Gamification in Healthcare: Motivating South Africans to Exercise

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Abstract. Studies have shown that daily exercise has a positive effect on the prevention of heart disease. However, many South Africans do not have a healthy lifestyle. Some forms of gamification have been applied in health-related programmes in South Africa such as Multiply's Active Dayz™ and Discovery's Active rewards. This study looks at the motivational aspects of gamification in healthcare. It investigates the impact of gamification on clients' use of activity rewards programmes, and aims to identify the core motivational factors that would drive people in South Africa to improve their health through exercise. We use Yu-Kai Chou's Octalysis framework of motivation in gamification as guide. The results show that time is a barrier for engaging in exercise, rewards programmes lead to more health check-ups, knowing the benefits of exercise not enough motivation to engage in exercise, and members of rewards programmes have different motivational factors for their behaviour than non-members.

Keywords: Gamification · Motivation · Healthcare · Hear disease · Exercise · Rewards

1 Introduction

Sustainable healthcare is attained when people are motivated to proactively take care of their health before it deteriorates [1]. In a survey of over 2000 South Africans conducted by Pharma Dynamics in 2017 [2], more than 46% of respondents acknowledged that they indulge in activities that put their health at risk. Some important results of this study were that 21% of young adults do not take any interest in improving their health, whereas 88% of older adults have actively sought a change in lifestyle to improve their health. Of these older people, 69% make an effort to exercise regularly. This study also claims that 215 South Africans die every day from heart disease and even though genetic factors are at play, living a healthier lifestyle can avoid about 80% of these deaths.

Exercise can help prevent heart disease by: decreasing blood pressure; increasing good high-density lipoprotein cholesterol that transports fat away from arteries; reducing low density lipoprotein cholesterol that can form fatty deposits in arteries; improving blood circulation; increasing fat loss; and building muscle mass [3]. One

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aim of our study was to determine if South Africans are aware of the positive effects of exercise on heart disease.

Gamification has the potential to motivate a more active lifestyle. Gamification has also been successfully used in marketing [4], e-learning [5] and business [6] to motivate individuals to accomplish a goal. Pokémon Go, for example, is an augmented reality game that positions virtual Pokémon characters at different places where gamers have to move around, locate and capture them. Pokémon Go users are twice as likely to achieve the recommended goal of 10000 steps a day, with some achieving 7600 more steps on average [7]. Pokémon Go is not a health-related app, it is merely a game that increases physical activity, thereby improving players' health.

The second part of our study focused on understanding what factors used in gamification would motivate South Africans to exercise. The motivational factors that emerged were analysed with reference to Yu-Kai Chou's Octalysis Framework [8] to gain an understanding of the ways in which people can be motivated to improve their health.

The results of this research will be of value to designers of gamified health applications by showing which motivational factors to address in their designs. It will also be of particular value to organisations such as health insurance companies who want people to sign up for rewards programs aimed at motivating customers to pursue a healthy lifestyle.

2 Related Work

2.1 What Is Gamification?

According to Chou [9], gamification is "the craft of deriving all the fun and addicting elements found in games and applying them to real-world or productive activities". Gamification applies game-like elements and mechanics, but is a serious business. Companies in the healthcare and banking industries, amongst others, are increasingly adopting gamification in their operations.

The concept of gamification emerged in the 1800 s when S&H Green Stamps started selling stamps to retailers to reward loyal customers [10]. Nelson [11] argues that gamification originated in the early to mid-20th century in Soviet Union to motivate workers without capitalist-style financial incentives. Modern gamification was driven by airline loyalty programmes that reward customers with free "air miles" [12].

Different theories of gamification provide different views on gamification based on the industry where it is applied. One theory is that gamification is more effective than branding because of the emotional effect it has on the audience that leads to a longer relationship [13]. Another theory is that games create a natural reward compulsion loop driven by its effect on dopamine levels in the brain [14]. The origins and mechanics may differ, but the concept is simple: users are rewarded for certain behaviour based on their performance.

2.2 The Octalysis Framework

Chou [9] views gamification as a part of human-focused design. He acknowledges that

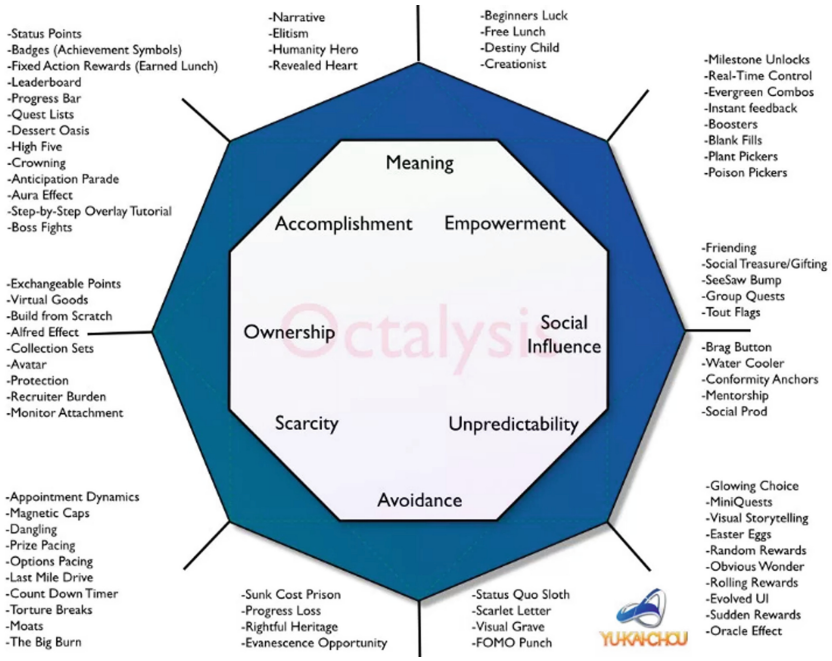

Fig. 1. Octalysis framework [15]

users of a system have feelings, insecurities, and reasons why they do certain things or not. His Octalysis Framework (Fig. 1) represents eight core drivers that inspire, empower, manipulate or make us obsess, but ultimately drive us toward a particular action. The eight drivers are:

1. Epic Meaning and Calling: People feel they have a purpose that is greater than themselves, or they feel unique and that they can achieve a certain task.
2. Development and Accomplishment: A person feels challenged and is constantly developing. Points and badges validates that they have overcome the challenge, and feel rewarded for it.
3. Empowerment of Creativity and Feedback: A person is able to try different things and given the opportunity to explore. They receive feedback and are able to use this feedback positively.
4. Ownership and Possession: When people can own something, they will be keener to grow or improve it. This is often seen when people customise their personal space or their avatars.

5. Social Influence and Relatedness: A person feels accepted, part of a group, or in esteemed company. Competitiveness is at play here. Relatedness applies to objects, places, activities, as well as people.
6. Scarcity and Impatience: A person has a limited time period in which to achieve goals. When they cannot, they constantly yearn for it.
7. Unpredictability and Curiosity: A person wants to find out what happens next, at the next level or what challenge they might face.
8. Loss and Avoidance: A person feels like they will lose out or fail. The fact that something negative might happen keeps them going.

A person becomes motivated and the gamified concept becomes more effective when one or more of these drivers have been triggered [15].

2.3 Examples of Gamification in E-Health

The World Health Organization (WHO) defines health as "a state of physical, mental and social well-being" [16]. Although we focused on heart disease, exercise or physical activity has an overall positive impact on health. WHO claims that the leading causes of global mortality are blood pressure (13%), tobacco use (9%), high blood glucose (6%) physical inactivity (6%) and obesity (5%). They say that physical activity has a positive effect on blood pressure, blood sugar levels and weight loss, which help prevent cardiovascular disease, diabetes and cancer [16]. Physical activity can also help with mental disorders, such as depression, anxiety and low self-esteem [17, 18].

The following are international examples of successful use of gamification in healthcare [9]: The *Mango Health* app encourages patients to take their medication because busy lifestyles make people forget to take their medication. They are motivated by earning monetary rewards such as gift cards at Target and GAP or a donation to the SPCA. The app includes Core Drivers 2 and 4 listed in Sect. 2.2. *Respond Well's* platform uses a virtual animated trainer. Patients can choose a trainer, music and a 3D environment and can even get their friends and family involved. It uses Microsoft Kinect, a motion-sensor technology that analyses the movement of patients and reports back to the patient and their doctors on their progress. This app includes Core Drivers 4 and 5. Pact users are paid by making a pact to exercise and eat healthier, and they lose money if they fail to do so. Users decide how much money to put into the pool with their friends and the person who reaches their goals receives the pay-out. This app reflects Core Drivers 2, 5 and 8.

A number of insurance companies in South Africa uses gamified rewards programmes to motivate health insurance policyholders to be more active. Momentum's *Multiply Active Dayz*™ (MAD) tracks physical activity using wearable devices, phone apps and gym visits. If members achieve certain daily milestones, they are awarded with "active days". Active days earn a discount on their medical aid premium and a cash back in medical savings (up to R1 000 a month) [19]. Since the launch of MAD in 2016, clients covered a distance of 98 million kilometres through their steps until October 2017 [19]. Seventy-four percent of clients have improved their cholesterol levels and 54% reported weight loss. Multiply also claims to have a lower claims rate for chronic illnesses as a result of Active Dayz™ [20]. Discovery's *Vitality Active*

Rewards allows members to set personalised fitness goals and tracks them against the goals on a weekly basis. Members are rewarded with discounts on partner products, free rewards such as coffee or smoothies and fitness points to enhance their Vitality Status. Old Mutual's *Greenlight Gym Benefit* is available to all Greenlight policy-holders and their family members. Members receive discounts on gym membership fees for certain gyms.

Our research aimed to uncover which factors motivate or will motivate South Africans to join such gamified systems.

3 Research Question and Objectives

Our main research objective was to determine which motivational factors in gamification would encourage South Africans to exercise and thereby reduce their risk of developing heart disease. We investigated the following questions:

1. How active are people on gamified health programmes compared with people who are not?
2. Do people on gamified health programs care more about their health than those who are not?
3. Do people on gamified health programs know more about their health than those who are not?
4. What factors derived from the Octalysis Framework will motivate people to start exercising and to take care of their health?

4 Research Methodology

4.1 Research Strategy and Data Collection

We used an online survey to study the phenomenon of interest – gamification in eHealth systems that promotes a healthy lifestyle, with specific focus on factors that motivate adoption. We targeted two groups in the survey, namely current members and non-members of activity rewards programmes.

Two separate, but similar, questionnaires were used – one for members and one for non-members of some rewards programme. Both groups answered questions about their frequency of exercise and knowledge of their health. Members were asked about factors that motivated them to join their activity rewards programme, and non-members about factors that would motivate them to join such a programme. We based the questions relating to motivational factors on the Octalysis Framework. The questionnaires included multiple choice, yes/no, open ended and ranking questions. We compiled them using Google FormsTM. We recruited participants through our own social media networks. In particular, we posted a link to the questionnaire on Slack and Facebook, and sent out an e-mail (with permission) to employees at a large company where one of the authors is employed. There were 100 responses – 50 members and 50 non-members.

4.2 Data Analysis

An advantage of Google Forms is that we could easily export data in graph format or as an Excel spreadsheet. The data analysis involved reading the responses to each questionnaire individually, collating the results per question of members and non-members respectively in graph format, and comparing the results of the two groups.

Two open-ended questions in each of the questionnaires required manual analysis of the data. For the questions, "If you exercise, why do you exercise? If not, why don't you exercise?" and "What health conditions do you think can be positively affected by exercise? If possible, list 5." each response was transferred into a Word document. We analysed these through simple descriptive statistics (e.g. counting the number of times a specific answer appeared).

5 Results

There were two data collection instruments used, Multiply Active Dayz and the questionnaire results. The results of each of these instruments will be discussed in turn.

5.1 Multiply Active Dayz™ Results

Since the launch of Active Dayz™, Multiply clients would have covered a distance of 98 million kilometres through their steps taken. This is equivalent to approximately 70 000 trips from Johannesburg to Cape Town. The calories burned by Multiply clients through Active Dayz™ would be enough to power 100 households for a year. According to Multiply, 74% of clients have improved their cholesterol levels since joining, with a further 54% reporting weight loss. Multiply also claims to have a lower chronic claims rate as a result of Active Dayz™ [20]. Active Dayz™ is linked to Core Driver 2 – Development and Accomplishment, and Core Driver 8 – Loss and Avoidance.

5.2 Questionnaire Results

This section gives the results of both sets of participants. The age distribution of the two groups of respondents appear in Table 1. The biggest difference between the two groups is that the members are older. Of the 50 non-members, 21 fall in the 18 to 25 range while only four members fall in that range.

Table 1. Age distribution of questionnaire respondents

Age range (years)	18–25	26–35	36–45	46–45	55+
Non members	21 (42%)	22 (44%)	5 (10%)	2 (4%)	0
Members	4 (8%)	26 (52%)	18 (36%)	2 (4%)	0

The members had to indicate to which activity rewards programme they belong. The results are as follows: Discovery Active Rewards – 53%, MAD – 43%, Old Mutual Greenlight – 2%. Three respondents had both MAD and Active Rewards, and one answered the question incorrectly.

The remainder of the discussion is organised according the questionnaire questions.

How Aware Are You About the State of Your Health? The answers to this question are summarised in Figs. 2 and 3. An equal number of members either go for a check-up when something is wrong or they go once a year – together 80% of the group. Most non-members (64%) only go when they think something is wrong. Only 16% of members and 14% of non-members have regular check-ups and are well-informed about their health. Twelve percent of non-members blame time constraints. Overall the activity rewards group members are more proactive when it comes to monitoring their health than the non-members.

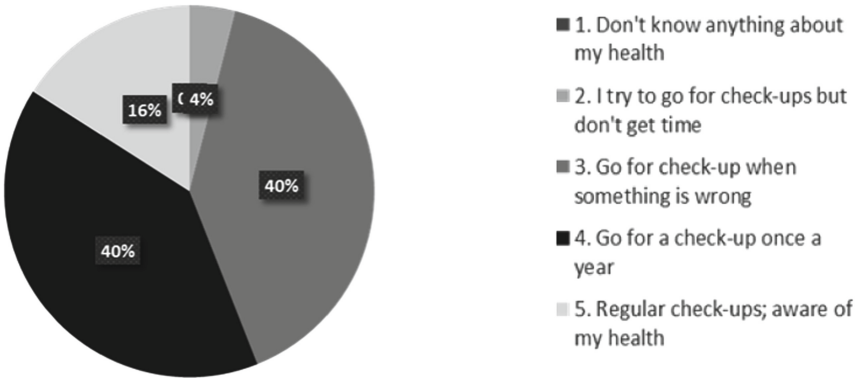

Fig. 2. Members' awareness of their health status

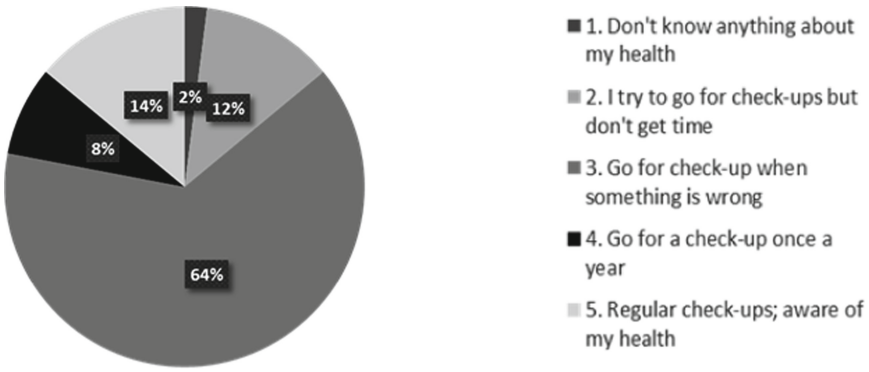

Fig. 3. Non-members' awareness of their health status

Which of These Best Describes Your Exercise Routine? More than half (52%) of members of an activity rewards programme visit a gym or exercise four or more times a week, while only 12.2% of the non-members fell into this category. The most popular response among non-members was that they do not gym but try to take the stairs (44.9%). Seventy-eight percent of members exercise at least once a week. Of the non-members, 18.4% do no exercise at all. None of the members chose this option. Figures 4 and 5 summarise the results for this question. Belonging to a gamified programme doubles the likelihood that a person will exercise.

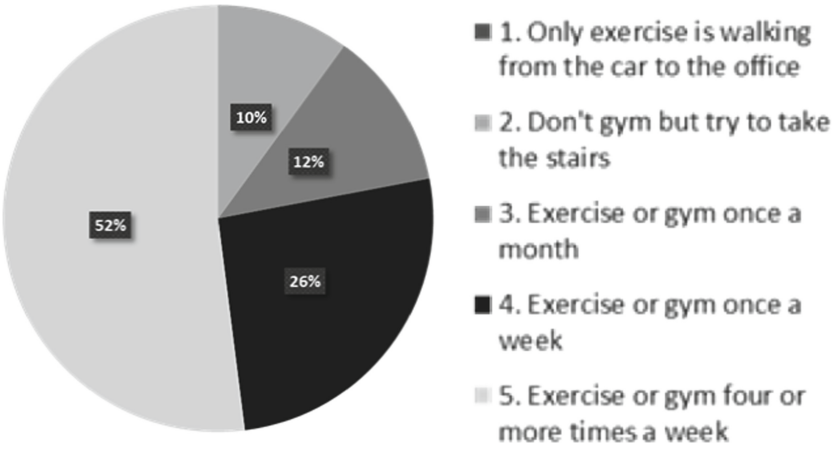

Fig. 4. Members' exercise routine

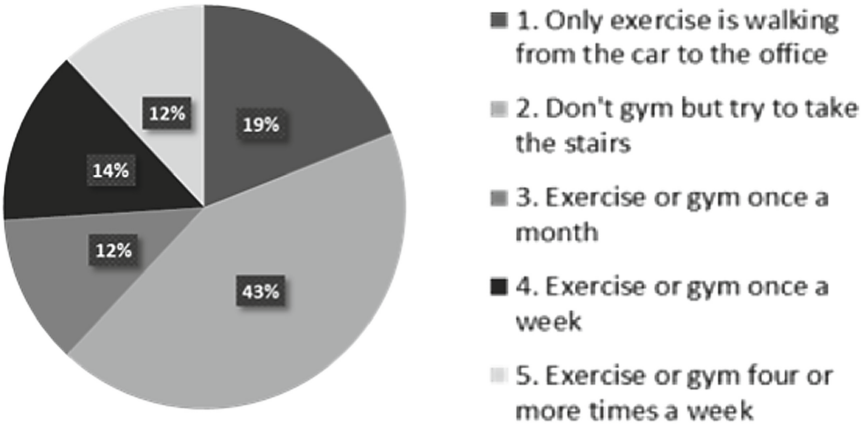

Fig. 5. Non-members' exercise routine

If You Exercise, Why Do You Exercise? If Not, Why Don't You Exercise? Respondents could provide multiple answers to this question. We received 74 responses from members. All but one gave reasons for doing exercise. Forty-five percent (45%) of responses were members. All but one gave reasons for doing exercise. Forty-five percent (45%) of responses were "to keep fit and healthy". The next most popular reasons were "weight loss" and "to look good" (12% each). In the "Other" category reasons such as "to test myself" and "it was recommended by my doctor" were mentioned. The one member who does not exercise said the reason was lack of time.

Fifty non-members responded to the question – 29 said they do not exercise. Twenty-three of these (79.3%) claimed that they had no time, while 13.8% admitted laziness. The remaining participants said they have commitment issues or that they are already fit. Twenty-one non-members said they do exercise. Thirteen (59.1%) do it "to stay healthy". Two responses each were recorded for "managing stress levels" and "because I play sport".

This question has uncovered two key outcomes: (1) people, whether on an activity rewards programme or not, want to be fit and healthy; and (2) time is the biggest barrier to exercising.

Forty-one participants in the non-member group responded to this question giving 134 responses. These participants also named 18 different groups of health conditions. Of the responses, 14.5% included "heart disease" as a condition that could be positively affected by exercise. "Diabetes" appeared in 13.7% of the responses and "cholesterol" in 12.1%. There is not a considerable difference in the knowledge about health conditions that can benefit from exercise. Both groups recognised that exercise is important and plays a positive role in their health.

Choose ALL of the factors listed that motivated you to join your active rewards programme.

Member Responses. Respondents had to choose between the eight factors of the Octalysis Framework listed in Sect. 2.3. All fifty respondents answered. "Development and Accomplishment" was the most selected reason for joining an activity rewards programme, selected by 70% (35 participants). The second and third most selected options were "Social Influence and Relatedness" (30%) and "Loss and Avoidance" (24%). This could be related to peers comparing steps, calories burned, etc. in social situations, as well as to the fact that on activity rewards programmes, one could miss out on discounts, points and status if the required number of activities are not completed.

Non-member Responses. We first asked the non-members if they had heard about rewards programmes such as Active Dayz. More than half (56%) said they had. We asked all of the non-member respondents which of the eight factors would motivate them to join. Fifty-nine percent (59%) chose "Development and Accomplishment", while "Epic Meaning and Calling" and "Empowerment of Creativity and Feedback" were each selected by 34%. We can link this to the earlier outcome that non-members do not exercise as much as members, and they may want to be empowered or require feedback on whether their exercise is done correctly and is not a waste of their time. Ten percent said outright that they would not join an activity rewards programme.

6 Discussion and Conclusions

This paper aimed to understand which motivational factors in gamification will encourage people to exercise. We investigated four sub-questions. We next provide the answers to each, highlighting the lessons learnt. Firstly, we asked *how active people on gamified health programmes are versus people who are not.* The findings show that those on activity rewards programmes are more than twice as active as those who are not. We can conclude that these programmes are beneficial in improving healthcare. These findings are in line with previous studies who found that gamification of health programmes positively influenced users' emotional experiences and as a consequence improves their self-esteem [21, 22]. Furthermore, it supports Marshedi's [22] finding of gamification motivating users to adapt their health habits for the better. However, it has been shown that users might lose interest in the gamification aspects over time [23]. A key outcome from non-members are that time is a significant barrier to exercising.

Secondly, *do people who are on gamified health programmes care more about their health than those who are not?* The answer is yes, they are more proactive in checking up on their health. Because they will be more likely to identify issues related to their health sooner, they will be more likely to take preventative measures. Members are incentivised with rewards for completing tests, which could be the reason they have more check-ups with a doctor than the non-members. This result could mean that health conscious people are more likely to sign up for these programmes, but the answer to the next question contests this.

Thirdly, do people who are on gamified health programmes know more about health issues than those who are not? This answer is no. The respondents in the non-members group could name nearly as many health conditions as the members. The percentage of each condition listed was very similar between the two groups. The key outcome of this question is that even though people know how beneficial exercise is, it is not enough of a motivation to ensure that they exercise. Added benefits are required to ensure that they do. Some people openly claimed they were lazy and that they are okay with that, despite knowing the health risks.

Finally, what factors derived from the Octalysis Framework will motivate people to exercise and take care of their health? "Development and Accomplishment" was the most chosen option for both groups. This finding is in line with the findings of a systematic review of gamification in e-Health [24] who found that the gamification elements that were most often used were "feedback, rewards, progression and social features". Another key outcome was that members and non-members need to be motivated differently. The members want to ensure they do not lose their points and statuses – an element of fear might drive them. The social aspect is also important to them, and it will be beneficial to add concepts that encourage competition or challenges between friends. This outcome supports the research of Roa and Pandas (cited in [24]) who reported that "developing positive social relationships and promoting a feeling of integration are the key social benefits noted for gamification". For the non-members, it is more important to receive feedback and be empowered. Another important factor for this group was "Epic Meaning and Calling", which could be attributed to the fact that they want to know these goals are achievable. It should not waste their time, and the

rewards should be immediate and notable. They have to be convinced that the value justifies the effort or money invested.

Health insurance providers and games designers can use the above results when designing programmes or apps that are aimed at making people more active. As a starting point, they should acknowledge that different kinds of users will be motivated by different factors and their products should cater for all.

This study was conducted in one African country among people who are customers of health insurance organisations. The results thus apply to countries where people use such health assurance. The adoption of health insurance programmes is influenced by the socio-economic context and often poor people working in the informal sector do not subscribe to health insurance at organisations with rewards programmes such as those investigated here [25]. Research therefore needs to be done to determine how, for example, community health insurance programmes that are aimed at low income workers can incorporate gamification to attract users.

References

1. Lee, C., Lee, K., Lee, D.: Mobile healthcare applications and gamification for sustained health maintenance. Sustainability **9**, 772 (2017)
2. Krishna, C.: Relationship with hearts, 'on the rocks' (2017). https://www.news24.com/SouthAfrica/Local/South-Coast-Fever/relationship-with-hearts-on-the-rocks-20170208. Accessed 17 Aug 2017
3. Henderson, D.: Exercise, heart disease and high blood pressure (2015). http://www.netdoctor.co.uk/healthy-living/a1168/exercise-heart-disease-and-high-blood-pressure/. Accessed 10 Sept 2017
4. Zichermann, G., Linder, J.: Game-Based Marketing: Inspire Customer Loyalty Through Rewards, Challenges, and Contests. Wiley, Hoboken (2010)
5. Abu-Dawood, S.: The cognitive and social motivational affordances of gamification in E-learning environment. In: The 16th IEEE International Conference on Advanced Learning Technologies, pp. 373–375 (2016)
6. Herzig, P., Ameling, M., Schill, A.: A generic platform for enterprise gamification. In: Proceedings of the 2012 Joint Working Conference on Software Architecture (WICSA) and European Conference on Software Architecture (ECSA), pp. 219–223. IEEE (2012)
7. Time.com.: Pokémon Go makes people walk 2,000 more steps (2017). http://time.com/4695726/pokemon-go-walking-steps/. Accessed 25 May 2017
8. Chou, Y.K.: Actionable Gamification: Beyond Points, Badges, and Leaderboards. Octalysis Group, Fremont (2016)
9. Chou, Y.K.: Top ten gamified healthcare games that will extend your life. Gamification & Behavioral Design (2017). http://yukaichou.com/gamification-examples/top-ten-gamification-healthcare-games/. Accessed 10 Sept 2017
10. Goodhue, E.: What is Gamification? (And How Does It Differ From Gaming?) (2016). https://elearningindustry.com/what-is-gamification-differs-gaming. Accessed 25 May 2017
11. Nelson, M.J.: Soviet and American precursors to the gamification of work. In: Proceedings of the 16th International Academic MindTrek Conference, Tampere, Finland, pp. 23–26 (2012)

12. McEachern, A.: A loyalty program becomes a retention hub (2017). https://blog.hubspot.com/marketing/loyalty-program-retention-hub#sm.000002ffzijwp8d1ipz3uejnvqcuw. Accessed 25 May 2017
13. Matthews, K.: Why gamification works: how brands are marketing with fun (2017). http://www.convinceandconvert.com/social-media-case-studies/why-gamification-works-how-brands-are-marketing-with-fun. Accessed 10 Sept 2017
14. Eisenhauer, T.: The psychology of gamification in the workplace. Axero Solutions (2016). https://axerosolutions.com/blogs/timeisenhauer/pulse/390/the-psychology-of-gamification-in-the-workplace. Accessed 20 Apr 2017
15. Chou, Y.K.: Octalysis: complete gamification framework. Gamification & Behavioral Design (2017). http://yukaichou.com/gamification-examples/octalysis-complete-gamification-framework/. Accessed 25 May 2017
16. World Health Organization: Global recommendations on physical activity for health (2010). http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/. Accessed 17 Aug 2017
17. Fontaine, K.R.: Physical activity improves mental health. Phys. Sports Med. **28**(10), 83–84 (2000)
18. Neff, K.D.: Self-compassion, self-esteem, and well-being. Soc. Pers. Psychol. Compass **5**(1), 1–12 (2011)
19. Multiply: What is active dayz? (2017). https://www.multiply.co.za/engaged/get-well/get-active/active-dayz/. Accessed 1 Nov 2017
20. Minnie, N.L.: Everything is connected. Presentation Delivered in Centurion, RSA, October 2017
21. Lentelink, S.J., Spil, A.A.M., Broens, T., Hermens, H.J., Jones, V.M.: Healthy weight game: lose weight together. In: Proceedings of the 2nd International Conference on Serious Games and Applications for Health, pp. 1–8. IEEE (2013)
22. AlMarshedi, A., Wills, G.B., Ranchhod, A.: The wheel of Sukr: a framework for gamifying diabetes self-management in Saudi Arabia. Proc. Comput. Sci. **63**, 475–480 (2015)
23. Munson, S.A., Consolvo, S.: Exploring goal-setting, rewards, self-monitoring, and sharing to motivate physical activity. In: Proceedings of the 6th International Conference on Pervasive Computing Technologies for Healthcare, pp. 25–32. IEEE (2012)
24. Sardi, L., Idri, A., Fernandez-Aleman, J.: A systematic review of gamification in e-Health. J. Biomed. Inform. **71**(July), 31–48 (2017)
25. De Allegri, M., Sauerborn, R., Kouyaté, B., Flessa, S.: Community health insurance in sub-Saharan Africa: what operational difficulties hamper its successful development? Trop. Med. Int. Health **14**(5), 586–596 (2009)