Towards Developing Design Guidelines for Exercise Applications

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ABSTRACT
This article aims at exploring whether the same factors that make Social Network Games (SNG’s) functional, and thus increases the usage, can form the basis of guidelines for exercise applications with the purpose of generating a continued use. I present the results of a survey that together with the important characteristics that makes SNG’s successful and theories of persuasive design form the basis of a set of elements and guidelines when creating exercise applications.

Author Keywords
Application Guidelines; Physical Activity; Exercise; Exercise Efficiency; Mobile Applications.

INTRODUCTION
The importance of exercise and healthy living in order to avoid diseases and early mortality has been known for decades. Numerous studies have been examining attitudes towards and different ways to work out, for example how the motivation can be enhanced [13], general effects of working out with supplements [26], as well as technical solutions for enhancing the amount of exercise [27]. Exergames, a combination of the words “exercise” and “gaming” is a growing field of research, intended to hide workouts in a gaming context in order to attract the users interest [16]. Results indicate that the user is viewing the workout in a different way if given an exercise game instead of a traditional workout situation. The exercise games increased the users willingness to workout since the effort was perceived as less noticeable, and the workout was thus considered less difficult. [27, 28]

New technical solutions, such as smartphones and tablets, have opened up for an ever-growing market of applications, targeting everything from control of the daily calorie intake to sophisticated training programs and workout trackers. Despite the range of applications made to assist the user in order to live healthy, there are few studies regarding important factors in exercise applications. In this report I will examine whether the important factors expressed in previous studies regarding why individuals play SNG’s can form the basis for elements and guidelines for smartphone applications, aiming to improve the exercising experience and motivation. SNG’s are games used on social network platforms such as Facebook [4] and varies from simulation games to card games and arcade games [17]. The goal has been to draw inspiration from a physically passive activity (playing SNG’s) and apply them to an exercise application for smartphones.

It is possible to categorize sports into two groups: those that are usually carried out individually (running, exercise at a gym and skiing for example), and those usually performed in groups or pairs (such as football, bandy and tennis). This report examines how the exercises that are carried out individually, primarily cardio training, can be optimized by distinguishing factors that should be taken into consideration when creating an exercise application.

THEORETICAL BACKGROUND
The work presented in here is mainly related to three areas of research within HCI – exergaming, SNG’s and persuasive design. The following sections are focusing on these three fields.

Exergaming
Change of behavior and attitudes is a central part of many health and physical activity campaigns [25]. A common problem is that individuals start exercising, but are having trouble finding desire and motivation to continue with the new behavior. An attempt to solve these problems has resulted in an increased amount of training games, called exergames, including multiple game releases form Nintendo Wii Fit, Playstation Move and Kinect for Xbox 360, just to mention a few. [11, 27] Well-known examples of exergames for video consoles include golf, dance and bowling. Some games also have a virtual agent that presents the user with a full workout plan with personalized warm up and cool down phases [11].

A large amount of exercise applications is available on the market today. There are two main categories of exercise applications; the ones that are focused on recording and the ones that are focusing on providing the user with workout instructions [16]. The games are often using pressure sensors, inertial sensors or camera systems in order for the game control and feedback to function properly [29]. By utilizing these features, users are able to perform movements that are recorded by the system, and thus allow their whole body to be a part of the game, not just their hands and arms, which used to be the gaming standard. The applications that are intended to assist users during cardio training are often focused on recording, and can, by
tracking the users movements with the smartphones GPS, generate statistics about distance, time and calories burned during the workout. The results from the workout are then presented to the user as numeric values (see example in figure 1). There are few studies that examine how exercise applications could be created in order to encourage continued use, which is the target of this report. It may be easy to facilitate a behavioral change for a short period of time, the problem addressed in this report is rather to uncover the elements that enables the user to maintain the behavior.

Previous research on exergames has a broad spectrum, ranging from examining the acceptance and usability among older citizens [28, 29] to the health benefits for children if given mobile exergames. The children reported that they had forgotten about what happened around them and fully emerged into the game in a study of mobile exergames made by Koivisto. [15] It was found that elderly citizens could improve their balance ability if using exergames as the means of workout [29]. The general results of the studies indicates that the focus on the workout was shifted if the playability was high, meaning the user do not perceive the exercise as difficult or hard work.

If the state of flow is attained, it is possible that the users perceive the game or activity as more thrilling and are more likely to succeed with the action. [10]

Along with the exergames designed for video game consoles, applications for smartphones and tablets have been created with the same goal - increase users’ physical activity by minimizing obstacles such as lack of time and making the exercise more of fun game-play rather than workout [4]. Exercise applications often allow the user to publish their achievements and statistics on social networks where friends and family are able to view and comment the completed training session. Today, this form of sharing is allowed by multiple external clients, which allows an increased amount of information from not only of training results but also results from online tests, articles or scores from smartphone games to be published on social network sites [9].

**Social Network Games**

SNG’s are games with different design and mechanics embedded into social network sites, such as Facebook. Three types of games is reoccurring; simulation games, i.e. Farmville, or card games and arcade games (Texas hold’em and Bejeweled Blitz) [17]. Most of the SNG’s are possible to play on several different devices. Traditional computer games used to be played in solitude, and the players often had to wait for new releases that could be bought from game stores. SNG’s are built into platforms that exist within the technical artifacts that we always carry around, the games are fast, easy to access and can be shared with friends through social networks [24]. SNG’s are played together with individuals within the own social network, and due to this the interpersonal interactions occur not only through the social network in itself, but also through the game [17]. The emergence of SNG’s has allowed social networks to taken the step from being merely a way to communicate into being a place where users can meet virtually and play together. This new form of games has fast gained ground in the users common gaming behavior, and during the few years that they have been on the market this new genre of games has become one of the most popular forms of gaming. [14] Although situated within social network platforms, individuals have different

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1. Clear goals
2. High degree of concentration and focus
3. Loss of self-consciousness
4. Transformation of the sense of time
5. Direct and immediate feedback
6. Balance between ability and challenge levels
7. Feeling of control over the situation
8. Intrinsically rewarding
9. Lack of awareness of bodily needs
10. Absorption into the activity

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**Figure 1. Screenshot from Runkeeper, an exercise application**

It is likely that the children participating in Koivisto’s study experienced what Csíkszentmihályi would describe as flow. Flow is explained as the state when a person is acting with total involvement. When the user is experiencing the flow sensation, the actions are based on internal logic that creates the feeling of little distinction between stimulus and response or past, present and future [5]. Gil-Castiñeira et al. defines 10 important factors that are accompanying the experience of flow described by Csíkszentmihályi:

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purpose and approach to the social aspect of the gaming. Lee and Wohn states that individuals that played with the intent to cooperate with other users are more likely to share their results to the social network site, while users that played solely for entertainment purpose instead focused on advancement [17].

There are numerous studies regarding SNG’s and why individuals continue playing them. Previous studies indicate that the SNG’s are attracting a large audience mainly because they are entertaining, allow users to interact with one another and are convenient [3, 4, 22, 24]. The simplicity is differentiating SNG’s from Massively multiplayer online role-playing games (MMORPGs), which often more often have rich graphics, are complex and demands a high level of collaboration between players, as well as a large amount of time spent on playing the game [2]. SNG’s are often built after the principle most fun in the least amount of time, and this form of games are attracting a broad audience mainly because they are easy to access and are simple to operate [4]. The multiplayer aspect of SNG’s are often turn-based and do not allow users to play against each other in real-time, as is found in MMORPGs [24]. Some users tend to be hesitant towards SNG’s due to security issues. Users have reported unwanted charges upon registration, which resulted in a recommendation to create a separate gaming account, sent out by Facebook. [24] If the user chooses to play in this way, however, the social aspect of the games would suffer, because the user no longer have access to his or her entire network.

Game designers of today are often including social aspects within online games in order to enable knowledge and emotion sharing. It is believed that by allowing the user to socialize with other players, the risk of game addiction and isolation is reduced [23]. Another benefit with social aspects of online games is that the interpersonal relations between players could be facilitated, both online and offline.

**Persuasive Design**

Exercise applications that intend to change the behavior of individuals and create a higher usage, and thereby also an increased amount of exercise performed, can be significantly improved by taking theories regarding persuasive design into consideration. The aim of persuasive design, according to Fogg, is to learn how to automate behavior change by encoding experiences that changes behaviors. By understanding what makes individuals change their behavior, it is possible to create technical solutions that better serves its purpose. In order to explain the factors that affect human behavior, Fogg created a model called Fogg Behavior Model (FBM). The model consists of three aspects: motivation, ability and triggers, which all have to be present in order for the target behavior to occur (see figure 2). It is stated that if the technical solution enhance the users’ motivation but that the action is not simple to perform no behavioral change will take place. Triggers are important because they motivate, enable and remind the user to perform the target behavior. The triggers can take three forms according to Fogg: sparks, facilitators or signals. The sparks have a motivational element, which in an exercise context could mean for example a video or message that inspires the user to workout. Facilitators, on the other hand, are focused on enhancing the users ability to perform the target behavior. In smartphone applications this could mean that an automatic message is send out that tells the user the user that s/he can get new program updates. The message can consist of a link to the update in order to make the target behavior even easier to conduct. Signals are working as reminders and do not have a feature to increase the ability and motivation. An example of a signal presented by Fogg a traffic light, the light changes in order to suggest the appropriate behavior, not to motivate or facilitate any action. [7]

The area being examined in this article is mainly cardio training, which is a form of exercise that can be performed almost anywhere outdoors and do not demand any context specific equipment, except from possibly a pair of comfortable shoes. This means that the majority of the users will have a high ability to perform the target behavior. Therefore, if FBM is applied to an exercise application, the main functions should be focused on well-timed triggers that motivate the users. Davis states that there are two types of motivators; extrinsic (perceived usefulness) and intrinsic (perceived enjoyment) [6]. Exercise applications often present the user with graphs and statistics over previous workouts, which could be seen as extrinsic motivators. The user is presented to their own improvements in a way that is easy to grasp, and h/she may possibly see the useful aspects of both the applications functions and the exercise itself, which may result in a higher level of motivation. One way for exercise applications to target the intrinsic motivators of the user could be to implement triggers that encourage playfulness, for example by making it easy for the users to compete against each other.

![Figure 2. Fogg Behavior Model](image)
**RESEARCH OBJECTIVES**

This paper's goal has been to examine whether ideas about why individuals continue playing SNG’s can be used in order to determine elements and form guidelines for exercise applications. Many researchers have requested context-specific research about behaviors within certain technologies, in line with this report [24]. Due to this, the findings presented here should be of interest to the HCI community.

The focus of the study has been cardio training, mainly running. The reason for this is that it is a form of workout performed by a relatively large amount of individuals. In addition to this, running does not require any special equipment and can be performed practically anywhere outside, which makes this form of exercise easy to perform for a large group of people of different social and economic status.

There have been previous studies regarding console gaming as a means of social interaction and taking ideas from one area and apply to another [10]. However, using the important features of SNG’s to improve exercise applications is something new. It should be of great interest to the designers and creators of this kind of application to raise awareness regarding different ways to enhance further usage.

**METHOD**

The methodology employed in this study consists of a survey, aiming at examining the reason why individuals do not work out. The information conveyed through the survey was then used together with the results regarding SNG’s functional and usable appeal in order to present a set of guidelines aimed at reinforcing exercise applications.

**Survey**

The survey was carried out in the study’s initial phase, and was distributed to the participants online. The survey was published on four different exercise communities and was accessible for the participants from 24th of April 2014 to 29th of April 2014. The information was then compiled in order to examine the reasons why the participants do not work out, as well as what forms of exercise that the participants were performing.

The participants were asked why they do not workout instead of what makes them workout. This can be seen as controversial, as it is investigating a non-behavior rather than what makes the users perform the target behavior. However, Fogg states that a thorough examination regarding why individuals are not performing the target behavior is important in order to create a client that triggers the desired behavior. The reason for this is that the designers need to be aware if the ability, motivation or triggers are lacking in order to create a solution that function properly. [8] Due to this, an initial investigation of why individuals choose not to work out has been done in order to explore if the reasons for not working out is mainly concerning motivational issues, low ability or a lack of triggers. This step has been necessary, since the guidelines for exercise applications presented in this article needs to appropriately address the reasons that are preventing the target behavior.

The reasons expressed as to why the participants do not workout, together with the usable and functional aspects of SNG’s presented by Chen Shen and Ma [4] considered when the guidelines were determined.

**Participants**

The survey was carried out on 100 participants, among whom the majority were 18–34 years old (84%) and out of which 42% reported their highest level of education as being a graduate degree. 38% identified themselves as females and 62% identified as men. (For full demographic information of the survey participants see figure 3.)

**RESULT**

There are a variety of reasons for why people choose not to work out – tight time schedules, a lack of energy and inability to see the point with working out just to mention some. Figure 2 provides a summary of factors expressed in the survey for not working out. It was possible for the participants to choose multiple answers, which is why the number of participants is different from the number of reasons for not working out. Most of the participants were found to perform cardio training or working out at the gym (70%), while 6% stated they do not work out at all. This means that the individuals that participated in the study are well consistent with the potential users of exercise applications aimed at cardio training.

The compilation of the results from the survey shows that the main reasons for the participants not to work out is lack of energy and lack of motivation, while few participants argued that they never fail to workout (7%).

<table>
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<th>ID</th>
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<tbody>
<tr>
<td>LT</td>
<td>Lack of time</td>
<td>29 (15%)</td>
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<tr>
<td>LM</td>
<td>Lack of motivation</td>
<td>34 (18%)</td>
</tr>
<tr>
<td>LE</td>
<td>Lack of energy</td>
<td>32 (17%)</td>
</tr>
<tr>
<td>IP</td>
<td>Injury and/or poor health</td>
<td>30 (16%)</td>
</tr>
<tr>
<td>LI</td>
<td>Lack of interest</td>
<td>18 (10%)</td>
</tr>
<tr>
<td>LEm</td>
<td>Lack of enjoyment</td>
<td>18 (10%)</td>
</tr>
<tr>
<td>LP</td>
<td>Lack of purpose</td>
<td>14 (7%)</td>
</tr>
<tr>
<td>NH</td>
<td>That never happens to me</td>
<td>13 (7%)</td>
</tr>
<tr>
<td>O</td>
<td>Other</td>
<td>0 (0%)</td>
</tr>
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</table>

Figure 3. The 100 participants reasons for not working out (multiple choice question)
THE FUNCTIONAL AND USABLE APPEAL OF SNG’S

Chen et al. acquired three characteristics regarding the functional and usable appeal of SNG’s by using The evaluation grind method (EMG). Seven experts in game design then described each of the three characteristics, and a hierarchical diagram of the upper level and lower level functions of the SNG’s preferences was created. The upper level descriptions are less detailed (instant, simple, exquisite) while lower level descriptions often are concrete requirements (semi-automatic upgrading, integrated with personal digital assistant).

The three factors for SNG’s functional and usable appeal conveyed in the study by Chen et al. was easy and convenient, social and interactive and friendly and lively design. [4]

Easy and convenient is a task related function that enables the usage. Taking motivational theory into consideration, this would be described by Davis et al. as extrinsic motivation, or usefulness [6]. Friendly and lively design is dealing with the graphic elements and the appearance of the client, appealing forms, recognizable culture and rich color match [4].

After reviewing the result regarding SNG’s success presented by Chen et al., four aspects where determined. These were social aspect, playability, progress and activity level and personal constrains.

- **Social aspect** was drawn from the cooperative features presented by Chen et al. In the guidelines presented here it is proposed that the users should be encouraged to communicate with each other within the system.
- **Playability** was included since it is stated that the system should inspire its users to compete against each other, and because it makes the client easier to approach. Playability aspects of exercise applications could be high scores and individual and/or multi-user challenges.
- **Progress and activity level** was developed because it facilitates the system and gives the user instant updates regarding the previous exercises. Seeing the own progresses and improvements in the exercise application should be simplified, advantageously by graphs and statistics.
- **Personal constrains** have been taken into consideration because it makes the client simpler and reduces the amount of thinking that is demanded by the user. Implementing information about workouts for different health issues could be

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<table>
<thead>
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<th>Item</th>
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<td>38</td>
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<tr>
<td></td>
<td>Male</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Other</td>
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<td>0</td>
</tr>
<tr>
<td>Age (years)</td>
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<td>5</td>
</tr>
<tr>
<td></td>
<td>18 – 24</td>
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<td>40</td>
</tr>
<tr>
<td></td>
<td>25 – 34</td>
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<td>35 – 44</td>
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<tr>
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<td>45 – 54</td>
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<td>2</td>
</tr>
<tr>
<td></td>
<td>&gt; 55</td>
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<td>1</td>
</tr>
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<td>7</td>
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<tr>
<td></td>
<td>Looking for work</td>
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<td>7</td>
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<td>1</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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**Figure 4. Demographics from Survey (100 participants)**

- **Gender**: The gender distribution shows a slight preference for females. - **Age**: The majority of participants are in the 18-24 age group. - **Education**: The majority of participants have a high school or undergraduate degree. - **Occupation**: The majority of participants are students or employed.

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- **Personal constrains** have been taken into consideration because it makes the client simpler and reduces the amount of thinking that is demanded by the user. Implementing information about workouts for different health issues could be
suitable in this aspect. If a user has problems with muscle soreness maybe s/he will have problems running longer distances. The application could then suggest workout plans that are apposite for the users specific condition.

**APPROACH**

The survey showed that the main reasons that the participants are not exercising are lack of motivation, lack of energy and injuries and/or poor health. The information conveyed during the survey, together with the learnings from the study made by Chen et al. regarding the usable and functional appeal of SNG’s is the basis of the experimental approach presented in this section. Four aspects inspired by the results from the study by Chen et al. are discussed here; social aspect, playability, progress and activity level and personal constrains. Each of the aspects is described examined within an exercise application context below.

**Social Aspect**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Chatting, helping, making friends, give support, collaboration, ability to create groups</td>
</tr>
</tbody>
</table>

By implementing social aspects into the sport application it is possible to address three of the issues expressed during the survey: lack of enjoyment, lack of purpose and lack of motivation. When being able to communicate with likeminded, the users are being allowed to help each other overcome objectives such as lack of motivation and purpose. The social aspect would primarily target the motivational problems that users may have, and by encouraging communication between users it is possible that the messages that are sent out and discussions that take place are functioning as spark triggers.

Although many forms of cardio training are performed alone, there are possible advantages if social aspects are provided. Previous research indicates that the sociability of games increases the perceived amusement and results in a larger number of sessions played [20]. It is likely that the result would be similar if social aspects where included in exercise applications.

Social features are present in MMORPGs, and often are present in SNG’s as well. The social interactions that are implemented in games ranges from complex compositions where the users are working together towards a mutual goal, often found in MMORPGs, to less complex interactions where the users are able to give each other life in the game in order to make it possible to continue playing, or chatting as is more often found in SNG’s. Regardless how the social aspect is formed, some ways of communicating with the other users needs to be present. If the users are not provided with any means of communicating with each other they are likely to use a secondary client, which changes the user’s focus, and perhaps contributes to a reduction of use.

Social aspects of a sport application could be the possibility of sharing results and statistics to social networks, or be a fully functioning social network within the application itself. However, if a social network is implemented within an application, it demands a higher number of users in order to be perceived as profitable by the user. The reason for this is that social networks require users to contribute with content, and if the content is lacking the social network loses its function [9].

![Social Aspect](image)

**Figure 5. Factors addressed by implementing social aspects**

**Playability**

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playability</td>
<td>Challenging others, explorations, fantasy, captivating, difficulty, awards</td>
</tr>
</tbody>
</table>

The playability element would mainly deal with the problem with lack of interest and lack of enjoyment in workouts, which was expressed in the survey. Both lack of interest and lack of enjoyment can be addressed by utilizing spark triggers, in this case, the spark trigger could for example be an invitation to a competition.

Playability is achieved by creating a client that captivates the user. Malone states that there are three factors that make a computer game captivating: challenge, fantasy and curiosity. It is possible that the same ideas can be applied to sport applications to increase the playability and use, and, by doing this increase the use which in turn could create a change in the behavior of the user. Challenge includes offering multiple levels with different difficulty levels and obvious goals. The fantasy element allows the user to see images of situations and objects, which could result in a higher amount of interest. The images could be of social situations, for example that the user sees himself/herself as someone sought after. A reasonable amount of complexity
is required in order for the users to become curious. If it is too easy, it is possible that the user do not find it challenging enough. [19] Previous studies shows that playability created a sense of total attention, where time and space were forgotten [15]. By allowing the user to achieve such a state through playability, it is possible that the exercise is perceived as less difficult and therefore the usage increases.

Figure 6. Factors addressed by implementing playability

Progress and Activity Level

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progress and activity level</td>
<td>Status, analysis, Provocation</td>
</tr>
</tbody>
</table>

Progress and activity is addressing the problems with lack of interest and lack of purpose mediated in the survey. The progress and activity level would address motivational issues, and the spark triggers could in this case be automatic messages that are sent out to the user whenever a new record has been achieved.

If information about progresses and activity levels are provided the users will likely find it easier to see development and thus can challenge themselves to see further progressions.

The information about progress and activity level is important within sport applications since individuals may find it difficult to continue working out because they do not grasp the results and do not see any great improvements. For this reason, the information provided within the application should be detailed and accurate.

This information should be easy to find within the application and also easy to read. An example is to show diagrams and illustrations instead of plain text.

Figure 7. Factors addressed by implementing progress and activity level

Personal Constrains

<table>
<thead>
<tr>
<th>Element</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Personal constrains</td>
<td>Customize, enabling actions, personalization</td>
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</table>

The reasons for not working out addressed within the feature personal constrains is injury and/or poor health, lack of time and lack of energy. In this case, sparks and triggers are necessary. These sparks could be messages that motivate the user, or information about how to workout when having health concerns. The signals would primarily target the issue of lack of time, and could mean that signals are sent out to the user on times when the user has a gap in his/her schedule.

One reason why individuals are not exercising could be that they do not find time to perform the activity. This could be addressed both by gathering statistics of the days and times that the specific user normally works out, but it could also mean drawing information from the users calendar and automatically present the user with suggestions of times and dates that could be appropriate for working out (e.g. days with no other activity). The suggestions could vary from being descriptions of longer workout sessions, to short recommendations of everyday training advices. By doing this, the use is facilitated and more pliable, which increases the usage [27].

Another reason for not working out expressed in the survey was injuries and/or poor health. By providing the user with exercise programs and advises to avoid injuries the risks can be reduced. The user could also be presented with customized exercises and advices for certain health conditions.

A problem that may be common is that individuals who have not been working out before could be exercising too hard during the first session, resulting in injuries and perhaps a fear towards continued training. Personal constrains is an important feature due to the users’ varying experience and goals. If the client is highly customizable, it is likely that it can appeal to a larger amount of users.

Figure 8. Factors addressed by implementing personal constrains
DESCRIPTION OF THE GUIDELINES

The result presented earlier is highlighting 100 survey participants’ reasons for not working out. The survey indicates that the participants’ main reasons are lack of motivation (18%) and lack of energy (17%). All of the reasons mediated by potential users where successfully addressed within the four aspects that were examined: social aspect, playability, progress and activity level and personal constrains. Listed below are descriptions of the guidelines for exercise applications presented in this article.

Implementation of Social Aspects

Implementing social aspects within a context that requires a large amount of attention to the given activity (i.e. running) requires the designer to consider when the social actions should take place. The system could allow interactions before, during or after the workout session, and for each occasion different types of interpersonal communication is more suitable. For example, it is difficult for individuals that are running to write messages simultaneously during the workout, while this may be an appropriate means of communication before and after the training session. Nike+ has developed a service that allows users to post on Facebook when they are starting a cardio training session. When friends and family like the post the user can hear applause in the headphones. This can be seen both as a form of encouragement and also one kind of communication.

Support of Playability

There are numerous studies that are examining why people behave in a certain way (e.g. [17, 18]). Davis found that the extrinsic and intrinsic motivators affect the willingness to use technical artifacts. The extrinsic motivators are mainly regarding usefulness while intrinsic motivators are concerning enjoyment. Intrinsic motivators are defined as “the pleasure that the individual feel when carrying out a particular activity”. [6]

Previous studies show that users perceive the training as less strenuous if some form of gamification is implemented [26, 22]. One way to create a gaming environment for an exercise application is to allow users to compete against each other, or provide pre-defined goals that need to be met by the particular user. Ahn et al. developed Swan Boat, a system to support interactive running on treadmills. The users are competing against each other by controlling the speed and direction of a boat displayed on the screen of the treadmill. During workout on a regular treadmill without the designed system the users reached average speeds between 4–10 km/h, while running with Swan Boat the users’ speed varied from 10–14 km/h. [1] The results presented by Ahn et al. displays the benefits from working out within a gaming environment, and allowing users to compete against either each other or themselves could provide beneficial results also in cardio training outdoors.

Applying Personalized Triggers

Persuasive design is well established within the field of health, aiming at changing individuals’ behavior. This could mean for example encouraging stop smoking, healthier eating or performing and sustaining exercise programs. [12] One of the most important factors when creating persuasive systems that are that the system should intervene at the right time, in order to inspire the user to perform the target behavior. If signals are sent out at the wrong time, there is a risk that the users are annoyed rather than motivated. Another important feature when aiming at behavioral change is to consider how the user should be allowed to tailor the system after his/her needs and goals. (7, 12)

Fogg states that well timed triggers could facilitate a behavioral change. The triggers that are implemented within the exercise application should be personalized in order to suit the individual user in the most appropriate way. Triggers could, according to Fogg, take the form of alarm sounds, announcements, or text messages. However, if triggers are sent out at a time when the behavior cannot be performed, the user may be annoyed rather than motivated. [7] For this reason, the triggers should be personalized and be sent out on times that are more likely to appeal to the user. It is difficult to determine what times are fitting since schedules and conditions may change, but by gathering as much data as possible about previous exercises and information from the calendar, it is feasible to create triggers that are sent out at a time that is most probable appropriate. Personalized triggers in the case of exercise applications could be that if a user normally performs cardio training on Monday and Thursday evenings, the system sends out automatic messages on that time, reminding the user to perform the desired behavior.

Removed Aspect

Progress and activity level addresses lack of purpose and lack of interest, reasons for not working out that are also found in social aspect and playability. Because progress and activity level do not have any unique characteristics, it is conceivable that this aspect could be removed and the application may still meet the intended purpose.

Reliability of the Guidelines

The guidelines presented here may be questioned since they are based on results from a different area of research. However, it seems that designers of SNG’s are taking ideas of persuasive design into consideration, in order to create solutions that captivates the users. The usable and functional appeal of SNG’s is, according to Chen et al., mainly that they are fast and easy to access, which corresponds well with FBM, where Fogg points out the importance of simplicity in order to achieve the target behavior. In the guidelines presented here, the simplicity is enhanced by suggesting that personal constrains is taken into consideration. It is here suggest that there should be a possibility to compete against each other. If notifications
are sent out to the user when s/he have been challenged it is possible that this functions as a spark trigger, inspire the user to perform the target behavior. This demands fewer functions and algorithms from the system, since fellow users instead of the system send the sparks. The reason for implementing sparks is that these triggers main goal is to motivate the user when the ability already exists [7]. As discussed earlier, cardio training requires a low amount of ability, meaning that the focus instead should be the motivational factors.

Further, personalized triggers are suggested in order to remind the user to use the exercise application, and also to perform exercises. These triggers serve more as a reminder than a motivator, telling the user that the specific activity should be carried out. This form of triggers is often implemented into SNG’s, where notifications are sent to the users when a new game can be played.

Although SNG’s and exercise applications function in a different way, the motivational factors, mainly the triggers, seem to work in a similar manner. It is therefore possible that the motivating factors of SNG’s can be used in order to enhance the usage of exercise applications.

Use-contexts
The presented guidelines recommends to be taken into consideration in the creation of exercise applications, primarily targeting workouts that are carried out in solitude and mainly cardio training. However, the guidelines could also serve as the basis for other applications that are intended to encourage a specific desired behavior. Students who want to develop an exercise application, but who need help and support in the process could consider the elements and guidelines, as well as experienced developers and designers that wants to reflect on how different features can be implemented and why.

Similarly to the use of design patterns, these guidelines are mainly focusing on enlighten why clients are created in a certain way. When an increased awareness of the own design process is achieved, the guidelines presented would serve more as a means of communication with stakeholders rather than a self-reflecting tool.

LIMITATIONS AND FUTURE RESEARCH
There are limitations for this study, leading up to suggestions for future research.

The first limitation is the restricted amount of participants taking part in the survey. Since the survey was based on the answers of 100 individuals, no general conclusions about working out habits can be drawn. It is likely that there are a variety of reasons for why individuals do not exercise that have not been discussed here. The survey, however, gives some indications about factors that may be important to take into consideration when creating an application aiming at changing the users behaviors. Further research should manage a larger data collection in order to possibly receive more diverse statistics.

Since this study lacks a control group it is not possible to say that the guidelines presented in this study would encourage increased usage. To investigate this, an application should be developed in unity with the factors mentioned here, in order to study whether the use is enlarged or not.

DISCUSSION
This study developed a set of guidelines for exercise applications, based on theories of the usable appeal of SNG’s. SNG’s are rapidly gaining ground in the gaming industry, and reasons for the growing popularity could be that they are easy to play, entertaining and do not demand a large amount of thinking, which attracts a large audience [24]. Four aspects drawn from SNG’s were examined, social aspect, playability, progress and activity level and personal constrains. The most common reasons for not working out expressed in the survey proved to be lack of motivation, lack of energy and injuries and/or poor health. All of guidelines for exercise applications presented in this article are addressing the different reasons for not working out, and it is conceivable that implementation of spark and signal triggers can increase the usage.

When creating persuasive solutions it is important to enable the stage flow to be achieved, in order to capture the user and create a situation where s/he is more likely to continue with the desired behavior [5, 10]. All of the 10 factors described by Gil-Castineira could potentially be addressed within the elements presented here.

1. SOCIAL ASPECT
The system should be supporting and encouraging interpersonal communication in some way, in order to allow the messages and discussions to function as spark triggers. The social aspect may also allow the users to help each other overcome obstacles such as lack of motivation, if the communication is carried out in a proper manner. This would possibly result in a higher level of intrinsic motivation as explained earlier by Fogg [7].

2. PLAYABILITY
If the playability is high, the user should achieve a state of high concentration and focus. The user may lose the sense of self-consciousness, time and place disappears and a total absorption into the activity is taking place. The playability aspect should allow competitions and challenges, both individually and against other users, meaning that the intrinsic motivation of the user could be increased. If a user is competing individually, predefined goals and levels should be present in order for the curiosity to increase.

3. PERSONAL CONSTRAINS
Goals, balance between ability and challenge as well as awareness of bodily needs are addressed within the feature personal constrains. By forming the system in this way, the user will feed in control over the situation, which may increase the interest and usage. It is possible that the usage is not interrupted if information about how to exercise
during certain injuries or diseases is present. Within personal constrains, sparks and signals should be present in order to raise the users motivation and serve as a reminder for the action that should be carried out.

Social aspects and playability are important features of SNG’s, and the result presented in this study indicates that these features are equally important in order to encourage the users to perform the target behavior.

Although effectively addressing lack of interest and lack of purpose, the feature progress and activity level have been disregarded and have not been taken into consideration within the presented elements. The reason for this is that lack of purpose and lack of interest is not unique for progress and activity level, but also treated within the factors of playability and social aspect. It is tempting to believe that progress and activity levels are the most important factors when creating a sport application. Here, progress and activity level have proven to be related to the issues lack of purpose and lack of interest. However, lack of purpose can be addressed by implementing social aspects, and lack of interest can be addressed by adding factors that makes the application having an increased playability. The factor progression and activity level do not treat any unique characteristic, and this study thus indicates that it could be possible to create an application without any tracking features or educational features that still meets the issues that were conveyed in the survey. This would mean that the application instead of focusing on numerical values of exercise, like found in Runkeeper for example (see figure 1), encourages a playful situation, where the users are allowed to communicate and help each other to achieve the individually desired behavior.

Taking Runkeeper as an example, the guidelines presented here imply that the users should be given a larger opportunity to compete within the system and additional social aspects. An opportunity to compete may result in a higher level of playability and intrinsic motivation, leading up to an increased usage. If more social aspects, for example possibility to send messages, discuss and comment other users workouts it is likely that the users motivational problems are reduced and the intrinsic motivation increases. Today, no form of personal constrains in the way that is proposed here are present within Runkeeper. By implementing functions as is proposed here, it is possible that the usage becomes less irregular, since the user are provided with information about workouts suitable when injured and receives signals reminding them to workout at appropriate times.

However, it is important to remember that this study did not have access to control groups, and therefore it is not possible to draw any definitive conclusions regarding what would happen to the exercise routines if the users where provided with an application that lacked the feature progress and activity level. The result of this study indicates that the normative ideas about how exercise applications should be created do not necessarily have to be the solution that creates a continuous use of the application. Even though information about distance, calories and speed can add value, this study indicates that an exercise application may be equally useful if social aspects, personalized information and triggers and playability are applied, and not any statistics regarding previous workouts.

It may be seen as provocative to take theories from one area of research and apply them to an entirely different context, and as previously mentioned, it is not possible to say if applications created in the manner that is presented here would result in an enduring usage. However, the guidelines presented here, and the theories conveyed by Chen et al., is built on previous research on persuasive design and mainly intrinsic motivations. Research regarding intrinsic motivators is not specific to either topic, but rather theories of why individuals choose to maintain the use of a specific computer system. That these theories can be applied to both the results presented by Chen et al., and the guidelines for exercise applications presented in this article, indicates that the difference in motivational factors between SNG’s and exercise applications may be less than we think.

Although information systems are sometimes perceived as neutral, they are “always on” and changing the users behavior to some extend [21]. It is important to consider that the changes in behavior that occur may differ between different users. Previous experiences, intentions, goals, contexts and norms may affect the way an individual perceive the system. It is therefor important to create clients that facilitate the desired behavior by using methods that can elicit the desired behavior of as many users as possible.

**CONCLUSION**

I have discussed whether the usable and appealing aspects of SNG’s can be applied to an exercise application for smartphones in order to increase the usage among a larger quantity of users. The study attempts to identify common reasons for not working out, which, together with the elements for SNG’s success presented by Chen et al. has formed the basis for the important elements and guidelines that was determined here. The guidelines intended to motivate a larger amount of exercise, primarily targeting cardio training.

This paper is hopefully giving some insight into the important features of exercise applications could be designed. However, further research is required to ensure that the features presented here is accurate and reliable.

**REFERENCES**


