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To Gamify or Not to Gamify? Gamification in Exercise Applications and Its Role in Impacting Exercise Motivation

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Abstract

Gamification and different exercise applications have become increasingly popular in recent years. The common purpose of gamification is to enhance one's motivation and engagement to certain activities. Gamification has been commonly understood as the use of game elements in non-game context. In this paper, we propose a divide between the process and the experience of gamification. This paper is the first to propose such division and the results demonstrate its necessity. Gamification exists also in many exercise applications. The purpose of this study is to explore how the use of an exercise application affects users' exercise motivation and behaviour by concentrating especially on the role of gamification in terms of these effects. Empirically, the study is based on 11 qualitative interviews. The results show that the use of an exercise application can enhance the awareness of one's physical activity and progress, and in many cases it can also increase one's motivation to be physically active. Gamification is found to have potential impact on exercise motivation, although individual differences occur.

Keywords: Gamification, Exercise application, Sports technology, eHealth, Motivation, Process of gamification, Experience of gamification

1 Introduction

Games have been a part of human life for ages. Traditionally they have been played for entertainment and relaxation, as they offer a possibility to escape the rules of ordinary life. Games have features that make playing fun and enjoyable, but they can also include more goal-oriented features that can support, for example, development of new skills (Mitchell, 2012). Indeed, during the recent years, games have been used increasingly for developing skills that are needed outside the game or for some other more serious purpose like promoting physical activity (Kari, 2014). It has also become very popular to implement different game-like elements outside the gaming context and to create gameful experiences for the user (Hamari, Koivisto & Sarsa, 2014b). These kinds of actions are typically called *gamification*.

As the interest towards gamification has grown, it has become a subject of growing interest in academic research as well (cf., Hamari, Koivisto & Pakkanen, 2014a; Hamari et al., 2014b). However, there seems to be a dearth of studies on gamification in the context of health and exercise (Hamari et al., 2014b). This is obviously a severe shortcoming. As the benefits of physical activity to health and well-being are well established (e.g., Lee et al., 2012; Warburton, Nicol & Bredin, 2006), it is important to study how gamification is experienced and could be better utilized in this context.

In order to fill the aforementioned research gap regarding gamification in the context of health and exercise, the purpose of this study is to explore how the use of an exercise application affects users' exercise motivation and behaviour by concentrating especially on the role of gamification in terms of these effects. For example, does gamification actually have a positive or a negative effect on exercise motivation and behaviour and how do its effects relate to those of other motivational and behavioural antecedents. In the context of this study, exercise applications are regarded as mobile applications that can be used to track and measure physical activity. The study is explorative in nature and is carried out by using qualitative research methods. The qualitative data is based on 11 interviews regarding the topic and actual experiences of using the Suunto Movescount application.

The results of the study can benefit several actors. The vast number of exercise application developers can utilize the findings in designing the applications and in the process of gamification. Thus, the applications can be made more appealing to the users and can perhaps motivate them to increase physical activity. In this way, the results also pose value for the public health sector, as there is a great need to find new solutions to promote the physical activity levels.

The paper consists of the following sections: After the introduction, the background is presented. These are followed by the methodology and the results sections. We then discuss the results in the conclusions section. Finally, the limitations and future research are presented.

2 Gamification and Exercise Motivation

2.1 Definition of Gamification

The term gamification, originally gameification, has been presumably used since 2008 (Huotari & Hamari, 2012) but was first defined by Deterding et al. (2011, p. 9) as the *"use of game design elements in non-game contexts"*. Following this definition, gamification simply refers to implementing game elements to different surroundings, tasks, software, hardware, and other targets that are not games. Compared to Deterding et al. (2011), Huotari and Hamari (2012, p. 20) emphasize the experiential nature and goals of gamification, as they define it as *"a process of enhancing a service with affordances for gameful experiences in order to support the user's overall value creation"*. According to Ziesemer, Müller and Silveira (2013) the definition of

gamification should not be solely restricted to the use of game-like elements, as all users are not aware of all game-like elements and have distinct knowledge and motivation about gamification. Ziesemer et al. (2013) see gamification to cover also those gameful experiences of the user that do not arise from pure gamified elements.

Considering these prior definitions, it seems that gamification can be understood both as a process and an experience. We do not suggest that one of the presented definitions would be better or worse than another but rather suggest that when discussing gamification, this difference should be noted. Thus, we propose that when discussing about gamification, there should be a divide between the *process of gamification* and the *experience of gamification*. The *process of gamification* is following more the definition by Deterding et al. (2011) and concerning the intentional use of different methods to gamify some certain aspect of use. On the contrary, the *experience of gamification* is following more the definitions by Huotari and Hamari (2012) and Ziesemer et al. (2013) and concerning the gameful experience of the user.

Based on the above, we propose the following definitions: We define the *process of gamification* as '*using a set of activities with the aim to implement game elements to non-game context*' and the *experience of gamification* as '*a use experience in non-game context that the user perceives as gameful*'. The common purpose of the *process of gamification* – as we define it – is to create more gameful and enjoyable user experiences, and thus motivate the user to behave in desired ways (Deterding et al., 2013). In other words, the *process of gamification* aims to arise an *experience of gamification* in the user. However, the *experience of gamification* can also emerge from non-gamified features, as our empirical result will demonstrate.

During the past years, the *process of gamification* has increased tremendously in several different fields, one such field being the sports and wellness industry. There are several different ways how to directly gamify physical activity and exercise applications (Zuckerman & Gal-Oz, 2014). Common ways of gamification in exercise applications are related to such aspects as social influence, scores, and competition. Many applications also have more indirect ways of gamification, which can be difficult for the user to identify as gamification (Ziesemer et al., 2013). Previous studies have suggested that gamification can have a positive effect on motivation in general, but differences occur both in individual level and between different solutions (e.g., Fitz-Walter, Tjondronegoro & Wyeth, 2012; Hamari et al., 2014b). Similarly, according to Zuckerman and Gal-Oz (2014), previous studies concerning the effects of gamification on motivation towards physical activity have had contradicting findings.

2.2 Utilizing Gamification to Affect Exercise Motivation

Motivation is an important driver and an explaining factor behind behaviour (Deci & Ryan, 1985; Ryan & Deci, 2000a). The orientation (type) and level (amount) of motivation can vary greatly between individuals and the target behaviours. The type of motivation concerns the "*underlying attitudes and goals that give rise to action*" (Ryan & Deci, 2000a, p. 54). Most typically, the concept of motivation is distinguished between intrinsic and extrinsic (or internal and external) types of motivation. Intrinsic motivation refers "*to doing something because it is inherently interesting or enjoyable*" (Ryan & Deci, 2000a, p. 55). Intrinsic motivation is probably the most important single factor reflecting the positive potential of human nature. Still, maintaining and enhancing this inherent propensity requires supportive conditions, as it can be disrupted by different non-supportive conditions (Ryan & Deci, 2000b). The concept of intrinsic motivation is often compared to extrinsic motivation, which refers to "*doing something because it leads to a separable outcome*" (Ryan & Deci, 2000a, p. 55), i.e., the persons acts because of external prods, rewards, or pressures. Extrinsic motivation also has differing degrees of relative autonomy that reflect the level of external control and self-regulation (Ryan & Deci, 2000a).

As mentioned earlier, the common purpose of the *process of gamification* – as we define it – is to create gameful and more enjoyable user experiences and thus, motivate the user to behave in desired ways (Deterding et al., 2013). Motivating is conducted through the use of game elements, that is, the aim is to utilize the positive aspects of games in generating gameful experiences and thus, affect the motivation. Gamification can be an effective strategy to influence the user's behaviour and use of an application such as mobile application (Law, Kasirun & Gan, 2011). Gamification can also have a positive effect on motivation in general, but differences occur both in individual level and between different solutions (e.g., Fitz-Walter et al., 2012; Hamari et al., 2014b). According to Knaving and Björk (2013), the *process of gamification* is often focused to certain elements as a separate layer from the main activity and thus, although commonly used as means to increase the intrinsic motivation, in many cases it mainly enhances the extrinsic motivation (Knaving & Björk, 2013). Extrinsic motivations, in turn, have been shown to reduce the intrinsic motivation (e.g., Cameron & Pierce, 2002; Deci, Koestner & Ryan, 1999). In other words, if the user centres the attention at the game elements only, it can move the user's focus off the behaviour itself and hinder the development of intrinsic motivation. However, in the absence of intrinsic motivation, generating extrinsic motivation can promote the behaviour. Gamification can generate extrinsic motivation, especially if it fosters the feelings of autonomy and competence (Knaving & Björk, 2013).

Previous studies have suggested that sports technology can be utilized in motivating people towards physical activity (e.g., Ahtinen et al., 2008; Bravata et al., 2007), and that the use of sports technology and feedback can increase the probability of motor learning and skill acquisition (Liebermann et al., 2002). Mobile smart phones are widely adopted and thus, a good platform for exercise and well-being related applications. Previous studies have shown, for example, that augmented feedback from a mobile exercise application during an exercise session can promote physical activity (Giannakis, Chorianopoulos & Jaccheri, 2013). According to Ryan & Deci (2000) social behaviour can increase the perceived communality and increase motivation, and Ahtinen et al. (2009) have found that this also applies in the context of physical activity. However, the role of social context seems to be two-fold in the use of sports technologies. When the use is mainly utilitarian, social context has a less significant role (Makkonen et al., 2012a), but when the use is mainly hedonic, the social context can be an important factor (Moilanen, Salo & Frank, 2014). Previous research (e.g., Kari & Makkonen, 2014; Makkonen et al., 2012a; Makkonen et al., 2012b) has shown that the reasons behind the use of different sports and wellness technologies are various and that they can be both hedonic and utilitarian. Thus, depending on the used sports technology, the elements that increase motivation can be different.

3 Research Method and Data Collection

Qualitative research was selected as the research method, as the aim was to understand phenomena from the point of view of the participants and to find out significant experiences of individual persons – something that would have been difficult to capture and understand by using quantitative methods (Myers, 2007). Qualitative research involves the use of qualitative data, such as interviews, to understand and explain social phenomena (Myers, 2007). It has been widely used in many fields and disciplines, including information systems, using a variety of well-established approaches, methods, and techniques (Myers, 2007). Qualitative research aims to understand people and their sayings and doings as well as the social and cultural context they live in. The goal is to understand real life and find new knowledge. One of the key benefits of qualitative research is that it enables the researcher to see and understand the underlying contexts in which actions happen and decision are made (Myers, 2013).

To collect the data, we chose interviews as the data collection method. Interviews are seen as the most common and among the most important qualitative research data gathering tools (Myers & Newman, 2007). Thus, semi-structured interviews were chosen for this study. They are the most common type of qualitative research in information systems (Myers & Newman, 2007). Semi-structured interviews typically include a pre-formed structure but an incomplete script, leaving room for the researcher to go deeper (Myers & Newman, 2007). The planning of and carrying out the interviews was conducted following set guidelines (Guest, Bunce & Johnson, 2006; Myers, 2013; Myers & Newman, 2007). For the interviews, we developed the mentioned pre-formed structure (Appendix A). Following Myers and Newman (2007), the structure included the opening, the introduction, key questions related to certain themes, and the closing. The thematic structure of the interviews consisted of sections regarding the earlier experience of sports technology and physical activity background, followed by a focus on the selected exercise application. The themes focusing on the exercise application consisted of sections on taking the application into use and using it, its effect on exercise behaviour, gamification in the application, the application's social features, and usage experience of the application.

In selecting the participants for the study, we used certain criteria. The person was considered as an appropriate candidate for the interview if he or she: 1) was a physically active adult but not an athlete nor a completely physically inactive person, 2) doing the kinds of exercises that could be measured with the selected application, 3) owned a mobile device with either Android or iOS operating system (to be able to use the selected application). To recruit the participants, we used the snowball sampling approach (Patton, 2002). We began by searching persons that matched the set criterion and then suggested them with the possibility to participate in the study. We asked the selected participants to provide information on further possible participants and then repeated this.

Before the interviews, the study participants used the selected exercise application Suunto Movescount. We selected Movescount for the following reasons. First of all, it has a low threshold to start using, as it is free of charge and it can be used with a mobile device on both iOS and Android platforms. Thus, it was available to all participants. In addition, the application can be used to measure different sports, and it includes various social features such as sharing one's exercise data (c.f., Movescount, 2015). Thus, it provided a variety of possibilities regarding the use for the participants. It also has a connected web-service where the exercise data can be stored and analysed in more detail. The exercise data compatible with the Movescount web-service can be measured directly by the mobile device or alternatively by using a Suunto sports watch. However, as the focus of the study was on the mobile exercise application, the participants were not using other Suunto products simultaneously. Also, we did not place any restrictions for the participants regarding the type or duration of physical activity during which to use the application, as we wanted the use to be as normal as possible for the participants. The Movescount mobile application in itself does not possess many explicitly added game elements, mainly some related to the visualization of the data and to the ability to compare own performances. However, as the main aim of the research regarding gamification was to investigate the *experience of gamification*, the selected application suited the study very well.

The participants were instructed to use the application for at least two weeks before the interviews. The two-week period was estimated to be long enough in order to generate multiple usage sessions and for the research participants to be able to evaluate their behaviour and possible changes in it. There were no specific instructions on the amount of exercise or on the use of the application, as the intention was not to control the use, as it might have affected the research results. The participants were

also encouraged to note their experiences on the usage of the application in order to better memorize especially those experiences that arose in the early phases of the use.

The interviews were conducted between May and June 2015. The interviews were conducted about three weeks after the start of the use of the exercise application. The usage periods ranged from two to three weeks. The average length of the interviews was 24 minutes. The interviews were recorded and transcribed for analysis. In addition, three of the participants kept a diary from the use period, which were also used, together with the notes from all the participants, in the analysis.

The method of analysis we chose was thematic analysis. Thematic analysis was used to identify, analyse, and report patterns within the collected data. It is the most widely used analysis method in qualitative research (Guest, MacQueen & Namey, 2012) and allows organizing and describing the data in rich detail (Braun & Clarke, 2006). The analysis of the interview data of this study was guided by Braun and Clarke (2006) and Patton (2002). Following their suggestion (Braun & Clarke, 2006; Patton, 2002), we adjusted the guidelines to fit the research topic and data. The analysis began by familiarizing ourselves with the data and marking all the interesting features of it. The analysis continued by first searching for recurring themes, which were then reviewed in relation to the data. The themes were also defined and named. In doing this, we used the Microsoft Excel program. Finally, the report was produced. As suggested (Braun & Clarke, 2006; Patton, 2002), the analysis process itself was recursive and non-linear, moving back and forth between the different analysis phases. The thematic analysis also aimed to interpret specific aspects and exceptions on the research topic.

4 Results

The sample consisted of 11 research participants. Out of these 11 participants, six were male and five female. The age of the participants ranged from 23 to 53 years, with an average of 28.3 years. As to the mobile platform used, six were using the application on iOS and five on Android. Most of the participants had earlier experience of using sports technology, and they reported that their motivation to exercise emerges from mainly intrinsic factors. However, also extrinsic motivation factors could be identified from the participants' answers, for example, the requirements set by one's work or improving one's personal appearance. Table 1 describes the sample of this study.

	Gender	Age	Operating system
Participant 1	Female	23	iOS
Participant 2	Female	23	iOS
Participant 3	Female	31	iOS
Participant 4	Female	27	iOS
Participant 5	Male	28	iOS
Participant 6	Male	26	Android
Participant 7	Male	27	iOS
Participant 8	Female	24	Android
Participant 9	Male	24	Android
Participant 10	Male	25	Android
Participant 11	Male	53	Android

Table 1: Description of the Sample

Regarding the most important features of the exercise application, almost all of the participants (10 participants) named basic functions as the most important ones. These included, for example, measuring distance or time and calculating speed. Additionally, the map view, routes, and calorie calculation were highlighted. The most interesting feature was the ability to compare one's own exercise sessions between each other.

The tracking of one's own exercises was held as a motivating factor regarding physical activity by almost all of the participants (10). Many (7) of them reported that being able to follow personal development affected the exercise motivation positively. Also, being able to compare information from different exercises was perceived to affect the exercise motivation positively. The participants were also asked whether they could name some features that were missing from the application but would have probably improved their exercise motivation. The most noteworthy features named were a possibility to compare the exercises to some more significant personally set goal, the visualization of not only exercise data but also one's physical development, a more automatic summary of various sports activities (e.g., automatically generated reports), and clear conclusions and instructions instead of just data and numbers. Regarding additional devices that would have supported the use of the mobile exercise application, the participants' views varied. The majority (7) reported that a heart rate belt connected to a mobile application could have improved their motivation to exercise through providing more detailed and comparable information between different exercises and different kinds of exercise methods. While the rest (4) reported that an additional device would probably not have affected their exercise motivation.

The majority of the participants (8) perceived that the use of the exercise application had affected their actual exercise behaviour in a positive way. With the help of the application, they had, for example, experienced additional boost (i.e., support and encouragement) to their exercise. The application had also improved their awareness of own exercise and its effects, which affected the future behaviours. The application was also perceived as a kind of a supervisor operating in the background of one's exercise, which led the person to aim to improve his or her exercising. For some of the participants (3), the application had also created an aim to improve their previous performance results (records), as it was possible to measure and compare them with the application. If the application showed that some specific aspects of the performance were better than on the previous exercises, it caused positive feelings.

However, not all of the participants perceived the changes in their behaviour solely positive. In some cases (3), the effects of the exercise application on one's behaviour were perceived more or less negative or restricting. This was apparent especially during the first usage sessions when one was not yet accustomed to use of the application and it thus caused additional effort, inconvenience, and time loss. These negative experiences were, however, reduced by growth of usage experience. Also, experienced problems and difficulties related to the use of the exercise application formed some negative attitude towards them. Especially the problems caused by software errors were perceived very negatively and caused frustration. These situations were perceived as especially frustrating after an exercise session where the user had experienced positive feelings and would have liked to compare the data of the exercise with previous exercise data.

Regarding the sharing of exercise data, almost all of the participants (9) felt negatively about sharing it in social media. Also the exercises shared by other persons in social media did not cause thrills. However, the sharing of exercise data to others within the web-service connected to the exercise application was perceived more positively, and the service was also considered as a possible platform for sharing thoughts and ideas about exercising. About half (6) also mentioned that seeing other people's exercise data causes sort of a peer pressure to increase their own physical activity.

The meaning of the term gamification was already well known among the participants, but to make sure all had equal understanding, the basic concept was explained to them during the interviews (after first asking about it). This was done to minimize the variability in the results caused by the possible variability of the interpretation of gamification. The majority of the participants (8) were able to name some features of the exercise application they believed had been gamified by the developer. However, the views on which features were believed to be gamified varied between the participants. These included, for example, different ways of visualization, replaying the exercise as a video, possibility to share exercises, and the general possibility to save and compare exercises. The participants were also asked, whether the usage of the application had generated gameful experiences to them. Most (8) of the participants reported to have experienced gamefulness when using the application. These gameful experiences varied between participants and were related to such aspects as the comparison of own exercise data, self-competition, visualizations of exercise data and/or progress, and comparing own routes. In other words, participants' experiences of gamification were diverse – emerging from different elements or features. Interestingly, the *experience of gamification* also emerged from such features and elements that were most probably not gamified by the developer. The varied views between participants on which features were believed to be gamified and which features had generated gameful experiences, supports our division of gamification between the *process of gamification* and the *experience of gamification*.

The majority of the participants (7) perceived that an *experience of gamification* in using the application had affected their personal exercise motivation positively. This was apparent at least on short-term, but as the use period was only two to three weeks, the effects for a longer-term were difficult to be estimated. One subject was unsure about the effects, while three stated that gamification could not improve their exercise motivation as they already had a strong internal motivation towards conducting the exercise itself and getting the pleasure out of it. However, we also found that individual differences occur regarding how gamification can influence the exercise motivation, depending on the user's individual characteristics such as exercise habits, competitiveness, and attitudes towards sports technology.

5 Conclusions

The purpose of this study was to explore how the use of an exercise application affects users' exercise motivation and behaviour by concentrating especially on the role of gamification in terms of these effects. For example, does gamification actually have a positive or a negative effect on exercise motivation and behaviour and how do its effects relate to those of other motivational and behavioural antecedents. The research was carried out using qualitative research methods and the qualitative data was based on real experiences of using the Suunto Movescount application. The results of this research could be used for improving public health, as gamification was found potential in increasing exercise motivation, and exercise is known to be a significant factor of health (e.g., Lee et al., 2012; Warburton et al., 2006).

We also proposed that when discussing gamification, there should be a divide between the *process of gamification* and the *experience of gamification*. We defined the *process of gamification* as 'using a set of activities with the aim to implement game elements to non-game context' and the *experience of gamification* as 'a use experience in non-game context that the user perceives as gameful'. Our results, more specifically the varied views between participants on which features were believed to be gamified and which features had generated gameful experiences, supports our division of gamification between the *process of gamification* and the *experience of gamification*. To our knowledge, this kind of division has not been previously proposed. Yet, our

results confirm its necessity. This can be seen as a significant theoretical contribution and as an important implication for future research.

Regarding the use of an exercise application, we found that using an exercise application can affect the exercise motivation and behaviour. This finding is in line with those of e.g., Ahtinen et al. (2008) and Bravata et al. (2007). Our findings complement previous studies by presenting sources from which this effect stems. The use of an exercise application can increase the exercise motivation of the user as the use increases the awareness of one's own exercise behaviour and its effects and enables the following of one's physical development. Following one's own exercises with the application was mainly perceived as motivating. Also, noticing one's physical development affected the exercise motivation positively and the exercise application helped to more easily observe such development. Some of the users, however, reacted negatively to the problems and restrictions imposed by the exercise application. Also software errors during the use caused negative reactions towards the exercise application.

Prior research suggests that gamification could affect exercise motivation positively. The results of this study support this. In most cases, the *experience of gamification* in using the exercise application affected the user's exercise motivation positively. A new finding from our results is that different people experience gamification in different ways and that personal characteristics such as exercise habits, competitiveness, and attitudes towards sports technology affect how gamification impacts the exercise motivation. Our results also highlight the role of *experience of gamification* in this. Figure 1 summarises the results of the perceived factors affecting exercise motivation.

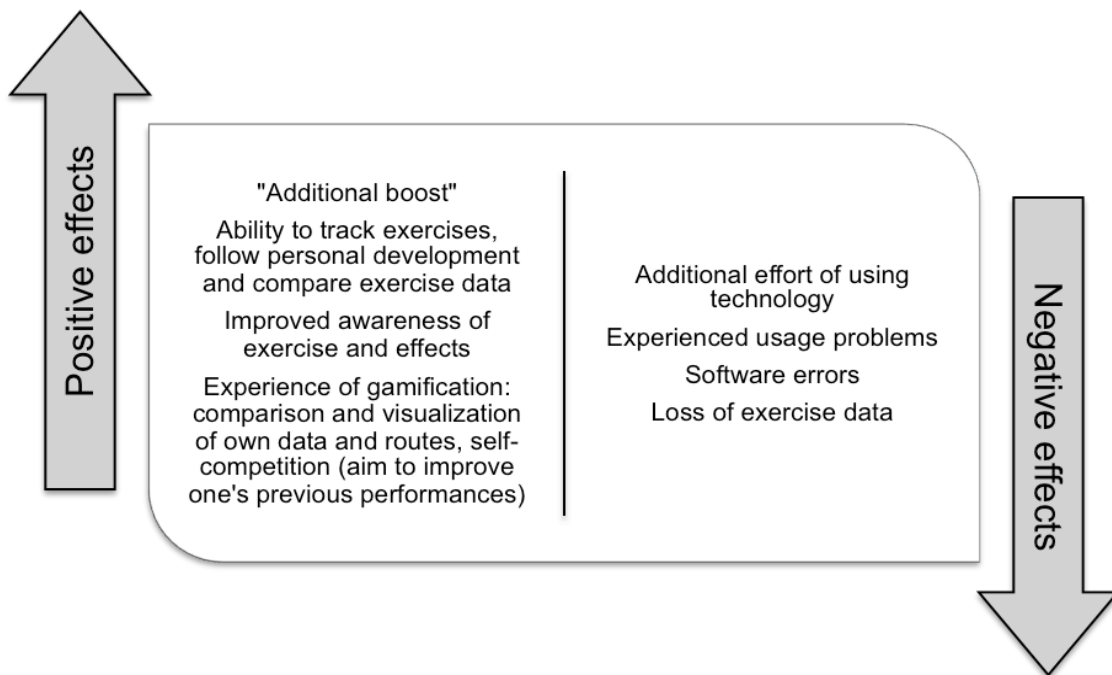


FIGURE 1: The perceived positive and negative effects on exercise motivation and behaviour from using the exercise application.

The concept of gamification was well known among the participants. The majority of the participants could name some features of the exercise application they believed had been gamified i.e., had gone through the *process of gamification*. However, as the views on which features were believed to be gamified varied between the participants, it is not unambiguous whether the developer had really gamified these features. This

implies that the *experience of gamification* is more important than the *process of gamification* in affecting the user's motivation and behaviour. This is an important new finding.

It can be concluded that the *experience of gamification* can affect a user's exercise motivation positively, and it would be valuable for the developers of exercise applications to undertake the *process of gamification* to foster these experiences. Thus, the main practical implication of the study is that exercise applications should have gamified features and the developers should undertake the *process of gamification*. Further, for the *process of gamification* to be successful, it requires the understanding of the users regarding the *experience of gamification* and the developers should aim to achieve this. In other words, understanding the *experience of gamification* should work as a foundation for the *process of gamification* in designing technological products and services with gamified features.

6 Limitations and Future Research

There are few main limitations to the study. First, studies regarding health and exercise behaviour have been known to have the challenge that informants may intentionally bias their responses by reporting their behaviours as more positively than in reality. However, it was emphasized to the participants that the amount of exercise itself is not relevant regarding this study but rather the experiences generated from using the exercise application. The aim was to minimize the possibility that the participants would consciously change their exercise behaviour as a result of participating in the study. Second, the exercise application selected for this study did not possess many explicitly added game elements. Thus, another more gamified application might have provided more information on the effects of adding specific game elements to an exercise application. However, as the main aim of the research regarding gamification was to investigate the *experience of gamification* and its effects to exercise motivation – not to the use of the exercise application, the selected application suited the study very well. Third, although the interviews produced a valuable amount of information, the number of participants could have been higher. Also, it is to be noted that one of the interviewees is significantly older than the other ten. The research, however, offers a good overview of the subject and provides some highly valuable insights. The fourth limitation concerns the relatively short usage period of two to three weeks, which prevents us from making any long-term interpretations.

The study also raises some potential future research topics. First, quantitatively measuring users' physical activity before and after the use of the application could produce a deeper view on, for example, the effects of the use on the amount of physical activity. This could be done by using established questionnaires to measure physical activity. Second, as the exercise data is typically collected automatically on the application, it could be interesting to include that in the analysis. Third, it would be interesting to investigate the long-term effects of using exercise applications with varying degrees of gamified features. Fourth, similar research could be repeated with the focus on some specific type of physical activity or with some other application.

References

- Ahtinen, A., Isomursu, M., Huhtala, Y., Kaasinen, J., Salminen, J., & Häkkinen, J. (2008). Tracking outdoor sports–user experience perspective. In E. H. L. Aarts, J. L. Crowley, H. Gerhäuser, A. Pflaum, J. Schmidt, & R. Wichert (Eds.) *Ambient intelligence* (pp. 192–209). Springer-Verlag: Berlin Heidelberg.
- Ahtinen, A., Isomursu, M., Mukhtar, M., Mäntyjärvi, J., Häkkinen, J., & Blom, J. (2009). Designing social features for mobile and ubiquitous wellness applications. In The 8th International Conference on Mobile and Ubiquitous Multimedia, 22.–25.11.2009 (pp. 1–10). Cambridge: ACM.

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi:10.1191/1478088706qp0630a.
- Bravata, D. M., Smith-Spangler, C., Sundaram, V., Gienger, A. L., Lin, N., Lewis, R., ... & Sirard, J. R. (2007). Using pedometers to increase physical activity and improve health: a systematic review. *The Journal of the American Medical Association*, 298(19), 2296–2304. doi:10.1001/jama.298.19.2296.
- Cameron, J., & Pierce, W. D. (2002). *Rewards and intrinsic motivation: resolving the controversy*. Westport: Greenwood Publishing Group.
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627–668. doi:10.1037/0033-2909.125.6.627.
- Deci, E., & Ryan, R. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Deterding, S., Björk, S. L., Nacke, L. E., Dixon, D., & Lawley, E. (2013). Designing gamification: creating gameful and playful experiences. In CHI'13 Human Factors in Computing Systems, 27.4.–2.5.2013 (pp. 3263–3266). Paris: ACM.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. In The 15th International Academic MindTrek Conference: Envisioning Future Media Environments, 28.–30.9.2011 (pp. 9–15). Tampere: ACM.
- Fitz-Walter, Z., Tjondronegoro, D., & Wyeth, P. (2012). A gamified mobile application for engaging new students at university orientation. In Proceedings of the 24th Australian Computer-Human Interaction Conference, 26.–30.11.2012 (pp. 138–141). Melbourne: ACM.
- Giannakis, K., Chorianopoulos, K., & Jaccheri, L. (2013). User requirements for gamifying sports software. In The 3rd International Workshop on Games and Software Engineering: Engineering Computer Games to Enable Positive, Progressive Change, 18.5.2013 (pp. 22–26). San Francisco: IEEE Press.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? an experiment with data saturation and variability. *Field Methods*, 18(1), 59–82. doi:10.1177/1525822X05279903.
- Guest, G., MacQueen, K. M., & Namey, E. E. (2012). *Applied thematic analysis*. Los Angeles: SAGE.
- Hamari, J., Koivisto, J., & Pakkanen, T. (2014a). Do persuasive technologies persuade? a review of empirical studies. In A. Spagnolli, L. Chittaro, & L. Gamberini (Eds.) *Persuasive technology 2014* (pp. 118–136). Cham: Springer International Publishing.
- Hamari, J., Koivisto, J., & Sarsa, H. (2014b). Does gamification work? a literature review of empirical studies on gamification. In 47th Hawaii International Conference on System Sciences (HICSS) 2014, 6.–9.1.2014 (pp. 3025–3034). Waikoloa: IEEE.
- Huotari, K., & Hamari, J. (2012). Defining gamification: a service marketing perspective. In The 16th International Academic MindTrek Conference, 3.–5.10.2012 (pp. 17–22). Tampere: ACM.
- Kari, T. (2014). Can exergaming promote physical fitness and physical activity?: a systematic review of systematic reviews. *International Journal of Gaming and Computer-Mediated Simulations (IJGCMS)*, 6(4), 59–77. doi:10.4018/ijgcms.2014100105.

- Kari, T., & Makkonen, M. (2014). Explaining the usage intentions of exergames. In The 35th International Conference on Information Systems (ICIS) 2014, 14.–17.12.2014 (pp. 1–18). Auckland: AIS.
- Knaving, K., & Björk, S. (2013). Designing for fun and play: exploring possibilities in design for gamification. In The First International Conference on Gameful Design, Research, and Applications, 2.–4.10.2013 (pp. 131–134). Waterloo: ACM.
- Law, F., Kasirun, Z., & Gan, C. (2011). Gamification towards sustainable mobile application. In 5th Malaysian Conference in Software Engineering (MySEC) 2011, 13.–14.12.2011 (pp. 349–353). Johor Bahru: IEEE.
- Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., Katzmarzyk, P. T., & Lancet Physical Activity Series Working Group. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The Lancet*, 380(9838), 219–229. doi:10.1016/S0140-6736(12)61031-9.
- Liebermann, D., Katz, L., Hughes, M., Bartlett, R., McClements, J., & Franks, I. (2002). Advances in the application of information technology to sport performance. *Journal of Sports Sciences*, 20(10), 755–769. doi:10.1080/026404102320675611.
- Makkonen, M., Frank, L., Kari, T., & Moilanen, P. (2012a). Examining the usage intentions of exercise monitoring devices: the usage of pedometers and route trackers in Finland. In The 25th BLED eConference, 17.–20.6.2012 (pp. 439–453). Bled: Moderna organizacija.
- Makkonen, M., Frank, L., Kari, T., & Moilanen, P. (2012b). Explaining the usage intentions of exercise monitoring devices: the usage of heart rate monitors in Finland. In The 18th Americas Conference on Information Systems (AMCIS) 2012, 9.–11.8.2012 (pp. 1–10). Seattle: AIS.
- Mitchell, B. (2012). *Game design essentials*. Indianapolis: John Wiley & Sons.
- Moilanen, P., Salo, M., & Frank, L. (2014). Inhibitors, enablers and social side winds. Explaining the use of exercise tracking systems. In The 27th BLED eConference, 1.–5.6.2014 (pp. 23–37). Bled: Moderna organizacija.
- Movescount. (2015). Suunto - Movescount. Retrieved 30.4.2015, from: <http://www.movescount.com>.
- Myers, M. D. (1997). Qualitative research in information systems. *MIS Quarterly*, 21(2), 241–242. *MISQ Discovery*, archival version, June 1997, <http://www.misq.org/supplements/>. *Association for Information Systems (AISWorld) Section on Qualitative Research in Information Systems*, updated version, last modified: September 8, 2014.
- Myers, M. D. (2013). *Qualitative research in business and management* (2nd edition). Los Angeles: SAGE.
- Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: examining the craft. *Information and Organization*, 17(1), 2–26. doi:10.1016/j.infoandorg.2006.11.001.
- Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd edition). Thousand Oaks: SAGE.
- Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54–67. doi:10.1006/ceps.1999.1020.

- Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78. doi:10.1037/0003-066X.55.1.68.
- Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*, 174(6), 801–809. doi:10.1503/cmaj.051351.
- Ziesemer, A., Müller, L., & Silveira, M. (2013). Gamification aware: users perception about game elements on non-game context. In *The 12th Brazilian Symposium on Human Factors in Computing Systems*, 8.–11.10.2013 (pp. 276–279). Manaus: Brazilian Computer Society.
- Zuckerman, O., & Gal-Oz, A. (2014). Deconstructing gamification: evaluating the effectiveness of continuous measurement, virtual rewards, and social comparison for promoting physical activity. *Personal and Ubiquitous Computing*, 18(7), 1705–1719. doi:10.1007/s00779-014-0783-2.

Appendix A. Structure of the Interview and Examples of the Questions

1. Describing the research, the use of data, and progress of the interview		
2. Background		
2.1 Demographics	2.2 Used operating system	
3. Physical activity background and previous experience of sports technology		
3.1 Amount and ways of exercising (amounts and sports)	3.2 Prior use of sports technology (used technologies, reasons, goals)	3.3 General perceptions on sports technology (the interesting aspects, appeal, motivational effect)
4. Examined exercise application (Suunto Movescount) and its use		
4.1 Implementation and use (fluency of implementation and use experiences) e.g., <i>“Describe your use of the application as accurately as possible?”</i> <i>“How did you experience different aspects of the use?”</i>		
4.2 Effectiveness (perceptions of the application’s effect on behaviour) e.g., <i>“Did the use of the application affect your actual exercise behaviour and how?”</i> <i>“Which features of the application did you perceive as most motivating?”</i>		
4.3 Gamified features (perceptions of gamification in general and experiences of gamification in the application) e.g., <i>“How do you understand the concept of gamification?”</i> <i>“Did you recognize gamified features in the app or experience gamification?”</i> <i>“Did the experience of gamification affect you exercise motivation and how?”</i>		
4.4 Social features (perceptions of using the social features in the application) e.g., <i>“Are you interested in sharing your own personal performances to others?”</i> <i>“How do you feel about the exercise data shared by other people?”</i>		
4.5 Use experience (use experiences; features that were valued or missed) e.g., <i>“Which features of the application were the most important ones to you?”</i> <i>“Can you name some potentially influential features that were missing?”</i>		
5. Closing		

Detailed descriptions of the key questions are available from the authors by request.