity to predict health parameters with these monitors. For example, by recording the number of steps (Fitbit Charge HR), they try to predict lung function in young asthmatics or blood pressure (Withings Pulse) in adults (Bian et al., 2017; Lee, An, Kang, Kim, & Dinkel, 2016). Fundamentally, these wearables aim to motivate users through achievable objectives (e.g., walk 10,000 steps/day), allowing the user to become aware of the distance travelled daily to ensure that he/she maintains sufficient activity in the daily routine to maintain a healthy life. It is also possible to control body weight (estimating caloric expenditure) or monitor the cardiac function through heart rate sensors. However, the overall effect of these devices on health and practice levels in older people is unknown.

Recently, Apple has launched a new framework called CareKit (http://arekit.org/) that allows developers to create applications for patient care, allowing monitoring their progress in different areas (pain, temperature, hunger, dizziness, range of mobility, and medication, are some examples), which allows to be connected to medical teams and send alerts to patients or relatives in the case of adverse events. For example, if the normal activity level were below a defined threshold, certain alerts could be sent. In addition, if applications such as One Drop are implemented, it could, for example, incorporate glucose levels in patients with diabetes and provide movement reminders.

Another interesting area of research is the work site health promotion, aimed at improving the health and wellbeing of employees. Most workers have behavioural risk factors that sometimes lead to high absenteeism, high medical expenses and decreased productivity at work (Goetzel et al., 2007). In the UK, accelerometer data showed high levels of sedentarism in office workers, that on average were sedentary more than 60% of their waking hours (Freak-Poli, Cumpston, Peeters, & Clemes, 2013). By means of these wearables, it could be possible to reduce health care or disability costs. The programs are usually designed to prevent the occurrence of disease (primary prevention) including programs that encourage physical activity, healthy eating, weight management and other healthy habits such as moderate alcohol consumption or stress management (Goetzel et al., 2007). As highlighted above, the prevalence and disease burden of obesity-related syndromes are increasing globally and most of the diseases associated with these conditions are strongly affected by modifıable behavioural factors that may be addressed in the worksite setting (poor diet, physical inactivity, and alcohol or tobacco use). Therefore, secondary prevention may be another area of interest considering that the prevalence of these illnesses is usually caused by modifiable health risk factors and poor lifestyle habits.

Considering that most adults spend a substantial portion of their waking hours in their workplaces, this could be an important setting for introducing health-promotion

programs, not just for the worker's health but also for the possibilities of enhancing company profitability. It is, therefore, a challenge for what has begun to be called "creative industries".

8.3 Creative Industries

Digital creative industries exemplify innovation processes in which user communities are highly involved in product and service development, bringing new ideas, and developing tools for new product uses and environments. Recognition of the importance of the creative industries is one of the remarkable developments of the twenty-first century. It has been realized that as the industrial participation of world economies declines, other forms of business are gaining significance. The creative industries can play a significant role in tackling the great societal challenges relating to sustainability, quality of life and the promotion of inclusive societies.

The creative industries refer to a range of economic activities that deal with the generation or exploitation of knowledge and information. It has been seen that creative industries are increasingly important for economic well-being. Human creativity can become a very powerful economic resource, so much so that the industries of the twenty-first century will depend more and more on the generation of knowledge through creativity and innovation (Florida, 2004).

The nomenclature on creative industries is a controversial issue. Several authors have even made various suggestions on what kind of activities should be included in the concept of creative industries. Regarding the issue that concerns us, we have found authors who consider it appropriate to include games, and others, which also include the much broader area of research and development in science and technology (Howkins, 2001).

Our experiences and understandings of the world are increasingly being filtered through multiple layers of digital environments. Digital technology, augmented reality, virtual reality and the corresponding technical capabilities are continuously transforming all aspects of our lives, either social, cultural or economic. Today's business world is formed and challenged by the development of highly innovative, competitive and disruptive technologies. New emerging technologies such as cloud computing, the internet of things, portable devices, 5G, big data analysis and three-dimensional (3D) technologies urge all interested parties to reconsider and reinvent their approach to respond to them quickly and effectively (Abbasi, Vassilopoulou, & Stergioulas, 2017).

Creative industries suggest added value, an improved market and new jobs, important bases for a competitive and growing economy. Policy makers emphasize that innovation, creativity and independent thinking are increasingly crucial for the development of the global economy (Moore, 2014). The 2010 European Competitiveness Report identified Creative Industries as one of the most dynamic sectors in Europe, with a growing potential as the Internet develops. They currently represent approximately 3.5% of the EU Gross National Product. In 2011, the EU

accounted for 38% of exports and 35% of imports in international trade of cultural and creative products.

A report by the McKinsey Global Institute (2013) identifies 12 technologies that could really promote massive economic transformations and disruptions in the coming years (Manyika et al., 2013). The report also looks at exactly how these technologies could change our world, their benefits and challenges, and offers guidelines to help company leaders and other institutions respond to these changes. In addition, it predicts that by the year 2025, between two and three billion more people will have access to the Internet and a possible economic impact of $5–7 billion is estimated for the automation of knowledge work. Gartner's hype cycle report for emerging technologies provides an intersectoral perspective on technologies and trends. Hype Cycles develop the possible viability of technology in five evolution phases (Linden & Fenn, 2003):

1. Technology Trigger: launch of new technology and its first repercussions and expectations. They are generally unusable products with unproven commercial viability.
2. Peak of Inflated Expectations: excessive expectations are generated about the possibilities of the technology in question. The cases of success (and some of failure) take place and are publicized, and we all want to adopt that technology. Expectations are exaggerated far from reality.
3. Trough of Disillusionment: the interest is diluted, the implementations are delayed or they do not arrive and some investors begin to fall. Initial expectations created are not met and some abandon the technology.
4. Slope of Enlightenment: more and more real and successful applications of technology are appearing. Companies take their tests with interest.
5. Plateau of Productivity: commercial viability begins to be a reality. The mass adoption of technology begins to be a reality, beginning to be profitable.

In recent years, the evolution of digital technology, tools and applications (or applications) has allowed users to easily access a variety of new technologies and digital tools. Technologies have become common and ubiquitous in creative industries, and are often used as a means to directly improve creativity, and in doing so, contribute to the life and culture of society as a whole, as well as to the identification of ways to overcome barriers or solutions to specific problems (Loveless, 2002).

8.3.1 Social Entrepreneurship

In recent decades, a new field has emerged to address social and public health challenges, social entrepreneurship (Harding, 2004). Social entrepreneurship generates benefits based on a business model that pursues a social goal, creating a business that meets the needs of society without giving up market strategies, that is, it is based on the idea of a business that exists partly due to a social good and not only for the benefit (Sullivan, 2007). Roughly speaking, it can be defined as the oriented business that

uses market forces to address social challenges, where the impact related to the mission becomes the core criterion, not the creation of wealth (Dees, 1998).

Social actions often work in the prevention or improvement of health, focusing on diet or promoting physical activity among others. In order to achieve improvements in any of these behaviours, structural changes are essential to improve opportunities and access to them (Sánchez-Oliver, Grimaldi-Puyana, & Alcaraz-Rodríguez, 2018).

If we focus on companies that use physical activity, we find many organizations that work through new technologies (Cai et al., 2016; Gao & Chen, 2014; Thomas & Bond, 2014). When observing social enterprises, it can be observed that they usually work through gamification or counting physical activity. Thus, in this way, we find active videogames, known as exergames, which are another most used option to increase physical activity levels, and therefore for promoting physical activity (Lamboglia et al., 2013). There are different models that are based on active video games. Those models that make use of the classic concept of the videogame console, such as the Xbox 360 Kinect exergames (Boulos, 2012) are among the most used for promoting physical activity, or those that use the phone and the GPS system to play outdoors (Maamar, Boukerche, & Petriu, 2012). Similarly, companies such as Fitbit (https://www.fitbit.com/es) or Jawbone (https://jawbone.com) have created mobile technology trackers to encourage people to increase their physical activity, or mobile applications such as Google Fit (https://www.google.es/fit) or Endomondo (https://www.endomondo.com), that help monitor the physical activity done and that in turn also use gamification among the many users who use them.

This type of initiative has been studied very much in recent years (Cai et al., 2016), and although we must continue to investigate it since there are contradictory reviews, today they are one of the most widely encountered options for promoting physical activity (Thomas & Bond, 2014). In addition, mobile applications that combine playing with physical activity, such as Pokémon Go, lead to substantial increases in short-term activity and unlike many existing interventions, they have the potential to reach populations with low activity levels (Althoff, White, & Horvitz, 2016).

Together with the social entrepreneurship initiatives mentioned previously, others have emerged, although in a more dispersed way, which should also be taken into account. Thus, we find initiatives such as Zamzee (www.zamzee.com), which seeks to turn physical activity into a game for children and physical activity monitors, registering physical activity and transforming it into prizes, or others like Let Kids Play (www.letkidsplay.com) that encourage physical activity by increasing the accessibility of outdoor physical activity spaces.

8.3.2 Examples of Worksite Health Promotion in Creative Industries

We have previously highlighted the importance of worksite health promotion. Over the past years, the number of organizations and companies that offer a health promotion program for their employees at the worksite has increased exponentially.

Several studies have addressed the question of whether health programs can influence employees' lifestyles and behaviours and thus reduce health care costs. In this line, different work site programs based on individualized counselling are likely to produce acceptable financial returns. In the literature, it is possible to find examples of work site studies done in well-known companies such as Johnson and Johnson (Breslow, Fielding, Herrman, & Wilbur, 1990), Citibank (Ozminkowski et al., 1999), Bank of America (Fries, Bloch, Harrington, Richardson, & Beck, 1993) and more recently in Johns Hopkins Medicine (Safeer, Bowen, Maung, & Lucik, 2018).

Classical studies by Goetzel et al. (1998) and Anderson et al. (2000) assessed 46,000 employees from both private and public sectors, over a 6-year period. Authors examined ten modifiable health risk factors to determine whether these risk factors (e.g., diet, physical activity, obesity, high blood pressure or glucose, cholesterol, stress, depression, smoking or excessive alcohol consumption) were related to medical claims. It was reported that more than 25% of the employer health care expenditures could be explained by the employees' risk factors in the study. Furthermore, those with greater risk factors represented a greater expense than those with a lower number of risk factors. Interventions aimed at enhancing access to physical activity programs (exercise facilities or time off for exercise), providing healthy food choices in coffee corners, and enacting policies that support a healthier work site environment (such as a smoke-free workplace) should be recommended.

Among these factors, probably the most sensitive and frequently evaluated have been physical activity and dietary behaviours. In most cases, worksite health promotion interventions provided at the work site were offered free of charge to encourage participation; however, despite the possibilities of these variables, the programs that reported intake of fruits or vegetables have obtained inconclusive results with only a small proportion of employees who increased their intake. Similar trends can be observed regarding physical activity (i.e., time spent engaged per week). Although small increases were generally achieved (11%), some employees did not comply with the current physical activity recommendations. The evidence of the effectiveness of these programs in most outcomes such as increasing dietary intake of fruits and vegetables, reducing overweight and obesity, and improving physical fitness is insufficient (Goetzel et al., 2007).

It is necessary to dig deeper into the mechanisms and processes that facilitate the change of workers' behaviour. Therefore, it is necessary to explore other promotion ways. In this sense, in the face of this need to find companies offering some type of health promotion program for their employees, a wearable device has recently appeared as an alternative to promote physical activity in these settings (Monroe, 2016). There is recent evidence suggesting that these trackers can improve physical activity in workers (Finkelstein et al., 2016). One key study that included more than 35,000 active employees and adult dependents during 4 years analyzed the effect of participation in the physical activity tracking application on BMI, total cholesterol, and blood pressure and reported that individuals changed their exercise behaviours in response to the intervention (Yu, Abraham, Dowd, Higuera, & Nyman, 2017).

The number of interventions focused on reducing workplace sedentary behaviours has been increasing over the last years (De Cocker, De Bourdeaudhuij, Cardon,

& Vandelanotte, 2016; Evans et al., 2012; Pedersen, Cooley, & Mainsbridge, 2014; Urda, Lynn, Gorman, & Larouere, 2016; van Berkel, Boot, Proper, Bongers, & van der Beek, 2014). A recent systematic review and meta-analysis suggested that interventions using mobile and wearable technology were able to reduce sedentary behaviours, especially on sitting time in the short term (Stephenson et al., 2017). Despite these promising results, there are still some potential barriers related to levels of employee participation in these workplace programs that need to be considered.

8.3.3 Limitations of the Use of Technology in Worksite Health Promotion Programs

Despite the increasing popularity of wearable technologies in our society, their inclusion in work site programs has not been broadly adopted yet due to different barriers. The effectiveness of interventions using these technologies to reduce sedentary behaviours is not consistent in the literature, especially regarding diet, body composition or physical activity. Therefore, an effort must be made to discuss barriers to implementing work site programs.

One of the main arguments against their implementation, besides the lack of demonstrated utility, is confidentiality (Reale, Slater, & Burke, 2017). There is a generalized lack of confidence in the technologies that may be related to a lack of experience using these devices to assess health outcomes (i.e., physical activity). Furthermore, although workers who are less healthy might benefit more from these programs, those participants with important health risks may be less likely to participate and it can be counterproductive for those who typically seek out medical information. To address this potential barrier and ensure the levels of employee participation, the privacy of the data must be ensured. These authors also highlighted the cost as one of the barriers, any strategy that arises in this line must be paid by the employer and must provide a value to the worker.

There is no doubt about the potential of these technologies, or their potential in this field. In fact, in a recent survey on Wearables in the Workplace, participants surveyed suggested that they would be willing to use wearable technologies at their workplace to track relevant health metrics and their primary motivation was the possibility to track their physical activity (Brown, 2016). Another concern is that these worksite programs promoted during work hours may distract workers from their duties and thus, impact negatively worker productivity. Consequently, future strategies should consider activities/challenges that have a minimum impact on the worker's daily routine (e.g., getting up every 30 min).

In parallel with these limitations, it is necessary to consider the adherence to these programs. In order to maintain the participation, we need easy access to programs and that should be preferably during working hours. It was suggested that the interest in these proposals is substantially greater if they are offered onsite when compared with classes offered off-site (Goetzel et al., 2007). Social support and reinforcement have also been highlighted as possible determining factors that may

influence participation in exercise programs (Lovato & Green, 1990). It seems that the support of relatives or other significant people, contributes to the persistence in the program. Therefore, it is necessary to look for strategies to reduce the poor attendance in health education sessions. A possible alternative in this sense could come from the hand of gamification.

8.4 Gamification

Gamification has become a trend nowadays. The growing popularity of gamification stems from the belief in its potential to encourage motivation, behavioural changes, friendly competition and collaboration in different contexts, such as customer participation, employee performance and social loyalty (Dichev & Dicheva, 2017). It is considered that these desired patterns of use emerge as a result of positive, intrinsically motivating experiences triggered by the motivational game implemented (Deterding, Dixon, Khaled, & Nacke, 2011), either from a business or marketing perspective (Huotari & Hamari, 2012) or from the point of view of learning and teaching (Dong et al., 2012).

It is a new strategy to influence and motivate groups of people. The implementation of web 2.0 has accelerated the creation of communities around all types of social networks, digital media or corporate websites. A correct implementation of gamification strategies allows going from mere connectivity to engagement (or commitment), achieving that the members of a community, in this case the university, participate in a dynamic and proactive way in actions that generally require an effort of the will. This technique considers three possible categories, external gamification, in which the users acquire a commitment or an affiliation to the "product, objective or company"; internal gamification that consists of applying gamification techniques within "a specific work or task" in order for the users to conceive their responsibilities as an entertainment; and the gamification of behavioural change that is used in order to motivate a change of behaviour in people, either towards their health, education or other aspects (García, Fernández-Gavira, Oliver, & Puyana, 2017).

Gamification is defined as the implementation of the most common and entertaining mechanics of videogames, in contexts not related to videogames (Handel, 2011). Badges, classification tables, points and levels, challenges and missions, as well as circuits of social interaction and incorporation are among the most implemented gamification mechanics. Although several studies have described the concepts of gamification in its application to health, very little research has specifically focused on mechanics, a justification for its use and the best way to apply them to mHealth applications. Gamification functions are integrated into the broader context of the application in order to reinforce usability and appeal to the gaming facets that players usually enjoy and that make them play continuously (Miller, Cafazzo, & Seto, 2014). An understanding of these mechanisms and their associated design and development considerations, contextualized through examples of mHealth applications, could help guide the development of gamified mHealth applications that could better incentivize user self-management.

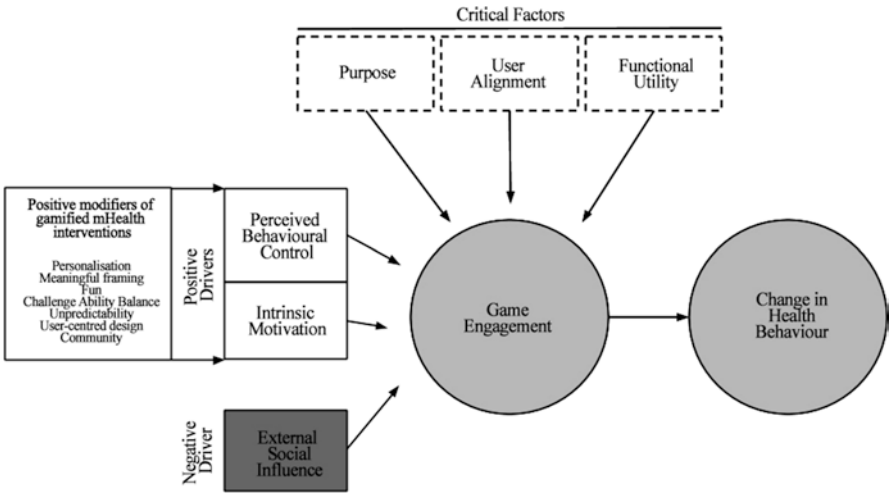

Fig. 8.1 How can positive health behaviour through the gamification of mHealth applications be promoted? (El-Hilly et al., 2016)

The theoretical framework suggests that a change in health behaviour depends on the degree of commitment to the gamified intervention and that this was influenced by "critical factors" and "controllers"of participation in the game (Fig. 8.1). An mHealth application that seeks to promote a positive change in health behaviour needs a "purpose" that is explicit and clear to the user. However, this 'purpose' must be aligned with the user's personal goal ('user alignment'). This 'user alignment'is key to take advantage of the user's intrinsic motivation, ensuring a sustained commitment to the intervention, as explained by experts and users alike. In the context of health behaviour, participation in the game can be maximized by taking advantage of modifiers that increase self-efficacy and minimize control beliefs (El-Hilly et al., 2016).

8.5 The Case of GameMyHealth

Briefly, this project was designed to determine the role of wearable technologies and gamification in sedentary behaviours and nutritional habits of university students, although its transfer to the worksite with health promotion is proposed. In this experience, a total of 13 lecturers from three different universities (University of Seville, University of Cádiz and Universidad CEU San Pablo, all in Spain) were included, representing 24 subjects in four different degrees. Strategies to promote a healthy lifestyle (regular practice of physical activity and monitoring healthy eating patterns) were applied. Furthermore, the acquisition of knowledge related to previous habits through gamification was assessed. A mobile application synchronized with a personal wearable activity tracker that allowed for individualized planning and follow-up of users' lifestyle was developed and provided to each participant (Fig. 8.2).

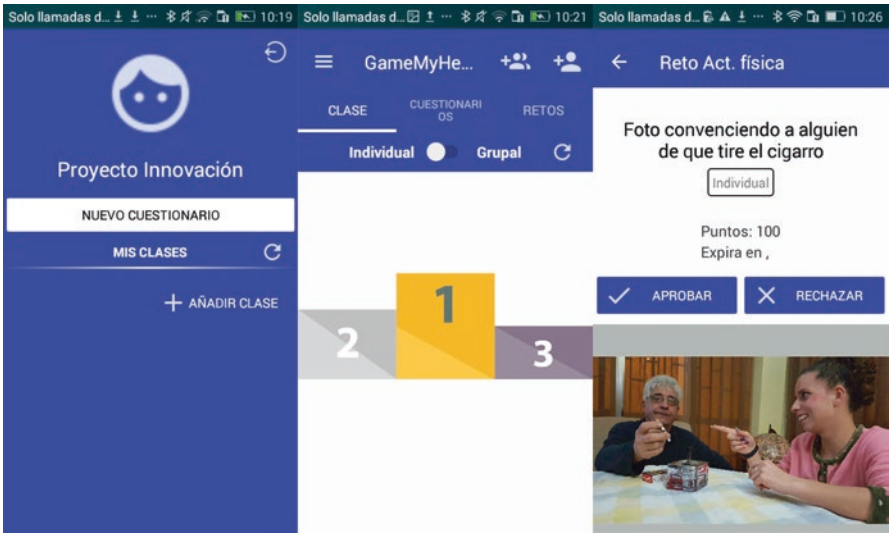

Fig. 8.2 Example of GameMyHealth App screenshots

The students in the different degrees were divided into groups of a maximum of four people, who designed an avatar that represents their team. Through the application, the activity habits of the participants were recorded (e.g., sitting time, number of steps taken) and challenges were established for the different outcomes, for example:

Physical activity

(a) Greater number of individual steps (10 points).
(b) Greater number of steps of the team (30 points).
(c) Time intervals greater than 30 min sitting (−10 points).
(d) Photo with the exercises and challenges proposed.

Nutrition

(a) Photo eating seasonal fruit (10 points).
(b) Photo eating vegetables, oily fish, legumes or nuts (10 points).
(c) Compliance with breakfast, lunch or dinner of the Harvard dish (10 points).
(d) Photos of the whole team eating the established foods (30 points).
(e) Photo drinking water (10 points).

At the same time and also in a group, questions related to both physical activity and diet were asked and involved additional "rewards". In addition, throughout the process, students received specific training on contents related to the project:

(a) Impact of physical inactivity and sedentary lifestyle on health.
(b) Gamifying from the educational field in healthy habits.
(c) New technologies applied to monitoring of physical activity.
(d) False myths in nutrition. Guidelines for a healthy diet.

At the beginning of the experience, the physical activity and feeding habits of the participants were recorded through the IPAQ questionnaire (International Questionnaire of physical activity) and an FFQ (Frequency Food Questionnaire). In addition, age, sex, and height were also collected. Basal metabolism and total energy expenditure were estimated. The questionnaires were completed again at the end of the process (8 weeks). Each student also fills in a questionnaire about their expectations and the degree of compliance with the competences established.

8.6 Conclusion

The gamification mechanisms are represented in several mHealth applications and are an encouraging implementation to stimulate the user's self-management better. As the developers of mHealth applications become increasingly familiar with these concepts, it is logical to think that applications can be gamified more and more and, hopefully, improve self-management and control of different variables. While additional research is needed to discern the effects of gamification in the context of mHealth applications, the recommendations and the example discussed in this chapter could be taken into account to design applications that have the potential to incentivize and enable people to improve their health through games.

Gamification has the potential for highly effective, low-cost mHealth solutions that can replace or complement the behavioural support component found in current health-improvement programs. In addition, it can be extended to pave the way for new methods of public health education, since gamification could be an effective way to involve people more globally. However, there are still questions regarding the long-term effects of gamification. Future research is needed to evaluate the effectiveness of the previous framework against current behavioural interventions to improve lifestyle.

A novel approach in this study was that it allowed the user to view lifestyle-related trends for physical activity and eating outcomes. Perhaps the most valuable feature of the GameMyHealth application is the use of game mechanics, which was perceived to highly motivate users to change their health behaviours and stay engaged with the application. This solution incorporates a feedback system that motivates users in achieving goals, even in groups, and self-manage their own wellbeing.

A mobile application that allows participants to monitor their lifestyle is proposed. The major advantage of gamification in this context is, perhaps, the inducement of positive changes in users' behaviour that are beneficial for their overall health and wellness. This solution can easily be implemented in different contexts (e.g., companies), providing opportunities not only for promoting health but also, from a social perspective, improving communication and bilateral encouragement among users.

Gamification, applied with mobile health applications, has the potential to facilitate patient self-management better. Although it is accepted, the short-term

effect on users' motivation as the users' interest in the game-like features seems to decrease in the long run, by implementing group strategies or daily goals we have tried to keep their interest. Future analyses should identify factors that promote users' app engagement. Another area of interest would be to investigate the best way to contextualize the use of gamification mechanics for specific condition types or even departments in a company. In short, we consider that upon completing the tasks, users may feel inclined to adopt or maintain the behaviour without further reinforcement from the system.

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