ANALYSIS OF HAPPINESS RELATED QUALITIES OF MOBILE PHYSICAL
ACTIVITY APPLICATIONS

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ACTIVITY APPLICATIONS

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ABSTRACT

ANALYSIS OF HAPPINESS RELATED QUALITIES OF MOBILE PHYSICAL ACTIVITY APPLICATIONS

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Due to the increase in the number of people choosing sedentary lifestyle, there are efforts to encourage people to be physically active. In that regard, persuasive technology is found to be a promising tool for changing and maintaining physical activity behavior. Owing to advantages such as ubiquity and connectivity, mobile phones are considered to be beneficial for establishing a platform for persuasive technology. Despite the growing number of interventions realized through the creation of persuasive mobile applications, people encounter difficulties in sustaining motivations for physical activity. Although persuasion in context of increasing physical activity has been studied a lot, the literature on mobile applications, which intend to change behavior to be physically active, lacks a study about the qualities of smart mobile applications engaging users through the enhancement of subjective well-being. This thesis explores the qualities of mobile physical activity applications that are associated with happiness, by answering the questions around users' subjective well-being needs and perceptions. The results of literature review together with the qualitative analysis gathered by semi-structured interviews and diary data of 20 people are aimed at presenting product design framework for designers on creating positive user experience that enhance happiness by engaging users with applications to sustain physical activity behavior.

Keywords: Happiness, Subjective well being, Physical activity, Mobile Applications, User Experience

ÖZ

MOBİL FİZİKSEL AKTİVİTE UYGULAMALARININ MUTLULUK İLE İLİŞKİLENDİRİLEN ÖZELLİKLERİNİN ANALİZİ

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Hareketsiz yaşamı seçenlerin sayısındaki artış nedeniyle, insanları fiziksel olarak aktif kılmak üzere ortaya çıkan teşebbüsler bulunmaktadır. İkna edici teknoloji, insanların fiziksel aktivite davranışını değiştirmek ve sürdürmek için umut vericidir. Her an her yerde bulunabilmesi ve her yerden bağlanılabilmesi sebebiyle, cep telefonlarının ikna edici teknoloji için faydalı bir platform olduğu düşünülmektedir. İkna edici mobil uygulamalar aracılığıyla gerçekleştirilen müdahalelerin sayısındaki artışa rağmen insanlar fiziksel aktivite için motivasyonlarını sürdürmekte güçlük çekmektedirler. Her ne kadar ikna, literatürde fiziksel aktiviteyi artırmak amacıyla davranış değiştirmeyi hedefleyen mobil uygulamalar bağlamında çok çalışılmış olsa da, uygulamaların öznel iyiliği artırarak kullanıcıların mobil uygulamalara bağlanmasını sağlayan ürün özelliklerinin anlaşılması konusunda bir çalışmanın eksikliği görülmektedir. Bu tez, kullanıcıların öznel iyilik ihtiyaçları ve algıları çevresinde, mobil fiziksel aktivite uygulamalarının mutlulukla ilişkilendirilen özelliklerini araştırmaktadır. Literatür araştırması ve 20 katılımcının günlük bilgileri ve yarı yapılandırılmış görüşmelerden elde edilen verilerin nitel analizinden elde edilen sonuçları ışığında, bu tez, tasarımcılar için kullanıcıları ürünle bağlayarak fiziksel aktivite davranışının sürdürülebilmesi amacıyla olumlu kullanıcı deneyimi yaratıp mutluluğu artıran ürün tasarım ölçütleri sunmaktadır.

Anahtar Kelimeler: Mutluluk, Öznel iyilik, Fiziksel aktivite, Mobil uygulamalar, Kullanıcı deneyimi

To my family...

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

PA	Physical Activity
PSD	Persuasive System Design
SWB	Subjective Well-being
WB	Well-being
NT	Nike Training
F4R	Fit for Rhythm
ST	Sports Tracker
Fit	Fitocracy

CHAPTER 1

INTRODUCTION

1.1 Problem Definition:

Because being inactive causes negative consequences on human health and well-being (Olofsson, 2010) such as diabetes, heart diseases, cancer, obesity and depression (Warbuton et al., 2006), there are multidimensional efforts to increase physical activity by altering people's attitude and behaviour towards inactivity (C3 Collaborating for Health, 2012). As the number of people who are living sedentary lifestyle grows, attempts to encourage people to perform physical activity are increasing (Biddle et al., 2004).

Technology is seen as a strong tool for intervening health problems. With the idea of using technology to gain people healthy behaviours, persuasive technology (Fogg, 2002), becomes a prominent field of research within human computer interaction. By keeping track of people's activity, suggesting tasks, providing dialogues and social support, persuasive technology is used to coach people to achieve the target behaviour and to decrease their sedentary habits. Therefore, it serves an important function in establishing grounds for interventions (Chatterjee & Price, 2009; Lehto & Oinas-Kukkonen, 2011). As being the medium for the development of persuasive health interventions, mobile technology is favoured since it supports users anytime, anywhere (Patrick et al., 2008). Besides, the potential to develop mobile applications, which provides effective means of intervention, is seen as an advantage (Fanning, Mullen & McAuley, 2012).

Although there are many mobile applications developed on the basis of persuasive technology and which are aiming to encourage people for performing physical activity, findings in the literature show that people encounter difficulties for sustaining motivations despite using mobile applications (Arteaga et al., 2009; Olofsson, 2010). Since emotions establish grounds for the intended behaviour change (Pfau & Dillard, 2002), it is required to explore certain emotions to induce and maintain physical activity. However, the literature lacks studies on exploring happiness in relation to product use, which motivate users to maintain physical activity behaviour and engage them with the products through the enhancement of subjective well-being. Hence, the need to explore perceptions of users about the product qualities, which are associated with happiness, appears.

The approach towards designing mobile applications to induce behaviour change for physical activity requires the understanding of the contributions of various perspectives, which are persuasive technology, psychological needs of people due to subjective well-being, and the experience of people with smart mobile applications. Figure 1 shows the relations in the literature between persuasive technologies, user experience and positive psychology as a guide to the study.
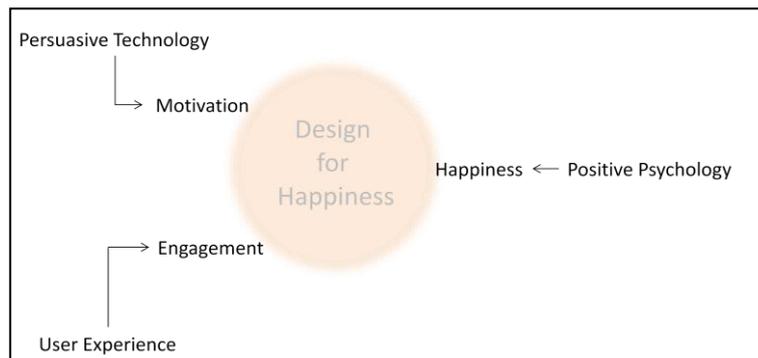
Figure 1. Relations between research areas

1.1.1 Persuasive Technology:

Persuasive Technology is defined as the use of computer-mediated products in order to change people's cognition and behaviours (Fogg, 2002). Due to *mobility* and *connectivity*, mobile devices, especially smart mobile phones, step forward by providing a basis for persuasive technology to increase physical activity (Oinas-Kukkonen et al., 2008; Olofsson, 2010; Liua et al., 2011). Despite the existence of wide range of mobile applications intending to change behaviour for physical activity, by using the techniques of persuasion, people encounter difficulties to sustain motivation for physical activity. In this regard, playfulness of persuasive systems is explained to be an important matter for motivating people to be active (Arteaga et al., 2009; Romero et al., 2010).

1.1.2 Positive Psychology:

Positive psychology is a field dealing with positive human functioning which concentrates on what is subjective well-being (happiness) and how it can be achieved. Happiness, stemming from hedonic and eudemonic well-being, is defined as the combination of emotions and cognition which correlates with having relatively more positive affect than negative affect and living an overall sense of life satisfaction, respectively (Diener, 2000, Ryan & Deci, 2001).

For inducing behaviour change through persuasion, both emotions and cognition of people have to be considered together (Pfau & Dillard, 2002). Although there are studies aiming to alter physical inactivity behaviour by changing cognition of people, it is required to take notice of people's emotions as well. The limited number of studies emphasizes the importance of enhancement of positive feelings to motivate people for change since current applications fall behind sustaining motivation in the long term (Kuru, 2013). The literature lacks a study on what people associates with positive feelings, especially happiness, in connection to their experience with mobile technology products (Arteaga, 2009). By taking positive psychology's aspect about happiness as being the result of hedonic pleasures and satisfaction due to the fulfillment of goals, physical activity carries the possibility to be more motivating based on enhancement of the needs in relation to subjective well-being. Therefore, there is a need to evaluate happiness-related user perceptions to understand the motives that encourage people to continue to perform physical activity.

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1.1.3 Design for happiness:

The interventions for physical activity concentrate on preventing people from sedentary habits which is grounded on problem-driven design. However, for encouraging physical activity, design for happiness (Desmet & Hassenzahl, 2012) which is rooted from possibility-driven design, is likely to provide an opportunity to both engage people with the product and contribute human well-being by evoking happiness.

1.1.4 User Experience:

Apart from pragmatic qualities, qualities beyond instrumental, emotion and affect, and experiential (Hassenzahl & Tractinsky, 2006) play crucial role on the engagement with the product. Besides, experience of users with mobile applications shows some peculiarities based on smartness, mobility and being personal.

1.2 Aim and Scope of the Thesis:

The aim of the thesis was to present source of information for designers by delivering a report on the qualities, engaging users with smart mobile physical activity applications, through enhancement of subjective well-being. With this goal, the thesis investigated mainly 4 areas that are (i.) understanding current interventions for physical activity, (ii.) understanding possibilities about enhancing well-being, (iii.) understanding users' perceptions about their experience with smart mobile applications for physical activity and (iv.) understanding users' experience in relation to well-being by answering four main questions listed in follows and the subquestions given at Table 1.

- What are the perceptions of people while selecting applications for physical activity?
- How do people perceive happiness throughout physical activity?
- What are the qualities of mobile physical activity applications, which evoke happiness?
- Which qualities of mobile physical activity applications are associated with happiness similarly by the people?

1.3 Structure of the Thesis:

This thesis consists of 6 chapters. Chapter 2 explores the interventions for increasing physical activity with respect to use of persuasive and mobile technology. In Chapter 3, with regard to positive user experience, the literature on user experience, positive psychology and design for happiness are examined. Chapter 4 presents the methodology of the study. In Chapter 5, the qualities of physical activity applications, with respect to happiness, are explored and discussions on the proposed model for flourishing subjective well-being in all dimensions of wellness are presented. Final chapter covers the conclusions and contributions of this thesis.

Table 1. Structure of the Thesis

Content	Aim	Questions to be answered	Chapter
Health Interventions	Literature review about physical inactivity	• What are the health interventions for decreasing physical inactivity? • How do health interventions approach to physical inactivity?	2
Persuasive Technology	Literature review about persuasive technology	• How does the field of persuasive technology approach to physical inactivity? • What are the techniques used to change people's physical inactivity behaviour?	2
Mobile Technology	Literature review about mobile technology	• How is mobile technology used in relation to physical activity?	2
User Experience	Literature review about user experience	• How do users interact with smart mobile applications?	3
Design for Happiness	Literature review about design for happiness	• What are the considerations when designing for happiness?	3
Positive Psychology	Literature review in relation to theories of well-being	• What is happiness? • How can it be evaluated • How can it be achieved?	3
Methodology of the field study	Methodology		4
Results	Understanding users' perceptions about their experience with smart mobile applications for physical activity	• What are the perceived qualities of mobile physical activity applications? • What are the aims of usage of physical activity applications?	5
	Understanding users' experience in relation to well-being	• How do people perceive happiness throughout physical activity? • What are the qualities of mobile physical activity applications, which evoke happiness? • Which qualities of mobile physical activity applications are associated with happiness similarly by the people? Is there any happiness	5

		pattern?	
		• How does enjoyment of experience evolve over time?	
		• How does the difference between people's level of physical activity affect their happiness in regard to use of application? Is there any relation?	
		• How does people's general state of happiness affect people's happiness in regard to use of application? Is there any relation?	
Conclusions	Discussion of the framework		6

CHAPTER 2

LITERATURE REVIEW ON CURRENT SITUATION

This chapter begins with a short overview on health interventions developed for increasing physical activity on a macro and micro level. In the second section of the chapter, the considerations for designing persuasive technology products are highlighted. The chapter ends with a brief section on mobile technology products, comprising their qualities and the kind of experience they provide.

2.1 Health interventions

McGraw-Hill Concise Dictionary of Modern Medicine defines health intervention as "an activity undertaken to prevent, improve, or stabilize a medical condition" (2002). With this regard, the efforts towards increasing and maintaining level of physical activity are called as physical activity interventions.

2.1.1 Definition of Physical Activity

Physical activity is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure". It can be grouped into occupational, sports, conditioning, household, or other activities (Caspersen, Powell & Christenson, 1985).

The terms exercise, physical activity and physical fitness are used interchangibly. However, exercise is a subgroup of physical activity that is performed with a plan for an objective; whereas, physical fitness shows the attributes in relation to health or skill (Caspersen, Powell & Christenson, 1985).

2.1.2 Types of Physical Activity

The pyramid of physical activity suggests that the types of physical activity are Fitness related, Leisure, Task Oriented and Residual Movement physical activities (Figure 1). The recommended levels and the types of physical activity depend on various factors and one of them is the age of the person. For children and young people under 18, the activities can be grouped as "games, sports, transportation, recreation, physical education or planned exercise." At this age group, at least 60 minutes of moderate to vigorous-intensity physical activity daily should be accumulated. For adults (18-65), physical activity involves "recreational or leisure-time physical activity, transportation, occupational, household chores, play, games, sports or planned exercise ". Adults are expected to perform either 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity in a week, which are composed of at least 10 minute sessions. For adults above 65, the same applies as long as their physical condition allows to perform physical activity ("Global

recommendations on physical activity on health," 2010).

Physical Activity Pyramid

Fitness Related Physical Activity (FPA)

Leisure Physical Activity (LPA)

Task Oriented
Physical Activity(TPA)

Residual Movement (RM)

Figure 2. Physical activity pyramid (Retrieved from
http://www.who.int/topics/physical_activity/en/)

2.1.3 Facts about Physical Activity

The growth of physical inactivity has triggered countries to take actions against
sedentariness. Being estimated as the main cause of 21–25% of breast and colon cancer,
27% of diabetes and 30% of ischaemic heart disease, due to increase in the level of blood
pressure, blood sugar and overweight (Engbers, 2008), physical inactivity poses serious
health risks (Haskell et al., 2007, 1995; Blair & Connelly, 1996; U.S. Department of Health
and Human Services, 1996). In relation to that, the change in the diet of people which relies
on overconsumption of energy, saturated fat, chloresterol, sugar, salt; despite the decrease
in the expenditure of these is yet another factor for obesity and overweight (WHO regional
publication, 1988).

Physical activity is proven to have positive effects in reducing the health risks of coronary
heart disease and stroke, diabetes, hypertension, colon cancer, breast cancer and depression.
Nearly 35% of the deaths related with cardiovascular diseases, colon cancer and type II
diabetes, can be prevented if population gets physically active (Ruwaard et al., 1997;
Powell et al., 1994).

The efforts to encourage physical activity are developed based on guidelines, transportation
and physical environment policies on a macro level (WHO regional publication, 1988).
Owing to population-ageing, rapid urbanization and globalization, the countries especially
with low and middle income suffer economic burden of coping with sedentariness. In
highly developed countries such as United States, Great Britain, and Australia, most of the
population is found to be overweight, having Body Mass Index greater than 25 (Seidell,
2002). Studies show that, 30% of US, 11% of Dutch population are obese (Visscher et al.,
2001; Haslam et al., 2005). In China, percentage of overweight and obesity among young
population has reached 23.9 (Asfaw, 2006; Popkin, 2006; Popkin, 2008). Only 1/3 of the
population is meeting the required activity level, which is having at least moderate intensity
of physical activity for 30 minutes for at least five days of the week, in western societies

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(Haskell et al., 2007; Pate et al., 1995; EORG, 2003).

2.1.4 Facts about Physical Activity in Turkey

Retrospective studies show that obesity and overweight has an increasing trend in Turkey. In 1990, obesity in adults was measured as 18.6% and by 2000 it became 21.9% (Yamuk, 2005). Today, the prevalence of overweight and obesity has shown a remarkable raise among adults, and estimated to reach as high as 30-40% (Bereket & Atay, 2011).

An independent research conducted to reveal the level of physical activity, perceptions and expectations of people living in Turkey, shows that 3/4 of people are sedentary, and students are placed in the first rank for sedentariness with 72% by measure of occupation. Besides, leisure times are found to be the least active time slots since the perception on recreation does not involve physical activity ("Türkiye toplumunun fiziksel aktivite araştırması," 2010).

2.1.5 Physical Activity Interventions

For encouraging physical activity, there is a need for lifestyle improvement which requires a change in the behavior of exercise, diet or both (Bacon, 2002). Lifestyle improvement is accepted as one of the challenges in gaining people physical activity behavior, because it is related with economic, psychological and social aspects. Expenditures related with physical activity, lacking motivation to maintain physical activity and the desire to sustain in the existing social environment are accepted as the examples of the difficulties people are facing when improving their lifestyles (Orzano, 2004).

Being defined as "systematic approach to increase physical activity in any of these domains: occupation/workplace, transport/active commuting, domestic duties (household chores, yard work) and leisure-time (exercise, recreation, sport)", physical activity interventions concentrate on increasing awareness, education and skill development, influencing physical activity or sedentary behaviour, and influencing the social and physical environment" (Bauman, Schoeppe & Lewicka, 2008). On a community level, the efforts can be mainly grouped as informational, behavioral and social, and environmental policy approaches (Kahn et al., 2002). Informational intervention approaches are based on changing knowledge and attitudes on the benefits of physical activity and a healthy diet, while behavioural and social approaches are based on gaining people the management skills to change and facilitate social environments to develop physical activity behavior. In parallel to that, environmental approaches deal with the formation of physical and organizational environments for physical activity.

Physical activity interventions include but not limited to
- Point-of-decision prompts
- Community wide campaigns
- School-based physical education
- Social support interventions in community settings

- Individually-adapted health behaviour change programmes
- Creation of access to places for physical activity (Bauman, Schoeppe & Lewicka, 2008).

2.2 Persuasive Technology

Persuasion is defined as "human communication that is designed to influence others by modifying their beliefs, values, or attitudes" (Simons, 1976, p.21).

Dainton and Zelly (2010) state thay lay theories of persuasion are categorized as Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986), Cognitive Dissonance Theory (Festinger, 1957), Social Judgement Theory (Sherif & Hovland, 1961) and Narrative Paradigm. For behavior change interventions, theories of Reasoned Action (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980), Planned Behavior (Ajzen, 1991), Elaboration Likelihood Model (Petty & Cacioppo, 1986) and Persuasion Knowledge Model (PKM) (Friestad & Wright, 1994) are commonly used.

The technology designed with an aim to change user attitude and behavior is defined as persuasive technology (Fogg, 2002). The area of *persuasive technology* carries great potential for promoting physical activity and healthy behaviors within the context of health interventions (Oinas-Kukkonen & Harjumaa, 2009; Olofsson, 2010; Lehto & Oinas-Kukkonen, 2011). Firstly mentioned by Fogg (2002) in the literature, technology based web-system, computer, device or mobile application aiming to change people's attitude and behavior is defined as persuasive technology. Behavior is likely to change when a person feels motivated and one's abilities are increased with technology (Fogg, 2009b). With this idea, technology is used to persuade people to induce a behavior, increase motivation and abilities (Fogg, 2009b).

Application of persuasive technology is usually supported with the theories on user intentions and behaviors, which belong to the field of social psychology. However, the theories are generally focused on the acceptance of technology instead of solution-based thinking towards persuasive technology products (Oinas-Kukkonen & Harjuuma, 2009). When designing for behavior change, designers mostly benefit from the frameworks called as Persuasive Technology (Fogg, 2002) and Persuasive System Design (PSD) (Oinas-Kukkonen & Harjumaa, 2008). The frameworks will be examined in follows.

According to Fogg (2002), the use of specific tools, together with media and social actors make persuasion possible. The tools of persuasion are reduction, tunneling, tailoring, suggestion, self-monitoring, surveillance and conditioning.

- Reduction is the use of technology which reduces the effort needed to perform a behavior by suggesting simple tasks that encourage users.
- Tunneling is the use of technology which leads to the sequence of activities in succession.

- Tailoring is the use of technology which is providing user-specific information by considering user's individual characteristics.
- Suggestion is the use of technology offering suggestions at convenient times to increase the likelihood of behavior change.
- Self-monitoring is the use of technology which enables to monitor user's activity to achieve certain goals.
- Surveillance is the use of technology which enables users to observe others' behavior to achieve the targets.
- Conditioning is the use of technology which reinforces users to maintain the behavior or turn behavior into habits.

A systematic approach about development of persuasive technology was presented by Oinas-Kukkonen and Harjumaa (2008) under the name of Persuasive System Design (PSD). In the subsequent studies, the framework, together with other methods from social psychology literature, was used to increase effectiveness of persuasive designs (Räisänen et al., 2010).

Persuasive System Design (Figure 3) provides an understanding about solving the problems of persuasion for behavior change with respect to persuasive context that is based on Intent, Event and Strategy. Accordingly, persuasive system qualities are categorized into four dimensions, which are primary task support, dialogue support, system credibility and social support as shown in Figure 3 (Oinas-Kukkonen & Harjumaa, 2008; Oinas-Kukkonen & Harjumaa, 2009). PSD suggests persuasive qualities that are in line with the persuasive technology tools presented by Fogg (2002) earlier.
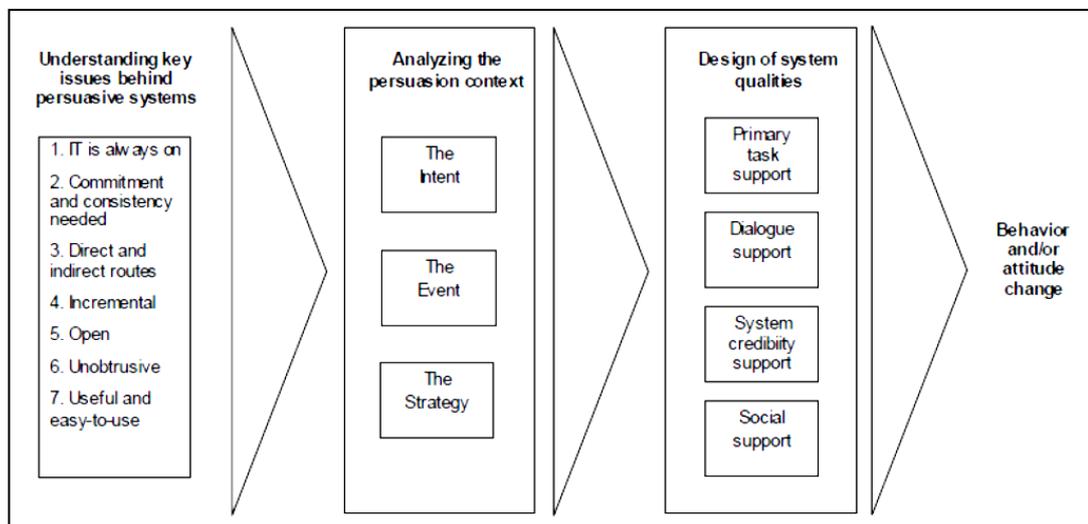
Figure 3. Considerations in Persuasive System Development (Oinas-Kukkonen & Harjumaa, 2009)

In addition to primary task support, presented in parallel to study of Fogg (2002), the dialogue between the user and the technology is important in creating behavior and attitude change in PSD. The feedback given by the system to the users motivates people in achieving goal or the target behavior. Oinas-Kukkonen et al. (2009) group the elements of

dialogue support as follows.

- Praise is using a positive dialogue containing words, images, symbols, or sounds to encourage users for reaching individual goals.
- Reward is providing users with virtual awards in regard to performing the target behavior.
- Reminder is the system reminding the target behavior periodically.
- Suggestion is offering suggestions on the target behavior throughout the process.
- Similarity is motivating people by reminding users of them in a purposeful manner.
- Liking is making the system look and feel appealing to the users.
- Social role is making the system address the users by adopting a social role.

Fogg (2002) states that credibility is a crucial concept, which affects persuasion through computers. Starting from the moment the product is seen, the evaluations on credibility influences the likelihood of persuasion. Fogg defines the types of credibility in computing products as the one related with general perceptions (presumed), the one appearing after the first experience (surface), the one arising as a result of referrals from esteemed sources (reputed) and the one gained over time (earned). Oinas-Kukkonen et al. (2009), by considering the design of the system from motivation and social influence perspective, defines principles of credibility as trustworthiness, expertise, surface credibility, real-world feel, authority, third-party endorsement and verifiability.

- Trustworthiness affects credibility on the basis of providing truthful information.
- Expertise; showing that the system is competent, affects credibility.
- Surface credibility; the first assessment about the system has an effect on credibility.
- Real world feel affects credibility on the basis of providing information that is creating the sense of reality.
- Authority, by referring people in the role of authority, enhances credibility.
- Third-party endorsements affect credibility by building trust through respected sources.
- Verifiability provides credibility regarding the accuracy of the information that can be checked via other sources.

In addition to credibility, the effect of social support in persuasion is also emphasized by Oinas-Kukkonen et al. (2009). Social support principles are;

- Social learning; in which users are more likely to perform the target behavior if they can observe others.
- Social comparison; in which users can compare their performance with others.
- Normative influence; in which users are brought together to perform the target activity.
- Social facilitation; in which users realize that they perform the target behavior with others.

- Cooperation; in which users are motivated for a target behavior by cooperating with others.
- Competition; in which users are motivated for a target behavior by competing with others.
- Recognition; in which users are motivated by being recognized within a group for achieving the target behavior.

In context of PSD, subjectivity of understanding the intent and the event is argued to limit enhancement of strategies (Wiafe, Nakata, Moran & Gulliver, 2011). Because PSD is not aimed at answering the changing needs of users, but facilitates the understanding of persuasive qualities, still there is a need to examine users with respect to use of persuasive technology.

Due to better understanding of the intent and the event, behavioral grid, that is developed by Fogg (2009a) is found to better address the needs towards designing behavior change (Wiafe, Nakata, Moran & Gulliver, 2011). Designing for behavior change requires thinking in regard to the analysis of the surrounders of behavior. In this sense, Behavior Grid which is developed by Fogg (2009a), makes the point about technology to be designed according to the type and schedule of the intended behavior. When five types and seven schedules of behavior come together, there happens 35 ways to consider for designing behavior change. Those strategies are based on the familiarity with the goal, kind and frequency of the outcome behavior and people's willingness about the change (Fogg, 2009a). With that regard, main behavior types are performing new behavior, performing existing behavior, increasing, decreasing or stopping behavior, whereas schedules of behavior are specified as one-time, continuous, periodic, predicted, on-cue, at-will and always performed behaviors (Fogg, 2009a). Still, this model is argued for lacking cognitive aspects of users and not accounting for the transition between states. This deficiency is suggested to be covered by using cognitive dissonance theory together with an analysis of change in users' attitudes and behavior (Wiafe, Nakata, Moran & Gulliver, 2011).

According to the Theory of Cognitive Dissonance, dissonance occurs when there are two or more conflicting cognitions, and people are likely to minimize the discomfort caused by the conflict either by rationalizing the current cognition or changing attitudes, beliefs and behaviors (Festinger, 1957). People tend to change their attitudes and adopt new behaviors or beliefs in order to decrease the conflict (Griffin & McClish, 1991). The feeling of discomfort in holding incompatible beliefs and behaviors functions as a powerful persuasive tool (Aronson, 1997). Therefore persuasion is the consequence of intrapersonal situation originated from dissonance (Dainton and Zelley, 2005). With this respect, developing a methodical approach for persuasive system design requires the understanding of users which retrieves from the perception of coercion.

Persuasive technology is about the techniques and users' relation with these techniques (Redström, 2006). It is important for designers to understand both the technology used to create the change and users' related behavior. Therefore, user-centred approach, which the constraints and affordances in human behavior explored, is crucial to design for behavior

change. With this idea, Lockton et al. (2008) suggest a design toolkit that is built on target behavior. In order to affect certain behaviors of users such as encouraging exercise and reducing energy use, designers are suggested to consider "inspiration" and "prescription" modes which are developed in regard to the design patterns of target behaviors (Lockton, Harrison, & Stanton, 2009; Lockton, Harrison, & Stanton, 2010). The purpose of the method is guiding designers to affect certain behaviors of users.

2.3 Mobile technology

Mobile technology products, containing mobile phones, music players, PDAs, offer an advantageous platform for creating behavior change by being the effective instruments to develop health interventions because everybody can carry them around anytime, anywhere (Oinas-Kukkonen et al., 2008; Olofsson, 2010; Liua et al., 2011).

2.3.1 Mobile Phone Systems

By being the effective means for interventions, mobile technology carries advantages for the promotion of physical activity (Fanning et al., 2012). Among mobile products, mobile phones are commonly used, owing to pervasive properties. The power of mobile phones is increasing because they are capable to turn into health monitoring devices with low prices (Fogg, 1998; Lacal, 2003) and commonly with no additional setups (Arteaga, 2012).

Creation of ubiquous technology has offered a new potential for enhancing the effectiveness of physical activity interventions. It brings opportunities for motivating people toward healthy behavior (Cassell et al. 1998). Benefiting from SMS technology, mobile phones are used for health interventions such as smoking cessation, physical activity, diabetes and asthma self-management through delivery of motivating and reminding messages (Hurling et al., 2007; Fjeldsoe, Marshall, Miller, 2009).

By looking to the development of pervasive computing in sports technology, it is seen that, technology is now directed towards computers working in combination with sensors and transmitting devices, from the use of computers for record keeping and data processing (Baca, 2009). Current analysis of market shows that sensor technology is used to facilitate services on traffic information, social networking, environmental monitoring, and health and well-being (Lane et al., 2010). For wellbeing purposes, due to integration of sensors such as accelometer and GPS devices, smart mobile phones establish grounds for assessing physical activity in the real time through collection of data, capturing behavior within its social and physical context (Fanning et al., 2012). Practiced upon Ecological Momentary Assessment (EMA), mobile technology offers a possibility to keep track of the current location, type of the performed activity, and social environment surrounding the behavior (Dunton et al., 2012). As an example, GPS technology enables phone to localize itself and it contributes to navigation and creates means for enhancing mobile social networks, and an accelerometer facilitates the recognition of physical movements or means of transportation (Lane, 2010). Although the debates around the accuracy of activity measurement with motion sensing via accelometer and gyroscope continues (Bergman et al, 2012)

development of technology in this direction is on progress, reaching as high as 90% accuracy (Wu et al., 2012).

2.3.2 Mobile Applications

With the growth of the application market, interventions for health and fitness have gained importance due to advantages of ubiquity. Mobile health applications, range from nutritional calorie counters to intervention applications for smoking cessation and physical activity. Among those, physical activity applications vary from workout applications in which users are suggested numerous exercises, to the applications with integrated accelometers and GPS devices that enable keeping track of physical activity in its real time (Fanning, Mullen & McAuley, 2012). Due to pervasive mobile technology products' enhanced capabilities and integrated sensors, current smart mobile applications benefit from the use of cameras, location sensors, accelometer and gyroscope (Arteaga, 2012). With the help of the sensors, the information on speed, pace, distance, location can be easily recorded. Users are suggested nearby routes and they are given the means of share with other users (Fanning, Mullen & McAuley, 2012).

As an example to persuasive applications benefiting from the use of sensor technology, Nike + can be given. Being as a joint work of Nike and Apple, Nike + uses positioning technology to calculate the distance and the pace of the walk or run. The system keeps exercise data and, by downloading the data to the web, user can see and share the progress. It suggests set of training programs and praises when the goals are achieved (Oinas-Kukkonen & Harjuuma, 2009).

Figure 4. Nike + products (Retrieved from http://news.cnet.com/8301-10797_3-57558252-235/nike-launches-app-accelerator-program-to-fuel-developers/)

Although technology is capable to facilitate solutions for interventions, mobile applications designed with intent to change physical activity behavior are mostly deficient in answering the changing and subjective needs of users. This fact is supported by the state in which users' motivation to maintain physical activity drops by 50% in 6 months (Fanning, Mullen & McAuley, 2012). Therefore, it brings the necessity of a user-driven approach. By considering the difficulties people face for sustaining motivation, design of persuasive

mobile applications tend towards the perspective that users' needs, which would increase motivation, are addressed. In the following, some examples of mobile applications will be explored.

UbiFit Garden, a mobile application developed as a joint project of Intel and the University of Washington, aims to initiate physical activity to promote healthy lifestyle by benefiting from persuasive technology (Consolvo et al., 2009; Lane et al., 2010). The application uses Locke & Latham's Goal-Setting Theory, with respect to the findings of psychology and health sciences stating that it is an effective motivator for behavior change. It monitors and encourages physical activity by measuring the level of physical activity and presenting this information in relation with individual's health goals through the display showing different colored flowers which blooms as the user accomplishes certain types of physical activity such as cardio, strength, flexibility and walk (Consolvo et al., 2009).
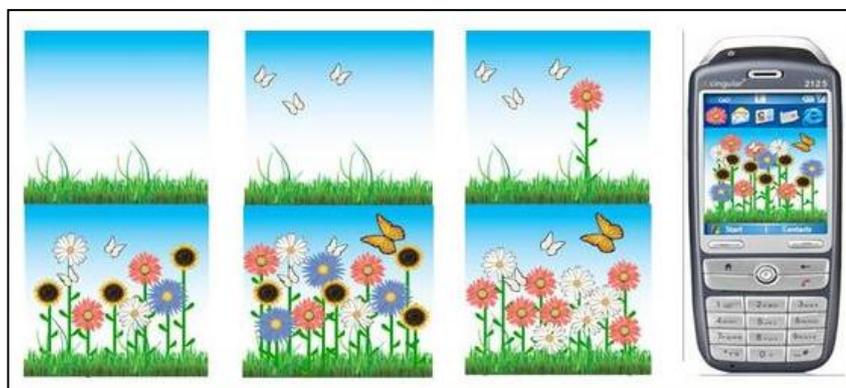
Figure 5. Snapshots of the application Ubi-fit Garden (Retreived from http://lucachittaro.nova100.ilsole24ore.com/2008/04/identificazione.html)

The examples of mobile applications are of variety in which goal-setting is focused to motivate people for behavior change by planning sources on motivation goals and time frames. In this respect, motivation is studied from both game-like (eg. Neat-o-games) and friendly competition (eg. Chic Clique) perspectives.

Games work by using an accelometer, which obtain step counts through physical moves, and they are associated with the establishment of fun and motivation to sustain usage (Arteaga, 2010). As a game like approach, NEAT-o-Games (Fujiki et al., 2008) collect data from a wearable accelerometer. The data contain step counts with respect to physical movement. Data is logged to a mobile phone to be used for a virtual game. The game offers competition among users. By recognizing the winner of the day, the game rewards the winner with hints for Sudoku.
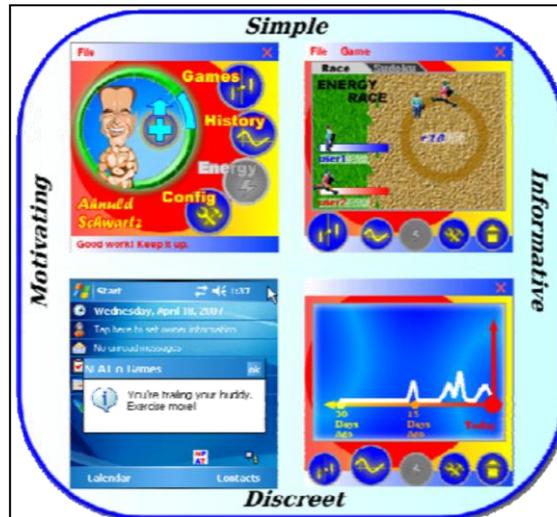
Figure 6. Design principles of NEAT-o-Games (Retreived from Fujiki et.al, 2008)

One other example of mobile applications, developed to increase and maintain physical activity in teenagers, also uses game-like approach by considering users' motivation through enhancing emotional attachment (Arteaga et al., 2009). As a way to do that, the application adopts friendly competition and built on the theories of Planned Behavior, Meaning Behavior, Technology Acceptance, and Personality (Arteaga, 2010), the application takes users' personality into account. The application offers a list of games tailored to users' personality. Users manually log activities, see their progress and they are given motivational feedbacks at the end of the sessions.

Figure 7. Snapshot of the application (Retrieved from Arteaga et al., 2010)

Usage of social networking, which exercise data gathered, analyzed and shared over social media, is gaining importance (Vickey et. al., 2011). Mostly, applications encourage activity share within a group in order to establish grounds for motivation through social support (Toscos et al., 2007). As an example to those applications, Chic Clique, that promotes friendly competition, can be given. It encourages teenage girls for physical activity by enabling keeping track of step counts and sharing it among their friends.
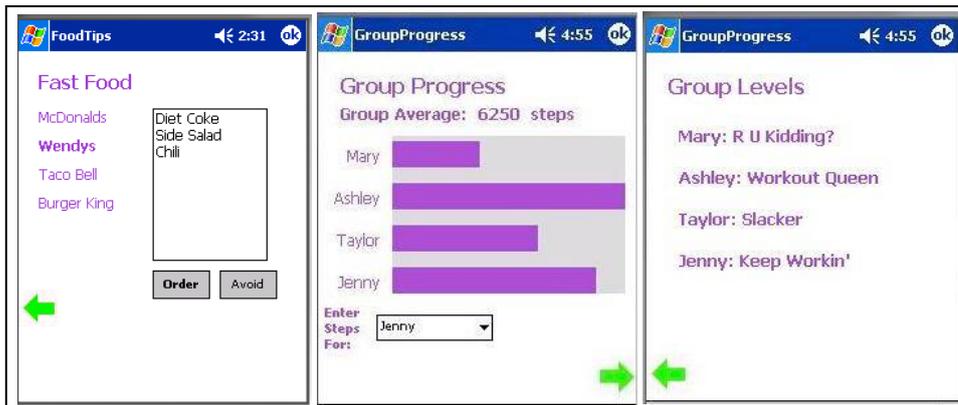
Figure 8. Snapshot of the application Chick Clique (Retreived from Toscos et al., 2006)

There is a tendency towards using music to increase motivation about physical activity since music creates an internal motivator by influincing perceptions about exercise (eg. MPTrain) (Arteaga et al., 2010). With the idea of the positive effect of music on the exercise, MPTrain assesses the heart rate of the user to determine the next song to be played in order to motivate user to continue performing physical activity. It assists users about the activity routines (Oliver & Flores-Mangas, 2006).
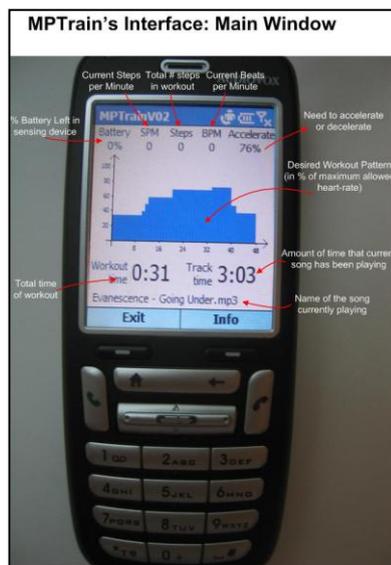
Figure 9. Snapshot of the application MPTRain (Retreived from
http://www.nuriaoliver.com/MPTrain/MPTrain.htm)

There are also efforts towards developing personal-coach like mobile applications. As an example, MOPET (Buttussi & Chittaro, 2008) assists users about physical activity routines. It records heart rate and speed and gives users the tools to analyze their progress. MOPET has a trainer that shows exercises virtualy. The application facilitates outdoor usage.

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Figure 10. Snapshots of the application MOPET (Retrieved from
http://www.web3d.org/casestudies/detail/mobile-fitness-using-an-x3d-h-anim-virtual-
trainer/)

Despite enhanced capabilities and technology being developed for mobile applications, it is
observed that motivation of users is of a greater design challenge. For motivating people,
rather than developing systems in visual-cognitive manner, users' universal needs have to
be satisfied. In this regard, the next chapter explores the arising needs around happiness.

CHAPTER 3

LITERATURE REVIEW ON HAPPINESS

This chapter begins with the overview of User Experience studies in regard to relations with the research of subjective well-being and continues with the exploration of the literature on positive psychology to understand the concerns around happiness.

3.1 User Experience

User experience is a term that is used to cover the aspects ranging from usability to aesthetics, hedonics, affect and experience (Forlizzi & Battarbee 2004).

Hassenzahl and Tractinsky (2006) defines the facets of user experience as beyond the instrumental, the experiential and emotion and affect (Figure 11). In the next sections, each of them will be explined in detail.
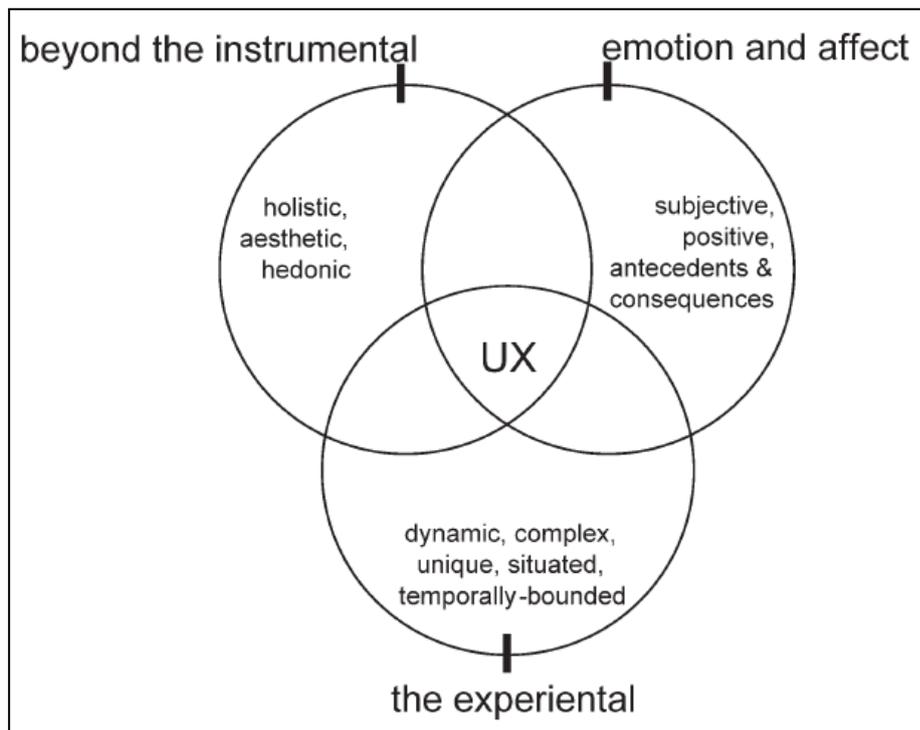
Figure 11. Facets of User Experience (Hassenzahl & Tractinsky, 2006)

3.1.1 Beyond the Instrumental

The area of User Experience studies has turned its direction towards three facets which deals with the "human needs beyond the instrumental", "affective and emotional aspects of interaction" and "nature of experience" (Hassenzahl & Tractinsky, 2006).

Within the context of user-centred research, the primary aim of user experience studies was the achievement of certain behavioral targets. On that basis, interaction was considered to carry an instrumental affect (Hassenzahl & Tractinsky, 2006)

Earlier studies on user experience took a step forward in identifying the elemements beyond instrumental aspects of experience such as beauty (Hassenzahl 2004b, Lavie & Tractinsky, 2004), by considering the fulfilment of basic human needs (Maslow, 1954).

Other than beauty, the needs such as surprise and intimacy were also referred with respect to their relation to experience with technology (Gaver & Martin, 2000). The area of user experience took advantage of the rise of the notion emotional usability (Logan et al., 1994). With respect to that, the area was offered to benefit from both hedonic and pragmatic tenets of the experience in which the products are aimed to enhance the aspects such as personal growth, self-expression, self-maintenance as well as fitting behavioral targets (Hassenzahl, 2003).

3.1.2 Emotion and affect

Early steps in HCI research towards the aspects in regard to emotion and affect were taken on the basis of affective computing (Picard 1997). Built on the fact that people interacting with technology usually have negative emotions, affective technology aimed to alter these negative feelings by sensing, adapting and interacting with users (Picard & Klein, 2002; Hudlicka, 2003). The examples of affective computing include the approaches in which users' emotions are targeted to prevent the feelings like loneliness, sadness and frustration (Picard and Klein 2002, p. 23).

Affective computing was found as limited in understanding affect, since it approaches from computer perpective, by considering the role of the computers in influencing peoples' emotions, researches within the field of UX were positioned to evaluate affect from human perspective (Hollnagel, 2003). Mostly by focusing on positive emotions such as joy and fun, researches pursued the analysis of positive experiences.

The relation between perceptions of users, their intentions and the experienced situation is also researched as part of the study of affect because the literature findings imply the relation between affect and technology acceptance (Zhang & Li, 2004). As an example of that, perceived enjoyment is reported to have an effect on acceptance (Davis et al. 1992, Igbaria et al. 1994),

Hazssenzahl and Tractinsky (2006) states that current UX studies highlight two main fields with respect to emotions, in which one is about exploring emotions as a result of product use and the other is understanding the role of emotions on evaluations about product use.

Because using affect as a design goal is a highly debated issue owing to the difficulty of the control of external determinants on the evocation of certain emotions, scholars suggest that

setting the context for obtaining certain emotions instead of emotion is likely an achievable design goal (Hassenzahl & Tractinsky, 2006).

3.1.3 The experiential

Hassenzahl and Tractinsky (2006) states that there are two aspects of experiential component of user experience which are "situatedness" and "temporality". In this manner, experience is defined as the state affected from both product and people's internal factors such as mood and personal goals. The interaction of these factors is assumed to form the real experience.

Experience is explained to have a positive influence on people's well-being (van Boven & Gilovich, 2003), because it leads to affection and have an influence on the regulation of affects. Therefore, experiential facet of experience is encouraged for interactivity with products. Even, it is described to initiate series of "self-talk" occuring during the interaction with products (Forlizzi & Batterbee, p. 263, 2004).

3.1.4 Experience of Technological Products

Although there are applications designed with an intent to change unhealthy behaviors, the effect of technology into users' life is often ignored while designing them (Consolvo et al., 2009).

Understanding users' pragmatic, physical and emotional needs with reference to user experience is of great importance (Helander & Tham, 2003; McCarthy, Wright, Wallace, & Roto, 2007; Stelmaszewska et al., 2004). In that manner, the research of Keyson (2008), reveals the aspects how technological products are incorporated into users' lives. The outcomes of the research show that both pragmatic and hedonic qualities such as functionality and playfulness have to be satisfied. Keyson (2008) states that there are three main factors for experiencing intelligent products in which;

1. User feeling in control of the product, not experiencing confusion or untrustworthiness (Norman,2007 in Keyson 2008) .
2. Product building the sense of emotional appeal and leading to an engaging experience through the factors such as personalization and flow (Csikzentmihalyi, 1975, in Keyson 2008).
3.Product fitting the expected and perceived pragmatic performances such as usability, stability and predictibility.

Because it is associated with affect, engagement carries great importance for an experience similar to fun (Hassenzahl, 2003; Cila & Erbug, 2008) and enjoyment (Roto, 2007; Kim,Park, Hassenzahl, & Eckoldt, 2011).

Being related to users' skills of "knowing, doing and feeling", Overbeeke et al (p.10, 2004) defines the major elements of an engaging experience as;

- "Functional possibilities and performance of the product
- The user's desires, needs, interests and skills (perceptual-motor, cognitive and emotional)
- General context
- Richness with respect to all the senses
- Possibility to create one's own story and ritual"

User engagement is highly linked to how attraction and interaction are sustained over time through the evocation of positive emotions and challenges with respect to aesthetics, interation and use (O'Brien & Toms, 2008). With this regard, experience with a product composes of the steps in which non-engagement, disengagement and reengagement may occur. It is product's ability to establish attraction to keep users' attention, their interest, and thoughts over the product. Chou and Conley (2009) states that along with aesthetics and usability, an engaging experience increases the value of a product.

For designing an engaging experience, flow carries an importance. Flow Theory explains it as the state that people are strongly involved in certain activities that other things seems insignificant because the activity is so enjoyable (Csikszentmihalyi, 1988, 1990). According to this theory, people experience flow when their abilities and the challenge of the activity are compatible. If the activity requires too much effort but the person is not skilled to perform this activity, it is likely that the person will experience anxiety whereas the person will be bored if the activity is not that challenging. In adition, the control over the activity also increases the level of flow.

Hence, for designing an experience, which engage users with smart products, there is a need to focus on affect just as enhancing pragmatic performances. The next section will explore people's needs to guide designing an experience that lead happiness.

3.2 Positive Psychology

Within the field of Positive Psychology, the early definitions made by Diener (1984), describe happiness as having positive affect and life satisfaction over experiencing less negative affect. Newer definitions focus on what means good life and pleasure, and explain good life as cognitive and affective evaluations made about one's life (Diener, 2002). In this perspective, cognitive evaluation is what an individual makes on his/her life satisfaction, in which it is determined by the discrepancy between ideal and present conditions. Whereas, affect is the state of emotions causing positive and negative moods in relation to everyday experiences. The difference between happiness and hedonic pleasure is often underlined. Pleasure is considered as the state of feeling good about oneself while happiness is recognized as the greater from of enjoyment, experienced at the moments of flow and intrinsic motivation (King et al., 2004).

3.2.1 Happiness

Happiness has various categorizations based around cognitive (or attitudinal), hedonistic, mood and hybrid views (Brülde, 2004). On the cognitive view happiness is considered as the cognitive state in which the person has a positive attitude towards life. While, according to hedonistic theory, happiness is the preferred balance of pleasure over displeasure. On the mood theory, it is defined as a specific positive mood and hybrit theory explains happiness as the mental state experienced partly cognitively by evaluating life positively, and partly affectively by feeling good about life (Brülde, 2004).

Happiness is used interchangeably with subjective well-being and well-being (Lyubomirsky, Sheldon, & Schkade, 2005; Sheldon & Lyubomirsky, 2004; Sagiv, Roccas, & Hazan, 2004; Diener, 2000) and studied within social, political and economic fields of interest with the rise of positive psychology.

Scholars in the field of positive psychology propose several different points of view on the definition of happiness. The early views on the definition the term are agreed to be as having more a pleasant affect, less unpleasant affect and an overall feeling of life satisfaction, which is seen to be a part of subjective well-being (Diener, 2000). Happiness by this definition is seen as an emotion combined with other positive emotions, resulting in subjective well-being. Some scholars have made a distinction between hedonic and eudeimonic happiness. While subjective well-being is seen as hedonic happiness coming from life satisfaction, the presence of a more positive mood and the absence of negative mood; well-being is often associated with social class and wealth, attachment and relatedness, and goal pursuit (Ryan & Deci, 2001). The flow experience, which is described as the intense concentration in which people forget the moment and self-consciousness, is also considered as an important in terms of creating happiness (Csikszentmihalyi & Hunter, 2003). There are also studies which define happiness as being the sum of affective and cognitive conclusions (Seligman & Csikszentmihalyi 2005; Seligman, 2008). In line with these findings some scholars (Forgeard et al., 2011; Seligman, 2011) define well-being as being the sum of having positive emotions, engagement, relationship, sense of meaning, achievement, which are interpreted as feeling good about one's self, living flow, being in connection with others, have a sense meaning and accomplishing the goals, respectively.

3.2.2 General State of Happiness

Happy people tend to perceive the world in a more optimistic way which results in construing the events to further their happiness (Lyubomirsky & Tucker, 1998). Despite the unclarity why people feel happiness or unhappiness dominantly, there are models on the factors affecting people's level of happiness. One model specifies the factors of happiness as the fixed set point of happiness, being caused by the genetic factors (Lykken & Tellegen, 1996), the life circumstances such as living conditions, the events experienced, and the variables like marital status and salary (Lyubomirsky et al. , 2005). Some scholars

argue that only a small portion of happiness is affected from circumstancial variables (Diener, Suh, Lucas, and Smith, 1999) accounting for only 10 % (Lyubomirsky et al., 2005). In this model, intentional activities are found to be most prominent factor in changing a person's level of happiness in the amounts of 40 %. These intentional activities are defined to be behavioral, cognitive, and volitional or motivational (Dunn, Aknin, & Norton, 2008; Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2011; Emmons & McCullough, 2003; Sheldon, Kasser, Smith, & Share, 2002).

There are some theories on people's adaptation to happiness. According to Dynamic Equilibrium Model (Headey & Waring, 1992), people adapt to the changes which results in going back to the set point. Similarly, another theory, 'hedonic treadmill' (Brickman and Campbell, 1971), suggests that people adapt to changes and go back to their set point level of happiness except death of someone important (Frederick and Loewenstein, 1999).

Despite the several arguments on the reasons of adaptation (Diener, Suh, Lucas and Smith, 1999), the difference in subjective well-being is found to be controlled by the genes and situational factors. Therefore, both personality and effort play importance in one's level of SWB.

3.2.3 Measurement of Happiness

There is an ongoing discusion about whether happiness can be measured objectively or subjectively. Some scholars argue that objective means of happiness measurement is possible if an individual's moods over time are gathered to assess by removing its dependency to memory. However, subjective measurements of happiness seem to be more reputed among current approach on well-being measurement.

An individual experiencing more positive affect and less negative affect is believed to have higher levels of SWB. Subjective well-being is a concept falling within the field of hedonics since it evaluates happiness as maximising pleasure while minimizing pain. Whereas eudaimonia puts the emphasis on meaning, self-realization, and integration with life (Waterman, 1993).

SWB measurement is made by evaluating three determinants which are one's life satisfaction, positive affect and negative affect (Andrews & Withey, 1976, Lucas et al., 1996). Measurement of life satisfaction can be made by using a 5 item questionnaire on satisfaction with life (Diener, Emmons, Larsen & Griffin, 1985; Pavot & Diener, 1993). Affect can be measured by using self-report measurement PANAS (Positive Affect Negative Affect Schedule) (Watson, Clark & Tellegan, 1988) or Experience Sampling Method (Stone et al., 1999) in which mood of an individual is collected over a period of time within random intervals to indicate the level of affect. Self-report measurements are criticized on the basis of incompetency to prevent situational factors. (Schwartz & Strack, 1991).

3.2.4 Dimensions of Happiness

En early study of Martin Seligman (1988), shows that the reason of high levels of depression rates are because people lose meaning in their lives. Meaning is described as being attached to something bigger than oneself.

According to the theory of dispositional optimism (Scheier & Carver, 1985), optimism towards the future affect people's way of dealing with the circumstances and the result is achieveing the goals and greater levels of SWB.

The findings of a study carried by Diener et al. (1999) show that optimism, control over life, self-esteem are correlated with higher levels of SWB.

Seligman (2002) defines the determinants of happiness as H=S+C+V and reveals that happiness is the sum of set range, circumstances and factors under voluntary control. In this equation, S is the genetically determined determinant which is stable throughout life. C identifies the circumstances such as getting married, having education or making more money. V stands for the engagement with the voluntary activities performed with an effort.

Fulfilling social life and having social support are considered to be related with high levels of SWB. Diener and Seligman (2002) found that people who are engaged in social activities are the happiest. Another study carried by Fleeson, Malanos and Achille (2002) shows that people engaged in 'extroverted' activities experience higher levels of happiness. In that regard, social participation is accepted as a substancial predictor for life satisfaction.

The study of Diener and Seligman (2004) shows that fulfillment in the social life is an important factor for the enhancement of happiness.

3.2.5 Happiness-Enhancing Activities

Fordyce (1977, 1983) states that intentional activities have the capacity to enhance happiness. On the basis of that, the intentional activities which increase happiness are promoted within the context of interventions. These interventions are called as positive activity interventions (Layous, Chancellor, Lyubomirksy, Wang, & Doraiswamy, 2011), positive psychology interventions (Sin & Lyubomirsky, 2009), and happiness interventions (Seligman et al., 2005). In addition to the intentional activities, physical activity is also found to be an important domain in the evocation of happiness (Sin and Lyubomirsky, 2009)

Another focus in the happiness interventions is driven from the emphasis on the strengths of a person. One method to measure strengths was developed by Peterson and Seligman (2004) in which 24 strengths are defined to be assessed by Values in Action on the grounds of six universal virtues "wisdom, courage, humanity, justice, temperance, and transcendence". Reported outcomes show that identification of strengths and using these strengths in a new way increase happiness (Seligman et al., 2005). Some other efforts evaluate the relation of problem solving to strengths (Mitchell et al., 2009) and the relation

between goal achievement, well-being and strengths (Linley, Nielsen, Gillett & Biswas-Diener, 2010). The results indicate that signature strengths affect goals positively that are in relation with the basic psychological needs such as competence, autonomy and relatedness (Deci & Ryan, 2000), which contributes to well-being. The goals related with the area of interest enhance well-being and satisfaction more.

An old study about activities suggest that individuals are happy when they engage in activities that are interesting and which match their level of skills (Csikszentmihalyi, 1975). Engaging mind with an activity and being in relation with others creates higher life satisfaction. However, when an activity requires challenges, which exceeds available time and capacity, it may result in anxiety (Oswald 1997).

Recrational activities performed during leisure times are found to be important determinant for SWB. For instance, exercise has both short term and long term effects in regard to enhancement of happiness. Because it changes mood of an individual, improves health outcomes, opens a room for social interaction, exercise increases SWB (Argyle, 2001).

Albrecht (2012) defines the moderators and mediators of happiness-enhancing physical activity interventions to be social support, person-activity fit, effort and need satisfaction.

The qualities are explained in follows:

Social support: Due to the psychological need of relatedness in enhancing one's well-being (Ryan and Deci, 2000), happiness interventions are believed to be more effective if people receive social support of others (Boehm and Lyubomirsky, 2009).

Person-activity fit: Although, self-selection of an activity to enhance one's well-being has found to be an important moderator since people's interests, virtues, strengts and dispositions may differ (Lyubomirsky et al., 2011), Deci and Ryan (2000) claims that if an activity is self-selected and able to realize one's competence, autonomy and relatedness, the activity is considered to fit everyone in enhancing well-being.

Effort- Initiation and Maintenance: Effort is evaluated as one of the mediators of happiness. Therefore, starting an activity and sustaining it, is also expected to require an effort (Lyubomirsky et al., 2011).

Need Satisfaction: On the basis of Self-Determination Theory, it is known that fulfillment of the basic psychological needs, which are competence, autonomy and relatedness, enhance one's well-being (Ryan & Deci, 2000). Therefore, Lyubomirsky et al. (2005), defines need-satisfaction as an important factor for increasing well-being through an activity.

For an intrinsic motivation, the activity should fit the person or fulfill one's basic psychological needs, and the activity is expected to be performed with optimum effort. Encouraging social support also mediates the enhancement of well-being. When an

intervention is designed by considering social support, person-activity fit, creation of awareness on effort and need satisfaction, the activity has the possibility to effectively flourish well-being on grounds of Sef-Determination Theory (Albrecht, 2012).

Self-Determination Theory

Happiness interventions needs to leverage the sense of self-determination. Self-determination theory is an approach reflecting a broad framework for the study of human motivation and personality. It focuses on the intrinsic and extrinsic sources with regard to motivation and shows their relation to the development of social, cognitive and individual differences. With this theory, the motivation to engage with an activity is associated with the fulfillment of the factors autonomy, competence and relatedess.

According to Self-Determination Theory, happiness enhancing activity is likely to be engaged when it creates an intrinsic motivation (Deci & Ryan, 1985).

Motivation is regarded as a psychological feature arising from intrinsic and autonomous or extrinsic and controlled regulation (Deci & Ryan, 2000). While intrinsic motivation is self-determined and based on the choice of individual, extrinsic motivation comes from external factors such as demand, threat, reward and pressure (Ryan & Deci, 2000).

According to SDT, need satisfaction enhances well-being and it facilitates development. However when the needs are not satisfied, individuals show breakdowns with respect to their mental processes (Deci & Ryan, 2000).

3.3 Design for Happiness

In terms of physical activity interventions, persuasive strategies focus on increasing physical activity, which is grounded on problem-driven design. However, some scholars argue that health interventions may adopt design to evoke happiness into consideration (Schot et al., 2009; Desmet & Hassenzahl, 2012). Desmet and Hassenzahl (2012) suggest that a possibility-driven design provides an opportunity to contribute to human well-being, which evokes happiness through the use of positive psychology. By providing means for increasing subjective well-being, the design is believed to enhance positive feelings, rather than offering solutions to a problem. Therefore, it is required to understand users' psychological needs in relation to the use of a product.

The examination of the product qualities enhancing happiness are believed to contribute to the emerging area of design for happiness.

CHAPTER 4

EMPIRICAL STUDY ON HAPPINESS RELATED QUALITIES OF MOBILE APPLICATIONS

The study explored happiness-related qualities of mobile applications for encouraging physical activity together with an investigation into subjective well-being. The properties of mobile phone applications for physical activity were investigated to attain the characteristics of a product, which is built on a happiness-driven design.

4.1 Study Design

Because the aim of the study is to evaluate the qualities in relation to enhancement of subjective well-being that requires an in-depth analysis, the empirical study was designed to consist of three phases, in which (i) an entry semi-structured interview, probing the perceptions on applications, (ii) diary, keeping record of the emotions lead by the experience in the real time, and (iii) an exit semi-structured interview, evaluating applications' effect on person's well-being, were conducted (Appendix A). In the first phase (Figure 12), participants were asked which type of applications they download in their daily lives, and they were shown four iPhone applications. Each application was introduced by using an application card (Appendix B) which consists of the name, the version number, five screen shots and a short description of the key features. After showing the cards of the four applications, participants were mainly asked to select one of the applications based on their usage aims. The list of semi-structured questions asked in the first interview are given in Appendix D.
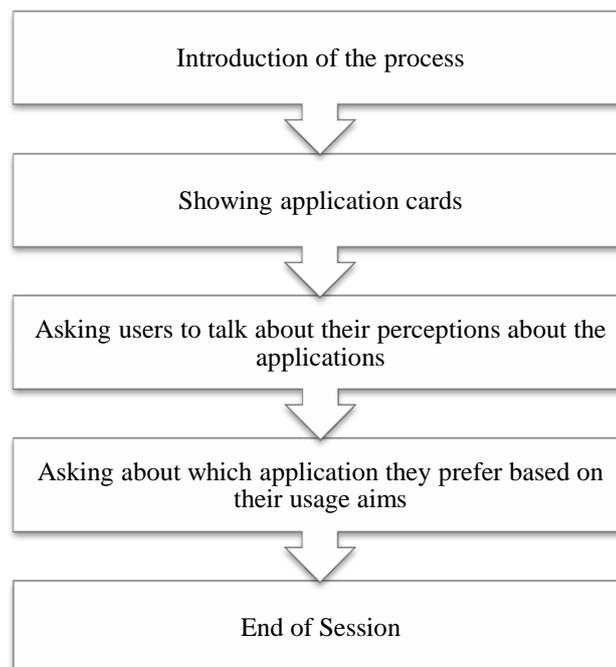
Figure 12. Flow of the first interview

In the second phase (Figure 13), participants were expected to use one of the applications for three times in one week period. Duration of the usage period was determined similar to Romero et al.'s (2010) study, which uses 1-week diary method with day-reconstruction technique and aims to find out dimensions people enjoy in their daily lives in order to design playful motivators to support people for social and physical activities. In parallel to that, after using the application to perform physical activity by, participants were asked to send diary, a written information recording the issues made them happy/unhappy during their experience and to fill in the physical activity enjoyment questionnaire (PACES), (Marcus et al., 1992) containing a semantic-differential scale which evaluates their enjoyment levels to prevent memory bias about recalling their emotions. At the end of the one week usage period, participants were asked the following main questions to understand the effect of using the application on their subjective well-being together with the semi-structured questions given at Appendix E. The data analysis is based on the answers to the following questions.

1. Does the use of the application create any satisfaction in your life? If so, how?
2. Does the use of the application shift your feelings into a positive or negative state? If so, how?
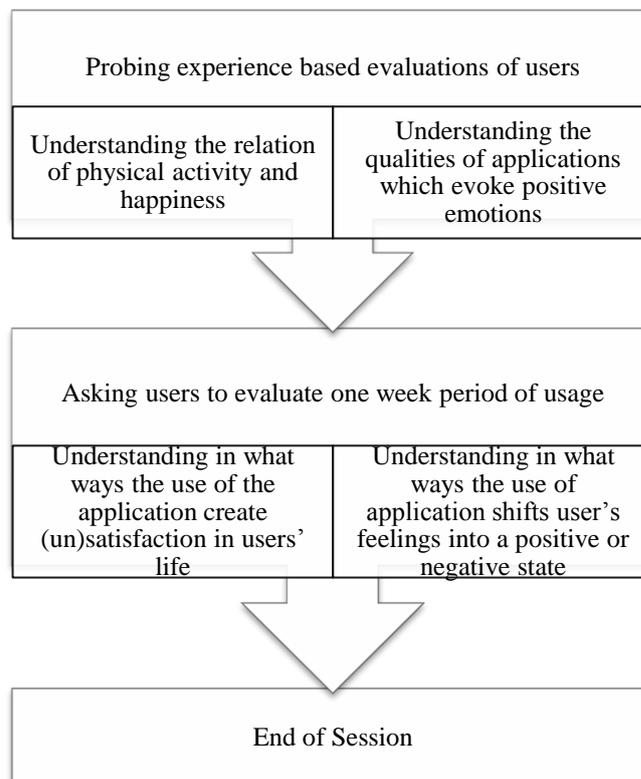
Figure 13. Flow of the second interview

4.2 Measurements Tools

While reviewing the literature on positive psychology, it was observed that the level of happiness differs in each person (Diener, 2000). Therefore, before the first interview, the

participants were asked to rate how often they experienced positive, negative, good, bad, pleasant, unpleasant, happy, sad, fear, joy, anger, contented moods within a month, by using the scale of positive and negative experiences which was developed by Ed and Robert Biswas-Diener (2009) (Appendix F, G). The questionnaire consists of a 5-point Likert scale. The aim of using this scale is to understand the balance of each participant's positive and negative emotions. By subtracting the negative affect scores from the positive affect scores, a number between -24, which implies that the participant is very unhappy, and +24, which implies that the participant is very happy, is obtained (Appendix J).

In the psychology literature, it was seen that the Experience Sampling Method (ESM) is the most referred to method in measuring the affects of subjective well-being in a real-time context. In addition, some newer methods such as the Ecological Momentary Assessment and the Day Reconstruction, which are grounded on the roots of ESM, are proposed to understand how people experience activities in their lives natural settings (Kahneman et al., 2004). Use of a diary method, which belongs to an event-contingent sampling, is found suitable for evaluating people's perceptions associated with the evocation of emotions to prevent recall bias, and analyzing the insights based on the real-time context and their lives natural setting (Bolger, Davis & Rafaeli, 2003; Csikszentmihalyi, & Hunter, 2003). Because of the arising need of evaluating momentary pleasures, a diary method in which participants are asked to record their observations on the properties evoking happiness while performing physical activity with the mobile applications was used. Momentary affect during their experience with the mobile application for physical activity was also quantitatively evaluated by using a physical activity enjoyment scale consisting of a 7-point semantic differential scale that is developed by Marcus and Forsyth (2003) (Appendix H, I).

4.3 Participants

Participants were selected based on non-probability, quota sampling based on the stages of change scale which was developed by Marcus et al. (1993) (Appendix C). Among the voluntery group willing to perform physical activity, the criteria for the selection of participants was being the owner of an iPhone and using it well, enough knowledge of English to use an application well.

The scale determines the stages of change on the basis of the level of physical activity performed during a week. Respectively, stage 1, is the state of being inactive and not intending to be more active in the next 6 months; stage 2, is being inactive but intending to become active in the next 6 months; stage 3, is being active but not at the required level; stage 4, being active at the required level of less than 6 months and; stage 5, being active at the required level for more than 6 months.

People, whose stages of change level were at 1 for physical activity, were not included in the study. This is because, being in the first stages of change corresponds to the state of physical inactivity and lack of intent to be physically active in the next 6 months, and the aim is to understand the applications' relation to the enhancement of well-being through physical activity, the sample group was selected among the people who are not performing

activity but intending to be physically active in the next 6 months, which is stage 2, or doing physical activity at different levels.

Table 2. Distribution of participants with respect to the selected applications, age, sex and SoC

SoC	Sex	Age	Participant	Application
S5	F	30	P1	
S2	F	22	P3	
S4	F	23	P7	
S3	M	27	P10	NT
S5	F	29	P11	
S4	M	20	P18	
S5	M	22	P19	
S2	F	21	P4	
S2	F	25	P5	
S4	M	23	P6	
S2	M	23	P9	F4R
S2	F	27	P13	
S3	F	24	P16	
S4	M	25	P20	
S3	F	26	P2	
S3	F	22	P12	ST
S3	F	24	P17	
S4	M	23	P8	
S5	M	24	P14	Fit
S5	M	24	P15	

The sample of participants contains 11 female and 9 male undergraduate, graduate and doctorate students between the age of 20 and 30, with a mean value of 24.2.

Among 20 participants who have completed all of the three research phases, P10 and P14 gave up using the applications after their second experience, respectively, due to health problem, and disengagement with the application on grounds of complexity and inavailability of the moves for logging.

4.4 Selection of Mobile Applications

For the study, four free iPhone applications for encouraging physical activity which are featured on the iTunes store were selected based on probability and disproportionate sampling. In the literature, there are different approaches for categorizing physical activity applications. Since categorizations of other scholars (West et al., 2012; Kranz et al., 2012), are built on the basis of characteristics of logging and the way instructions are given, it was decided to use the categorization of Ahtinen et al. (2008) by taking into account the possibilities that the applications may have for evoking happiness. Unlike other

categorizations, which are more primarily based on task functions, Ahtinen et al. (2008). categorizes physical activity applications based on the motivation of the users' perspective, such as loggers, personal trainers, playful applications and games, and social applications. Among the 16.499 health and exercise applications that are available to download from the Turkish iTunes store in November 2012, the most popular 375 applications were researched due to their perceived credibility. Out of the 375 applications, 142 were found to be geared towards physical activity, and 86 free applications were selected to be considered due to the ease of accessibility to the users. The second criteria in selecting the applications were the scores given by users; therefore, the ones that score below 3.5 were eliminated on account of perceived credibility. By categorizing the applications into personal trainers, loggers, playful applications and social applications (Ahtinen, 2008), and then sorting them based on their ratings; the Nike Training Club, Sports Tracker, Fit for Rhythm and Fitocracy applications were the ones selected to be used in this study.

Nike Training Club (personal trainer application) provides users with a list of workouts based on the goal and fitness level by showing the videos of trainers. It gives rewards and allows sharing information with friends. Users can listen to music and receive audio feedback during their workouts. Sports Tracker (logger application) keeps track of the workout on the map by using GPS, logs it automatically, and monitors the progress of the workouts. Fit for Rhythm (playful application) counts the number of the moves shown in accompanied by a virtual coach, while holding the phone in the hand. Fitocracy (social application) provides a platform to log workouts manually, track, share, and learn new exercises while receiving support from the community of application users. Users can create challenges and unlock achievements.

CHAPTER 5

RESULTS

The results are given by focusing on users' perceptions and preferences on applications, their initial experiences with the applications, their enjoyment of physical activity over time and presentation of product-related dimensions of well-being.

The analysis of the qualitative data was done by performing a content analysis of the in-depth interviews by concentrating on the product properties associated with emotions. By applying coding (Saldana, 2009) with the predefined codes from the literature, the patterns observed in data are conceptualized into a model representing user's feelings and experience with the physical activity applications. The findings of this analysis introduce a model in which the characteristics of mobile physical activity applications evoke happiness.

5.1 Perceptions of Participants

In the first interiew, the participants were asked to tell about their perceptions with each application. On the basis of positive and negative comments, the qualities are explained.

The number of positive and negative comments with respect to each application are shown in the following:

Table 3. Number of positive and negative comments with respect to applications

Application	Number of Positive Comments	Number of Negative Comments	Total
NT	51	39	90
F4R	51	38	89
ST	57	41	98
Fit	31	44	75
Total	190	162	352

With respect to the number of positive and negative comments most positively perceived application is ST, and most negatively perceived application is Fit.

In the average, each application is ordered as:

Table 4.Order of applications

	NT	ST	F4R	Fit	SoC
P1	1	2	3	3	S5
P2	3	1	4	2	S3
P3	1	2	2	3	S2
P4	3	2	1	4	S2
P5	4	3	1	2	S2
P6	2	3	1	4	S4
P7	1	2	3	4	S4
P8	3	4	2	1	S4
P9	3	2	1	4	S2
P10	1	2	3	4	S3
P11	2	1	3	4	S5
P12	2	1	4	3	S3
P13	3	1	2	4	S2
P14	3	4	2	1	S5
P15	3	2	4	1	S5
P16	2	4	1	3	S3
P17	3	1	4	2	S3
P18	1	3	2	4	S4
P19	1	3	2	4	S5
P20	4	3	1	2	S4
Avg.	2.3	2.3	2.45	2.8	

Although ST is perveived most positively, it is selected only by 3 users. The reason is observed to be familiarity with GPS technology, which is decreasing the novelty of the application. In that manner, although two users ordered ST in the first place, one of them (P11) chose other application (NT) due to novelty and because she wanted to increase her intellectual wellness. Also one participant (P13) stated that she did not choose the application due to weather conditions since the interviews were conducted during December-2012 and March 2013.

The qualities which are perceived as positive/negative for ST are related with:

Table 5. Perceived qualities of Sports Tracker

Sports Tracker	
Positive	**Negative**
Self-monitoring	Interface (complexity, colors)
Perceived usefulness	Seasonality
Motivation for achieving goals	Perceived professionalism
Social support	Social support (share)
Being informed	

Table 6. Number of positive and negative comments on applications with respect to sex

Gender/Apps	NT		ST		F4R		Fit		Number of Comments Positive/Negative
	P	N	P	N	P	N	P	N	
Female	34	28	42	17	33	24	15	35	124/104
Male	17	11	15	24	19	13	16	9	67/57
Total	51	39	57	41	52	37	31	44	**352**

ST's perceivable qualities are more positive for female than it is for male. These qualities are found as self-monitoring, social support, getting informed about process and use of visuals. In addition to these qualities, from well-being perspective, because ST is an application which is more often used for monitoring outdoor activities, the application is likely to enhance environmental wellness, which fits to female participants' usage aims.

On the other hand, Fit's perceivable qualities are more positive for male than it is for female.

Qualities which are perceived as positive or negative for Fit are in relation with:

Table 7. Perceived qualities of Fitocracy

Fitocracy	
Positive	**Negative**
Interface	Interface
Social support	Social support
Playfulness	Perceived usefulness
Sense of personalization	Similarity with social network platforms
Information learning	Manuel logging
Motivation	

For female participants social support, familiarity due to similarity with social network platforms and manual logging were perceived negatively.

For male participants social support, playfulness, information learning and ubiquity were perceived as positive.

Qualities of NT are as follows:

Table 8. Perceived qualities of Nike Training

Nike Training	
Positive	**Negative**
Appeal	Rewards
Music function	Phone related
Real world feel	Perceived professionalism
Perceived professionalism	Lack of personalization
Trustworthiness	Lack of interactivity
Companionship	Commanding coaching
Learning new moves	Familiarity (lacking novelty)
Coaching	

Relation between SoC and positive/negative comments are shown in the Table 9.

Table 9. Number of positive and negative comments on applications with respect to Stages of Change

Apps	NT		ST		F4R		Fit		Number of Comments Positive/Negative	
	P	**N**	**P**	**N**	**P**	**N**	**P**	**N**		
S2	12	16	18	7	32	8	4	17	67	49
S3	11	8	22	10	2	8	11	9	46	35
S4	11	1	7	7	15	0	5	6	37	16
S5	17	14	10	17	3	21	11	12	41	65
Total	51	39	57	41	51	38	31	44	191	165

The discrepancy beween positive and negative comments of the participants of the level S5 comes from applications' inability to meet expectations of the users (performing physical activity as a habit stage) on the basis of the belief that they have more knowledge than the applications may offer, which is related with intellectual wellness.

Qualities of F4R:

Table 10. Perceived qualities of Fit for Rhythm

Fit for Rhythm	
Positive	**Negative**
Appeal	Aesthetically displeasing
Simplicity (duration, exercise)	Trustworthiness
Familiarity (similarity with Kinect, Wii, PlayStation)	Lacking real world feel
Motivation	Game like features
Playfulness	Phone related issues
Perceived enjoyment	Simplicity
Rehearsal	
Interactivity	

The qualities of F4R are significantly negative for S5 (Table 10) because it is perceived as too simple and unprofessional. However, the qualities are significantly positive for the participants belonging to the level S2. This is because the application offers simplicity and playfulness. People from this level are in search of simplicity because they are not familiar with physical activity. The qualities of F4R are mostly positive for S4 people. According to Stages of Change Model for Physical Activity, S4 people are performing physical activity at the required levels from less than 6 months. The participants belonging to this level of physical activity are found to be in search of shorter duration activities and simplicity to motivate themselves to turn physical activity into a habit. Therefore, the quality of simplicity is perceived as a positive feature.

The qualities of ST are mostly positive for S3 people who perform outdoor walks.

The qualities of Fit are significantly negative for S2 who find social support to be negative because it creates demotivation. But when the overall positive and negative comments with respect to Fit are evaluated, the majority is found to be negative due to social support.

In parallel to this finding, there are people from each stages of change levels but commonly from lower stages of change, who believe physical activity should be performed individually.

Table 11. Participants believing physical activity should be performed individually

Participant Number	Stages of Change	Affect Balance
P3	S2	-4
P4	S2	6
P9	S2	-4
P13	S2	13
P10	S3	1
P12	S3	10
P7	S4	-12
P11	S5	4
P19	S5	16

Despite limited number of participants with higher stages of change levels, majority of the participants who are likely to believe physical activity should be performed individually and not sharing their physical activity information via the applications are from lower stages of change levels that is apperantly in accordance with self-efficacy. But interestingly, these participants are also observed to have lower affect balance in comparison to the participants with higher level of stages of change for physical activity, which is in parallel to the findings of positive psychology literature on the basis of the fact that physically inactive people are unhappier. This finding is supported by the fact that, happiness levels of the participants affect their preferences on information share which seems related to social comparison or social facilitation in the minds of the participants. As it is described in the study of Lyubomirsky (2001), happy people are "less sensitive to social comparison than less happy individuals". An earlier study of Lyubomirsky and Tucker (1997) shows that happy people are less invulnerable to social comparison.

5.2 Preferences on Applications:

In the first interview, participants were firstly asked the question in relation to their general application preferences. The results of this question were analyzed in order to understand whether there is a relation between people's general application preferences and their preferences with respect to the introduced physical activity applications. Figure 14 shows general application preferences of people which are grouped according to their selection of applications for physical activity. The results are evaluated to come up with user profiles according to the application preferences.

As shown in Figure 14, a glance of application preferences of the users who selected NT and ST show a wide variety of different interests, while the general application preferences of people who selected F4R and Fit are rather limited.

Users' comments show that they download social media, communication, music and game applications to their Iphones in common, independent from their preferences about physical activity applications (Figure 15).

Distibution of thegeneral application preferences of the users who selected NT, F4R, ST and Fit

Legend:
- Remote Access
- Navigation
- Innovative Apps
- Sports
- News
- Information
- Drawing
- Booking
- Language
- Photo
- Functional/Productive
- Social Media
- Music
- Communication
- Financial
- Game /Entertainment
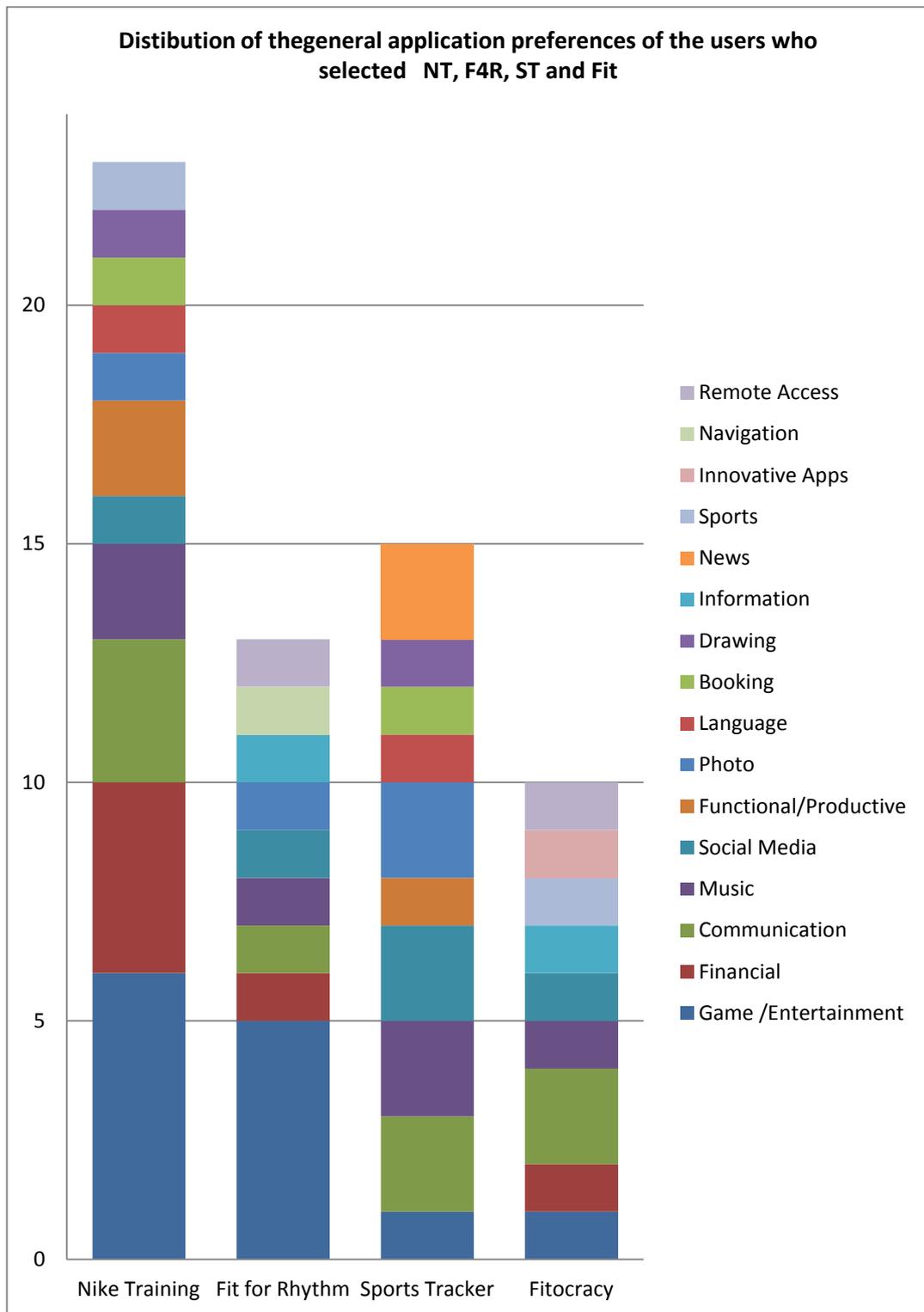
Figure 14.Distrubution of the general application preferences of the users

Majority of the users who selected NT application states that they download applications on gorunds of applications' functionality and the ease they create.

People who selected ST define themselves to be more information related. Except financial applications ST users' preferences on general applications are identical. But, differently we come across with news applications which fit the nature of ST's quality of self-monitoring that enhance intellectual wellness.

All F4R users state that they primarily download games, which is again similar with the perceivable quality of of F4R which is playfulness, related to emotional wellness. In addition, they expect an application to be novel to download.

Finally, Fit users consider downloading social applications such as social media and communication apps in the first place. Right after being social, an application's ability to create shortcut function is also defined as an important feature to download an application. Perceptions of the users on product qualities to download an application show similarity with the qualities they perceive Fit to be like. The affected wellness types of Fit users are social and intellectual.

The results indicate that users' general application preferences are likely to affect their expectations from physical activity applications as well. Therefore, it can be said that the selection of physical activity applications are made similar to applications they use in their daily lives.
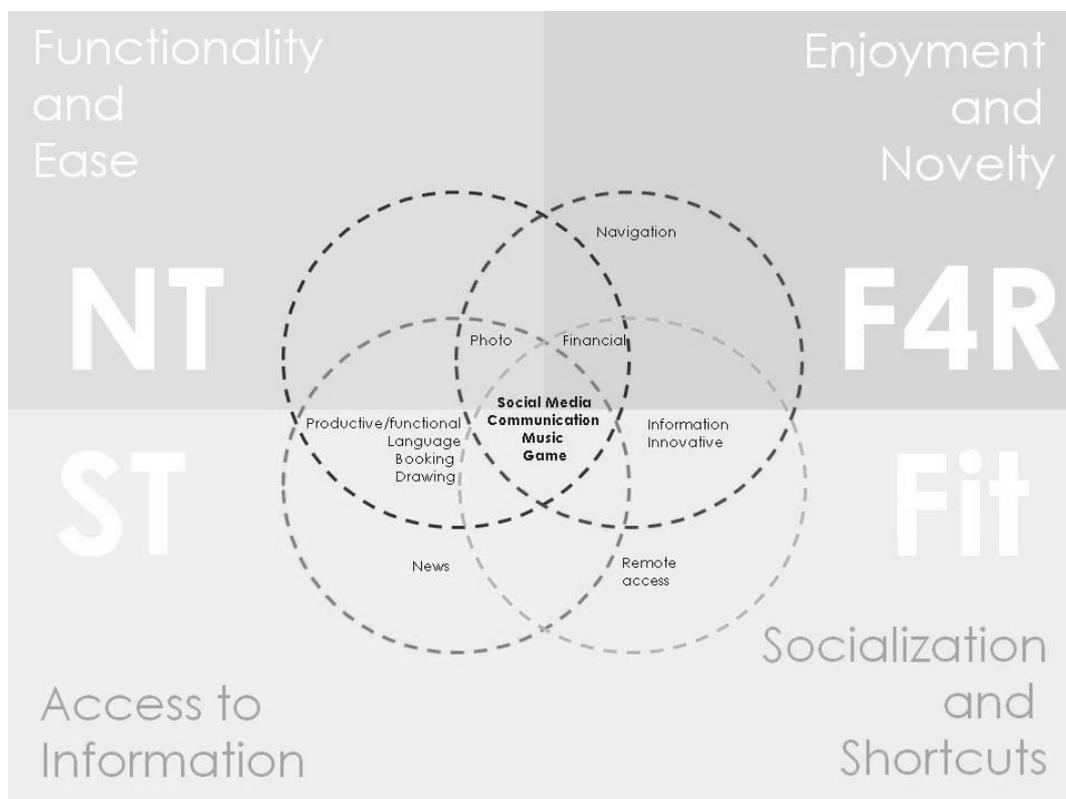
Figure 15. Perception of Applications at the Initial Experience

Summary of relationships is given in the following Table.

Table 12. Summary of Relationships with respect to the application, SoC, tendencies and usage aims

NT
SoC: All SoC but mostly by S5.
General Tendency: Functionality and ease
Indoor Users
ST
The application, is only chosen by female participants.
SoC: Mostly by S3.
General Tendency:Access to Information
Outdoor Walkers
F4R
Apperantly, participants who selected F4R prefer game applications in the first place.
SoC: Mostly by S2.
General Tendency: Enjoyment and Novelty
Enjoyers
Fit
The application is only chosen by male participants.
SoC: Mostly by S5.
General Tendency: Socialization and Shortcuts
Sport Center Goers

Analysis of data obtained by the users show that, users' preferences about selection of applications show similarity to their general application selection criteria.

Owing to the characteristic of coaching and ubiquity which allow users to exercise at any place, and especially at their homes, Nike Training Club (NT) was chosen by indoor users. However, Sports Tracker (ST), on the basis of the qualities of logging and GPS mapping of outdoor activities, was perceived as an application intended for outdoor usage. Fitocracy (Fit) was perceived as a backing application that eases sport center goers' keeping track of their progress by means of manual logging feature and learn new moves through social support, therefore it was selected by people going to sports center. Fit for Rhythm (F4R) was chosen by people, who care their enjoyment, on the basis of the qualities reminding games such as playfulness, enjoyment, interface and activity simplicity and short duration.

Figure 16. Personas and the qualities perceived at the Initial Experience

5.3 Experience-Based Evaluation of Enjoyment of Physical Activity

Figure 17 shows users' perceptions about applications with respect to the first interview (3rd column), the qualities they perceive over time (4th column), and the effect of these qualities to their level of enjoyment (5th column) (see Appendix K,L,M,N). The leftside of the 4th column is allocated for the qualities associated with positive emotions, and the rightside is for the qualities in relation to negative emotions. The qualities below the line are perceived not at the initial experience but over time.

Users' experience over time reveals various qualities, which were not perceived at the first interview. Most of the qualities perceived over time are said to evoke negative emotions. During usage, while some of the initial qualities were perceived rather positively, some of

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them either fell short of meeting expectations or caused a negative experience. Users state that these qualities give rise to the evocation of negative emotions, and lead to disengagement with the applications.

Enjoyment over time results indicate that there is no difference between the enjoyment levels of users who are described as living more positively or more negatively on the basis of SPANE, which is partly due to applications not being able to be incorporated in the users' life. In line with the participants' answers, which pointed out the necessity for using the application for a longer time period instead of just one week to adequately answer the question of satisfaction with the application, the need for evaluating the effect of SPANE into enjoyment in the long-term usage appears.

In addition to that, the results of the interviews also show that, the sense of enjoyment is very affected from users' mood at the moment of the activity (such as quit smoking for a while (P4), having a jury (P5), trying it in the different times of the day (P9)). Therefore, the role of external factors is of great importance when taking the level of enjoyment into account. Other than this finding, PACES results indicate the decrease in most of the users' level of enjoyment experienced over time (Appendix K, L, M, N) due to the qualities that require attention as given at Figure 17, which cause negative experience and leads disengagement. In parallel to that, the comments of most of the users points at a possible disengagement they would live if they used applications longer (P1, P2, P3, P4, P5, P6, P7, P9, P10, P13, P14, P18, P20).

	Initial Experience	Experience Over Time	PACES
Indoor Users	Absence of Social Connectedness Coaching Playfulness Trustworthiness Ubiquity Personalization Professional look Exercise richness Interactivity	Coaching Physical Stretch Self-monitoring Music → Personalization/Customization Playfullness Interactivity Suggestion Logging Personification Dependency to phone Physical Exertion Simultaneity	In addition to application's usage expectation coaching; self-monitoring, music and feeling physically stretched were experienced positively; however, the lack of personalization, level of playfulness, and interactivity failed to satisfy the expectations. Together with the absence of suggestion dialogue, simultaneity and logging feature; difficulty of the moves, dependency on phone, and personification were experienced negatively, which affected the enjoyment level of the activity.
Enjoyers	Absence of Social Connectedness Coaching Playfulness Enjoyment Simplicity Activity duration Appeal	Activity Duration Simplicity Physical stretch → Coaching Playfulness Personalization/Customization Trustworthiness Familiarity Dependency to phone Suggestion	The application's usage of activity duration and simplicity were experienced positively. Feeling a physical stretch was also considered to be positive. However, coaching and the level of playfulness fell short of meeting expectations. Doubts of trustworthiness, lack of personalization and suggestions, becoming familiar with the moves, induced a negative experience because of the lack of a sense of accomplishment, which affects the level of enjoyment.
Outdoor Walkers	Social Support Logging Playfulness Trustworthiness Self-monitoring Companionship	Self-monitoring Social support Ease of use Professional look Comprehensiveness → Trustworthiness Customization/Personalization Familiarity	The perceived qualities of self-monitoring and social support meet expectations. In addition, ease of use, professional appearance and comprehensiveness were found to be positive. However, having standardized estimations for all users affects trustworthiness of the application. Lack of customization and becoming familiar with the application and not perceiving any novelty affects the experiences in a negative way that influences the enjoyment level of the users.
Sports Center Goers	Social Support Logging Playfulness Ubiquity Information share	Social support Playfulness → Logging Comprehensibility User-friendliness	The qualities of social support and playfulness meet the expectations of the users. However, logging was found to be negative since it is not easily comprehensible. Deficiencies in the logging element, interface comprehensibility and user friendliness falls short of meeting expectations, which affects the enjoyment of the activity performed with the application.

Figure 17. Happiness related qualities of mobile applications experienced over time

5.4 Product-Related Dimensions of Well-being

Based on the acquired feedback, the applications are examined about the possibilities they have for enhancing their well-being. The evaluation of the users' perceptions about the qualities of the applications provide information, from users' perspective, about what type of enhanced wellness they are likely to achieve and why the application was selected. Nike Training Club was perceived to enhance physical and intellectual wellness because of its coaching characteristics; while Fit for Rhythm is associated with emotional and physical wellness based on being simple and fun. For Sports Tracker, on the other hand, the self-monitoring of outdoor physical activities is perceived positively and is associated with emotional and environmental wellness. Sports Tracker and Fitocracy were perceived both positively and negatively based on the social support dialogue, which is relevant to social wellness.

The product qualities are examined in relation to the dimensions of wellness and well-being in the following section.

The dimensions of keeping people motivated to be physically active by using mobile applications are drawn based on the wellness theory of Roscoe (2009), which show that wellness is a seven-fold notion that involves emotional, physical, social, spiritual, intellectual, occupational, environmental wellness, and the well-being theory of Seligman (Forgeard et al., 2011), which breaks down the components of well-being as being positive emotion, engagement, relationships, meaning, and accomplishment (PERMA). Content analysis (Krippendorf, 2004) of the research data reveals that the use of the applications for physical activity has the capacity to enhance well-being in all dimensions of wellness.

The model shown at Figure 9, represents the dimensions of well-being in relation to product features. The outer circle reflects the components of wellness (Roscoe, 2009). The inner circle indicates the domains of well-being (Forgeard et al., 2011) and its connection to the theory of wellness. Inside the inner circle, the product qualities which are expressed to affect well-being are represented.

Participant evaluations showed that the product qualities that affect emotional wellness are found to be related with positive emotions, engagement and accomplishment, and can be established through personalization, flow and achievement of goals.

Social wellness is associated with social relationship and support, and it can be enhanced by social support and assistive interaction.

Physical wellness, dependent on positive emotions and accomplishment, can be developed through physical exertion and achievement.

For spiritual wellness, being related to a lofty goal is significant and can be stimulated by establishing relationships, meaning and a sense of accomplishment.

Intellectual wellness is affected by accomplishment, and related to novelty and real life information.

Occupational wellness can be enhanced on the grounds of duration of the activity, which is related with accomplishment of goals.

Environmental wellness is associated with positive emotions and engagement, and can be enhanced by facilitating outdoor activities, which helps create a balance of the time spent in the nature.
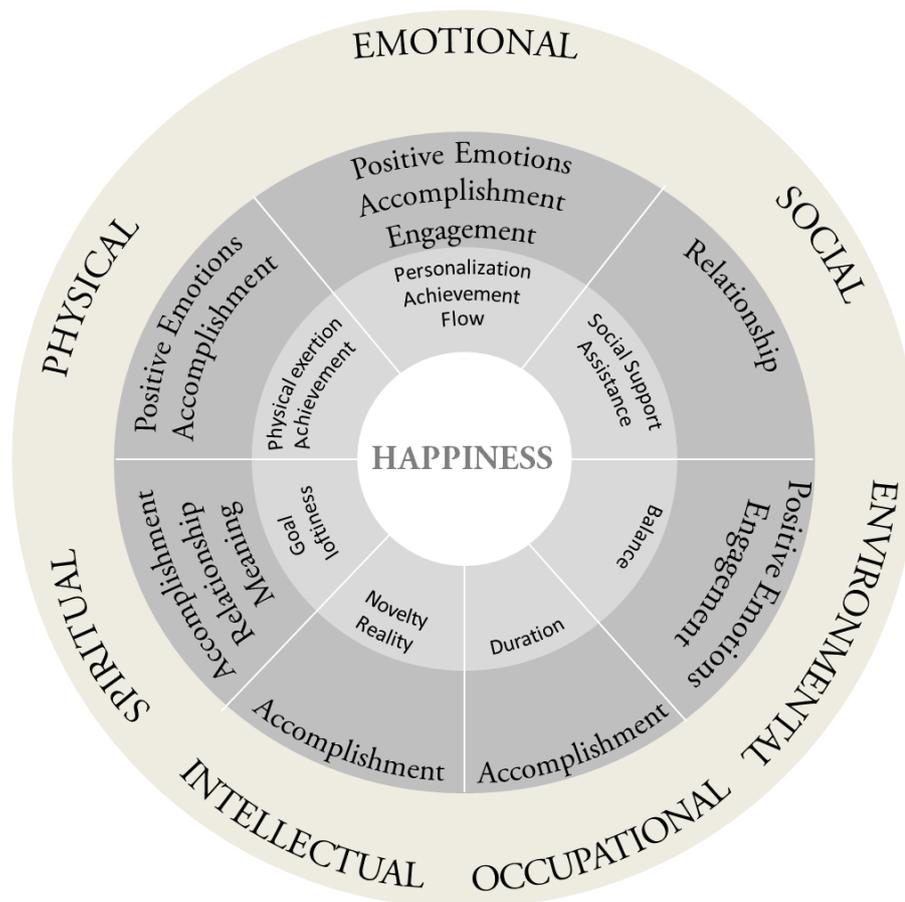
Figure 18. The dimensions of well-being in relation to product features

The distribution of the comments reveals that, evocation of happiness is in relation with enhancing respectively emotional, social, psychological, intellectual, spiritual, environmental and occupational wellness. The product qualities shown in the model are explained in the following.

5.4.1 Emotional Wellness

Emotional wellness is defined as the degree of anxiety, depression, well-being, self-control and optimism. Life satisfaction, interest and enjoyment are also considered as part of

emotional wellness (Renger et al., 2000). The definitions of the theory of wellness and well-being show similarities. Among the dimensions of the theory of well-being (Seligman, 2011), positive emotions are related to emotional wellness on the basis of the availability of more positive effects rather than negative ones. Engagement, which is defined as flow, is associated with the enjoyment of life (Csikszentmihalyi & Hunter, 2003). Life satisfaction corresponds to the feeling of the sense of accomplishment of goals. Hence, feeling positive emotions, experiencing flow and a sense of accomplishment during physical activity performed with the application is observed to increase emotional wellness.

5.4.1.1 Flow

Arousal of positive emotions is considered to be an aspect of hedonic happiness. Although they create short-term mood changes, because they engage the user in a physical activity, evoking positive emotions are required to be the part of the experience with the application. Majority of the comments given in relation to the evocation of positive emotions express the connection of happiness with flow, which is occurring during the physical activity. A product that provides users a sense of full concentration during physical activity may contribute to the process of freeing the mind and create short-term happiness.

P3: "I felt definitely positive. There are the effects of moving, freeing the mind."

P9: "The reason it made me feel positive is because when I was studying, my mind was full of thoughts, and it worked in freeing my mind and created positivity."

P6: "Surely, moving away from troubles gives me happiness."

Because being absorbed in a physical activity affects the level of enjoyment, flow is observed to be an important concept in terms of users' interaction with the application as well. By considering physical activity as a process which should not be interrupted; providing user a continuous experience gains importance. In this respect, because the products allows for concentration; trustworthiness of the application, simultaneous coaching, and simplicity of the interface and use of visuals instead of text are frequently mentioned.
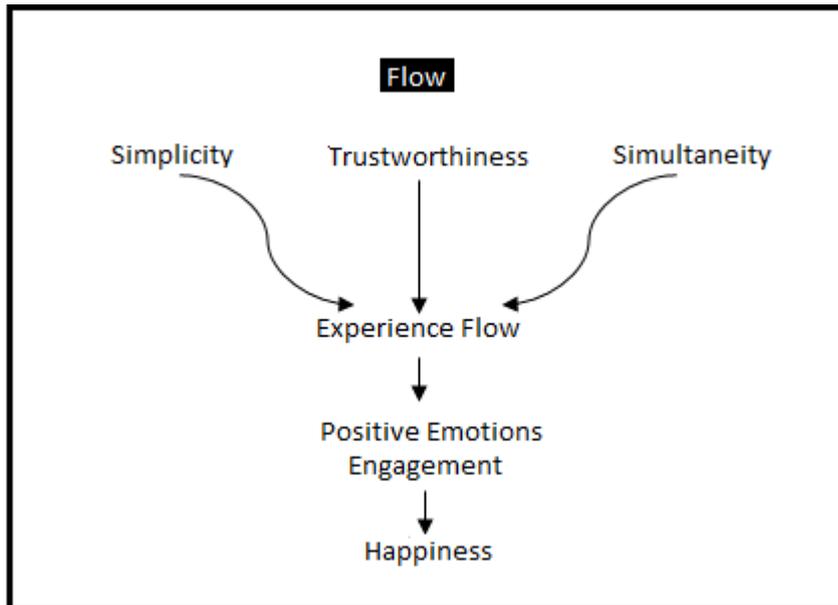
Figure 19. Dimensions of flow

5.4.1.1.1 Simplicity

Because ease of comprehensibility affects flow and holds interest during the experience, users seek a simple interface.

P2: "If it is aiming to encourage physical activity, it should definitely be easy to use, I should log whatever I want with ease and speed or I should control the data in an easier way."

Simplicity is also associated with the visuals used in the application instead of texts and graphics.

P2: "Rather than graphics, I wish it provides me more visual things. Instead of heart rate chart, it would be more appealing to provide enjoyable visuals which we can understand at a glance. Instead of seeing a chart like that, which seems too technical, it feels like it (seeing visuals) would be more enjoyable."

5.4.1.1.2 Trustworthiness

To engage the user in the activity performed, trustworthiness takes an important place. Doubting the accuracy of the information provided by the application breaks concentration, which affects flow and motivation in a negative way.

P6: "There was a punch part (in the application). Sometimes, I see it is not counting when I punch and sometimes I see that it has counted although I have not punched. In that manner, I had difficulty. You are not sure if it is counting right or wrong. It is saying punch 30 times, while pulling your arm back, it is counting. When I push my arm it feels like it is not counting. When I look at it, it is really not counting. In that sense I felt unhappy, thinking

why it is not working correctly."

5.4.1.1.3 Simultaneity

In addition to a number of applications, which contain either written instructions or pictures, there are also applications that use coaching videos to provide simulations of the exercises. Compared to text-based explanations about the moves, users favor pictures and videos because it is easier to understand.

P14: "There might be pictures the moves or there might be small videos which show how to do it."

P3: "At first, I took a glance. One move was shown in three steps with pictures. First, I said, "What is that?" because I did not understand. Then, when I saw the video option, I was like wow it is well explained, therefore, I liked it."

Simultaneity of the moves shown in the application affects the users in terms of the establishment of flow. While users are trying to understand the movement, the applications cannot guide them to an enjoyable experience. Therefore, users seek simultaneity.

P7: "Watching while performing is better of course. It is not a TV but while performing you must be watching how it is performed at the same time. If you forget how to do the move or do not understand the directions, it stops when you press the button. It causes a time loss. It is also important because half an hour is a short time; you have to continue one after another. Stopping (the timer) is bothersome in that manner. You are stopping at each move, thinking how I was doing that or looking if you are confused…. (In order to make me happy), you should watch how the coach is doing, while the timer is working."

5.4.1.2 Accomplishment

Another dimension which affects emotional wellness is observed to be the feeling of a sense of accomplishment.
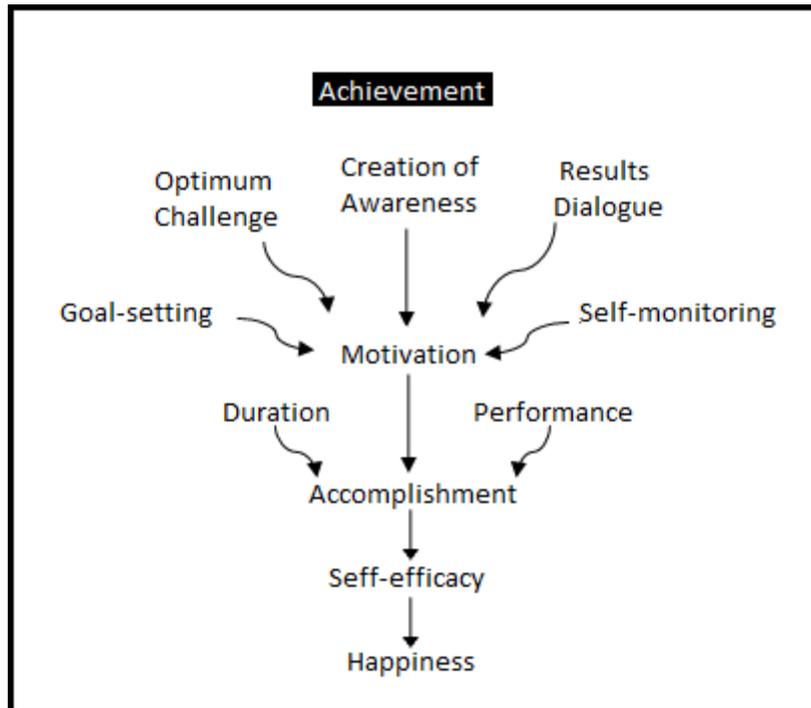
Figure 20. Dimensions of accomplishment

The creation of awareness of the activity, challenges, setting goals, self-monitoring, and seeing results contributes to the feeling of accomplishment, which feeds self-efficacy. Accomplishment, based on goal achievement and in accordance with eudemonic well-being, is considered to have a long-lasting positive effect. Therefore, setting goals, being involved in a challenge and monitoring the outcomes are useful in creating long-term happiness.

P16: "What I feel in general is positive. Even in that moment, you feel the sense of accomplishment. Ok, you have finished these five; you have completed the last three and so on."

P8: "What makes me happy is that gaining points as you perform physical activity pass levels and communication with others. "

P1: "... There is a thing called the sense of accomplishment. If I accomplish, I should accomplish it efficiently on time. And I should accomplish it ideally (in terms of performance)."

P12: "Normally, I walk in my daily life but it is not like doing sports. Well, I sometimes walk to perform physical activity and sometimes to free mind but I did not feel as if I was doing sports previously. People are going to sports center, swimming, but when I used this application I felt like I was doing sports."

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5.4.1.3. Personalization

The individualistic nature of a physical activity requires the personalization of the application if it is to suggest an activity to a user. Since the exercise needs of people vary from person to person, applications tailored to the needs of the user groups is still not enough to evoke positive feelings. Therefore, the need for personalized interaction is frequently mentioned by the users.
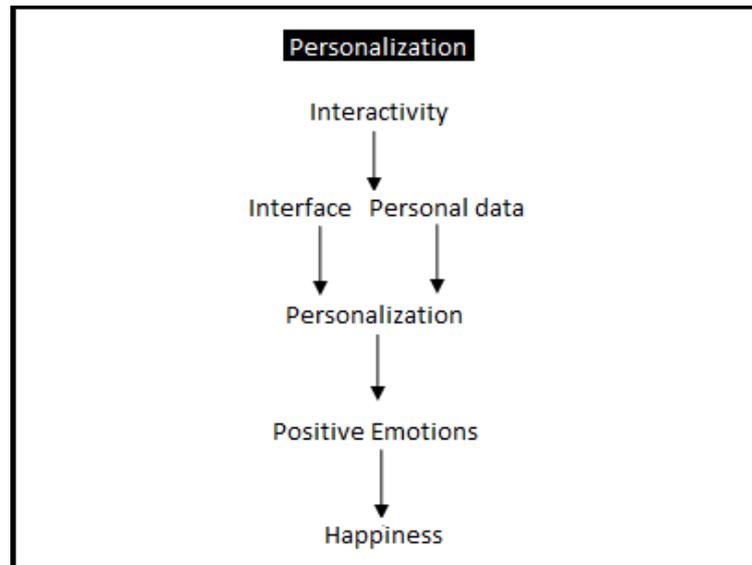
Figure 21. Dimensions of personalization

Because most of the applications provide a standardized content for each person and activity, there is a need to incorporate personal information, evaluate the user's experience and suggest moves and workouts based on the personalized data. The application, in this respect, is expected to be smart and be like an interactive personal coach.

P1: "I wish it gave suggestions. I mean I pause for example. It (the application) is most probably seeing that I paused, I paused for a long time or I stopped. I wish it asked, "Why have you paused?" or feels as if I find it difficult, or after which activity I paused or when did I pause. Sometimes I pause and watch for example, it elapses 2 seconds for nothing. I wish it asked if it was difficult, what happened and make suggestions the next time, accordingly; if you were not able to do that then try this. You are doing it on your own by trying"

5.4.2 Social Wellness

One of the dimensions of Renger et al.'s (2000) definition of social wellness is the interaction of the individual with other people. In terms of the theory of well-being, relationships and social support is considered as having a positive connection with others (Seligman, 2011). Therefore, being connected to others in a secure way is associated with social wellness.
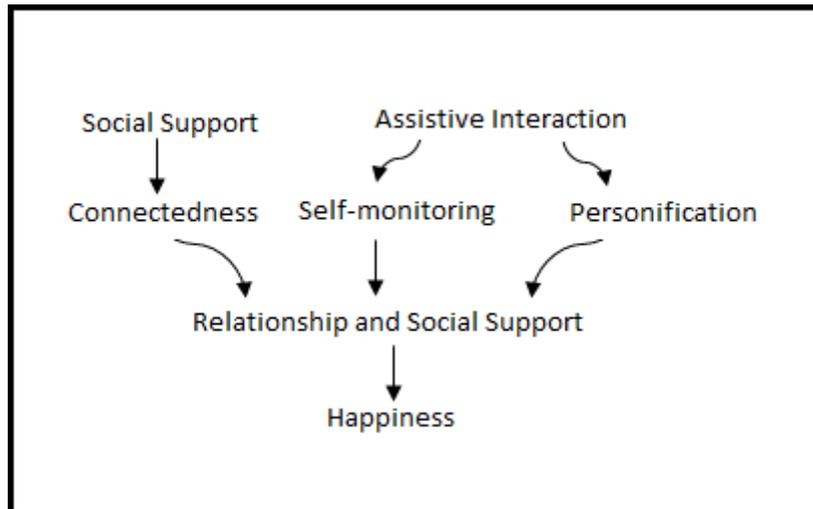
Figure 22. Dimensions of social wellness

5.4.2.1 Social Support

Some users enjoy social facilitation and competition because it brings fun to the activity. In terms of social learning and social facilitation, using the application with others, especially with friends, is found to be enjoyable.

P8: "In fact, using it with a few friends would make it more enjoyable."

However, some people comment about the nature of exercise being more of a personal activity.Therefore, social comparison is expressed as evoking negative feelings. Hence, it is not preferred.

P3: "I do not know why, but I do not believe it is a necessity to do sports and share it with others. You do it alone and sit. I do not think it is a thing to be shared with others such as, "Come on, let's exercise together," or "Look at how much I exercise I did today for some reason.""

Nowadays, all applications have the capability to connect social media and share information. In terms of physical activity, among the people preferring to perform physical activity alone, it is observed that the possibility sharing through social media causes trust issues with the application. A variety of applications provide continuous access to others through social media, however, users expect the access to be user-managed.

P2: "Wondering if it will be connected to the Internet or social media disturbed me. "Connect to Facebook" inscription may be presented in the settings or it may be more remote location compared to the other information on the screen. Instead, it is in the middle of the screen, which I may press by accident…. As I said, for example instead of social media, I may want to see what they are doing differently. I may, for example, follow but prevent others from following me seriously. It may make me happy…. Because I do not

want to connect, enter the site and open an account…. On the other hand, I may want to see others and, when I do, not want to hide myself. I find knowing that I control it makes me feel relaxed."

5.4.2.2 Interaction with the Application

Another social aspect is the relation between users and the applications. Applications make the user's work easier with periodic reminders, keeping records and providing suggestion dialogue. Therefore, they establish a type of social relation with user.

P7: "The application reminds that you should do this now and what you are doing is good. The phone reminder and the application are different things in my opinion. When the phone reminds you it feels like phone belongs to you. But the application is not like it belongs to you; it is like you have to do what it says. You feel you are being monitored by the coaches; it feels like you have to do it. You can turn off the alarm of the phone but when it comes from the application, it is like, yes, the coach is waiting for me. And you are getting up and going. "

Because there is a social relation between user and application, the interaction between them requires the application to take on human characteristics.

P10: "That robotic voice was the most irritating, disturbing thing. In the other application that I used to use, you are doing simultaneously while the thing (coach) is in the opposite and with a normal human voice. But here it shows you the video, closes (the video) with that robotic
voice. It should be a human, human voice. It would be more engaging. "

5.4.3 Physical Wellness

Adams et al. (1997) defines the concept of physical wellness as the perception and evaluation of physical fitness, and Durlak (2000) adds behaviors to this definition. On the basis of these viewpoints, physical wellness is considered to be the perception of the physical state at the moment of physical activity performed along with the application, and the feeling of strength that emerges as a result of the exercise.

Figure 23. Dimensions of physical wellness

5.4.3.1 Physical Exertion

The level of difficulty based on the user's comfort level will determine if the user will be bored or enjoy the exercise. Therefore, if there is enjoyment, the feeling of flow will be experienced. If the moves are too challenging or too simple, users are likely to get bored and give up the physical activity that is performed along with the applications.

P1: "It does not give breaks. I am getting tired and out of breath, sweating in a meaningless way. Maybe it has to be that way but I did not like it for this reason…. When you go to a sports center, they tell you, if you are weight training, for example, do it for 3 times and then rest. But it did not do that. My knees were like…. Finally, I gave up at the 12th minute. I got bored. For example, it is asking to do a single led for two minutes. How can I do it for two minutes?"

… The third was simpler. It gave breaks but it did not contribute anything. I did not feel any stretch. I am already doing it when I am at home and feel bored. Therefore, I experienced negative feelings."

5.4.3.1.1 Personalization

Although the primary aim of the applications is to increase physical wellness, because applications are not personalized on the basis of the level of difficulty of the moves, and they provide standardized content for each user, both positive emotions and the sense of accomplishment are negatively affected. Therefore, in order to enhance physical wellness, personalized interaction is crucial. Users seek for personalization on the grounds of being able to make changes in the list of the suggested workouts. Even if the content is tailored to the needs of the user groups, individual users experience various difficulties.

P10: "It asked me what do I want to do in general and I exercised according to that. On the other hand, it did not suggest anything by taking information on height, weight, personal

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characteristics and etc. Therefore, within the exercises it sets, there are also moves that I cannot do…. It is not doing personalization, but it can take height, weight information and maybe it can be more adaptable or, for example, while doing crunches, s/he is (the real coach at the gym) saying that do half crunch since it may injure you because you have problem with your weight. But it (the application) is saying that do full crunch. There were options in the program that I used such as easy, medium, advanced. It was showing the move at each different level. But it shows a standard version."

Another reason for the need for personalization is users are having doubts on whether or not the moves suggested by the application are safe, which have an effect on the level of trustworthiness of the application and in turn, the experience of flow.

P11: "I don't feel secure with those videos. As I said, when I do not know whether or not I do the move correctly, I may also get injured. I feel unsure towards that."

5.4.3.2 Achievement

Users are likely to feel a sense of accomplishment when they experience optimum physical exertion in terms of the moves level of the difficulty and duration.

P6: "... I continue to feel happier and invigorated as I continue using the application. Because the exercise is accomplished in a short time, I feel happy. I can easily do and accomplish the exercises, therefore I feel happy. It satisfies me."

5.4.4 Spiritual Wellness

Spiritual wellness is defined as having a sense of meaning and purpose in life, connectedness to the self, the environment or to a higher power according to Adams et al. (2000). Seligman's (2011) theory of well-being defines meaning and purpose as "feeling of belonging and serving something larger than the self." Therefore, having a meaning and purpose in life is connected to spiritual wellness.
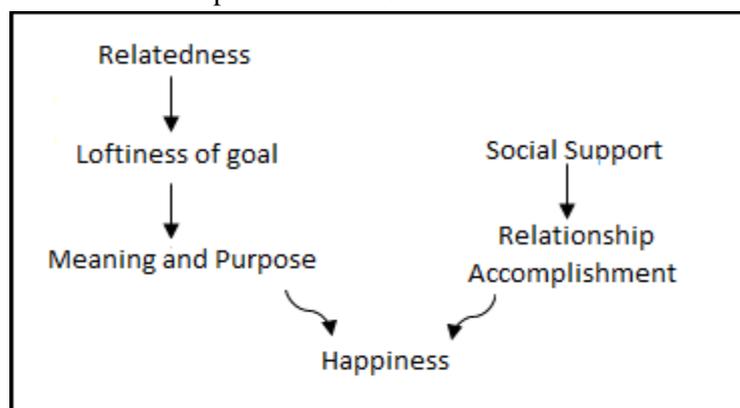

Figure 24. Dimensions of spiritual wellness

By establishing a sense of belonging and relatedness, spiritual wellness can be enhanced. Setting a lofty goal for physical activity carries a possibility for both increasing the sense of accomplishment and being related to an event or activity. Combined with lofty goals, being connected to others for a common purpose can be deemed to increase spiritual wellness.

P4: "In order to attain a feeling of satisfaction, it should be broader. It is like a competition. Either, it should serve the purpose of a lofty aim. It is not that lofty. I did it, took park for my enjoyment. I enjoyed but that is all. If I do physical activity, I want it to make a show of it or do it for a charity. However, I only did it myself."

5.4.5 Intellectual Wellness

Intellectual wellness is defined as "individual's perception, one's orientation and achievement toward personal growth" (Renger et al., 2000). Consequently, being knowledgeable about one's physical activity to achieve a goal improves intellectual wellness.
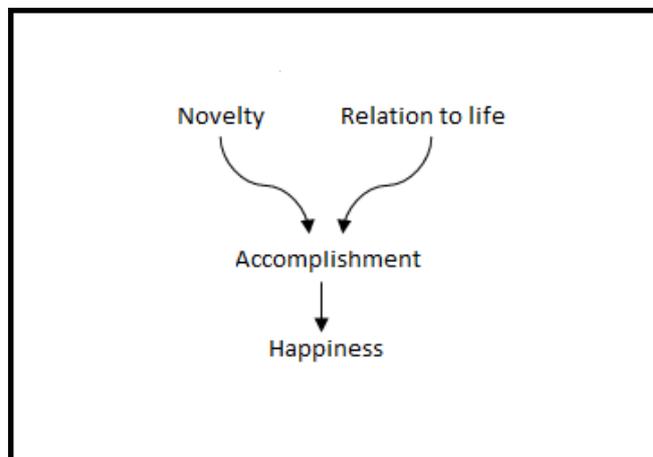
Figure 25. Dimensions of intellectual wellness

5.4.5.1 Novelty

Novelty of the information contributes to personal growth. Therefore, users feel positive about learning new information.
P15: "I experienced positive feelings. First of all, you can learn new information with this application. You can discover things you didn't know. It is valid for all areas of the life. If it teaches you something you do not know, then I feel it is good. "

5.4.5.2 Relation to Real Life

To enhance intellectual wellness, receiving novel information is more effective when the user can integrate the information into everyday life. Providing information or tips for the real world instead of giving estimations and calculations account, this leads to an arousal of positive emotions and motivation. Users seek real life information from an application because they seem useful and motivating.

P13: "It could possibly provide references that are more realistic. For example, the sportsmen of this kind do this with that number of repetitions, so let's begin with that many repetitions. By giving relating to real life, for example if there are these yoga moves, then giving information about it; the moves are those, they work for those, they make these muscles work, would be more convincing. "

5.4.6 Environmental Wellness

Roscoe (2009) specifies the concept of environmental wellness as the balance of interacting with the environment, by contributing to the welfare of environment and being aware of the effects on nature.

Figure 26. Dimensions of environmental wellness

Although the use of the applications is not observed to be related to the enhancement of environmental wellness as an answer by the users relating the well-being questions, providing means for performing outdoor physical activity via the application establishes possibilities to increase the time spent to commune with nature.

P12: "Sports center seems like a mandatory task. On the other hand going out for walk is for relaxation and fresh air. First of all, I dislike sport center and being indoors. There are many people around doing exercise. It may help psychologically help but seeing it as a task…. Being outdoors is more natural. Besides, the weather is nicer outdoors. Therefore, I prefer exercising the outdoors. "

5.4.7 Occupational Wellness

Based on the viewpoint of Hettler (1980), occupational wellness is defined as the satisfaction felt through work. The definition of Crose et al. (1992), however, puts an emphasis on the balance between work and leisure.
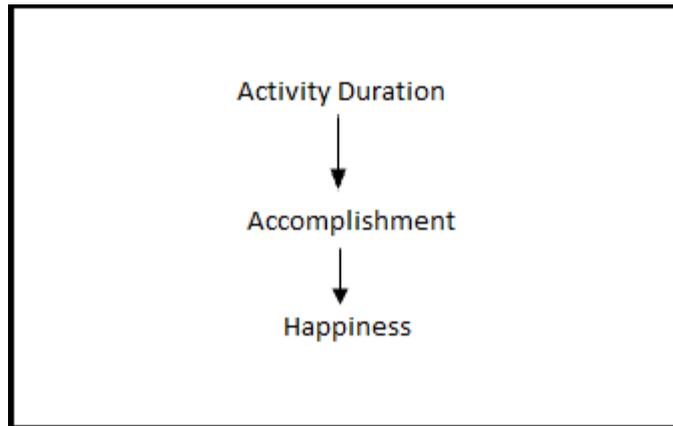
Figure 27. Dimensions of occupational wellness

A direct relation between using the application and increasing occupational wellness was not seen within the users' comments regarding well-being questions. However, having busy schedule at work and school is observed to be preventing physical activity.

P15: "I felt very bad (about performing sports). I had exams and busy schedule at work. Therefore, I did not have any time (for physical activity)."

Since the duration of the activities is an important factor when doing exercise, providing and reminding that shorter periods of physical activity carries a potential to evoke happiness and enhance occupational wellness on the basis of the accomplishment of the goals by increasing the balance of work and leisure.

P16: "I thought that I did something for myself during the day. Above all, I thought of myself as a person who spends time efficiently; I am waking up in the morning, doing exercise and going to work. It became something that I made me happy with myself."

CHAPTER 6

CONCLUSION

This chapter presents a brief review of the answers to the main questions of the study, acquired from literature research and the empirical study, and draws conclusions. The chapter ends with a section that discusses the opportunities for further research.

6.1 Reflecting back on the Research Questions and Main Findings

Current Approaches towards Physical Inactivity within the Fields of Health Interventions, Persuasive and Mobile Technology:

The actions taken in the direction of increasing physical activity has been growing as the number of inactive people and health problems with respect to sedentariness has multiplied throughout the world. With this respect, people are encouraged for increasing their level of physical activity within the context of health interventions that aims to change attitude and behavior, gain awareness and management skills, and provide environment for physical activity.

Persuasive Technology emerges as a field suggesting the use of technology to change user attitude and behaviors. The approach of the field of persuasive technology towards creation of interventions is established on grounds of the source, the receiver, the message of persuasion perspective. The techniques of persuasion mostly focus on providing information which is relevant to individuals, connecting people socially to facilitate change in the behavior, leading users through a series of events which engage them during the experience.

Due to mobility, connectivity and ubiquity, current persuasive technology interventions benefit from mobile devices, especially mobile phones. However, despite the wide range of mobile applications intending to change behaviour for physical activity through persuasion, people face difficulties to maintain their motivations.

Exploration of the Possibilities within the fields of User Experence, Positive Psychology and Design for Happiness for Enhancing Happiness:

The experience with smart products shows peculiarities with reference to users' pragmatic, physical and emotional needs. Both pragmatic and hedonic qualities have to be satisfied by making user in control of the product, creating the sense of appeal, leading to an engaging experience and providing healthy pragmatic performances.

Although technology is capable to facilitate solutions for interventions, products designed with reference to persuasive technology are mostly deficient in answering the changing and

subjective needs of users. This fact is supported by the state in which users' motivation to to use mobile applications for pyhsical activity is not sustained. Therefore, it brings the necessity of a user-driven approach that users' needs and perceptions are accessed and convenient interventions for physical activity are created through smart mobile applications.

Most of mobile applications, designed for increasing physical activity behavior, are aimed to solve particular technical issues. However, designing for increasing physical activity behavior needs a perspective in which the surrounders of human behavior are fully understood. As an alternative to the common problem-driven approach, design of health intervention products suggested to benefit from possibilities, which enhance happiness through better analysis of human needs and human practices.

As a starting point in possibility-driven design, design looks out for possibilities, which are rooted in our knowledge of happiness. Around exploration of human practice and human needs, design can both create positive experiences leading pleasure and increase individuals' awareness on their abilities that improve the belief on good life.

Happiness is categorized around cognitive (or attitudinal), hedonistic, mood and hybrid views. On the cognitive view, happiness is considered as the cognitive state in which the person has a positive attitude towards life. While, according to hedonistic theory, happiness is the preferred balance of pleasure over displeasure. On the mood theory, it is defined as a specific positive mood, and hybrid theory explains happiness as the mental state experienced partly cognitively by evaluating life positively, and partly affectively by feeling good about life.

Happiness studies are concentrated in the field of positive psychology under the name of Subjective Well-being. It is one of the complex areas studied as part of psychology. The early views on subjective well-being see hedonic happiness coming from life satisfaction, and living more positive affect than negative affect, well-being is often associated with social class and wealth, attachment and relatedness, and goal pursuit. Whereas, newer definitions concentrates on hybrid views that define happiness as the combination of positive emotions, engagement, relationship, sense of meaning, achievement. Intense feeling of flow is also regarded as an important factor for happiness.

The outcomes of the studies concerning positive psychology shows that personality is a determinant factor of SWB, however the circumstantial and voluntary factors also play importance. People who are married, having connection to other people, getting social support, feeling fulfillment about their jobs, having meaning such as religion, performing physical activity, feeling healthy, meeting his/her basic needs are found to be more happy. Besides, happy people tend to be more successful and contributing others' lives.

As stated above, physical activity is strongly connected to subjective well-being because both SWB of a person affects the way a person enjoying physical activity and the activity itself has grounds for increasing overall SWB of a person. Although, physical activity itself

is useful in creating short-term positive mood changes and satisfaction, use of current available mobile applications for physical activity fails to evoke happiness because they are not fully integrated with user's life.

Initial Perception of Qualities and Selection of Mobile Physical Activity Applications:

Analysis of the results indicates that users' initial perceptions and selections of physical activity applications are in parallel with their considerations they hold when downloading other application for their daily needs. Within this frame, we observe that the users who selected coaching application were fond of the applications perceived as functional and creating ease, while users who selected tracking application were access to information oriented. Playful application were selected by users considering enjoyment and novelty as important factors for downloading an application, and social application were assessed by users giving importance to socialization and creation of shortcuts.

As shown at Table 12, there is a relation between indoor users, outdoor users, sport center goers and enjoyers, and selection of coaching application, tracking application, social application, and playful application, respectively.

Perception of Happiness throughout Physical Activity:

In addition to the increase in the level of endorphine due to performing physical activity leading momentary pleasures, because users accomplish physical activity, which they see as a goal to be achieved in their daily lives for health purposes, usage of application even in the short term is said to create the short tem happiness.

Patterns of Happiness:

As shown at Figure 18, although initial exploration of possibilities for happiness patterns were searched around emotional wellness, the analysis of user comments, in line with the wellness theory, showed that other six dimensions of wellness are also affective about enhancing happiness with respect to different subjective well-being needs of people.

Enjoyment of Experience over time:

As discussed at Chapter 5, because the sense of enjoyment is affected from users' mood at the moment of the activity, the role of external factors is of great importance when taking the level of enjoyment into account. PACES scales obtained during one week usage show that most of the users experience lower level of enjoyment as they use the applications.

Level of Physical Activity (SoC) and Its Effect on Happiness concerning Application Usage

Because the level of physical activity has an effect on one's SWB, higher stages of change level for physical activity indicates the possibility to have higher level of happiness.

However, when the happiness with respect to application usage is considered, despite no direct relation with users' level of physical activity over happiness caused by application usage was observed, we see that lower stages of change level users were found to be vulnurable to social comparison leading unhappiness.

General State of Happiness and Its Effect on Happiness concerning Application Usage

Although, any direct relation with users' general state of happiness over happiness caused by application usage was not obtained, it was observed that the needs around social dialogue, especially social comparison, was found to be in accordance with users' state of affect balance.

Design Qualities of Mobile Physical Activity Applications, which Evoke Happiness:

Analysis of data obtained from semi structured interviews and diary data of 20 people, has shown that, users' happiness with respect to physical activity behavior is associated in all extents of wellness, which are emotional, physical, social, spiritual, intellectual, occupational and environmental. In the each extent, affected well-being qualities, which are living positive emotions, engagement, relationship and support, meaning and the sense of accomplishment vary. Therefore, drawn upon the Theory of Wellness and Well-being Theory, an application that is aiming to motivate users for increasing physical activity, should look for the possibilities of enhancing wellness in seven domains by enhancing particular well-being dimensions.

Emotional Wellness

The results of the empirical study show that flow (Figure 28), motivation (Figure 29), accomplishment (Figure 30) and personalization (Figure 31) are the mobile application qualities that are enhancing emotional wellness. For smart mobile applications, offering a continuous experience with qualities of simplicity, trustworthiness and simultaneity is crucial to increase the likelihood of flow.
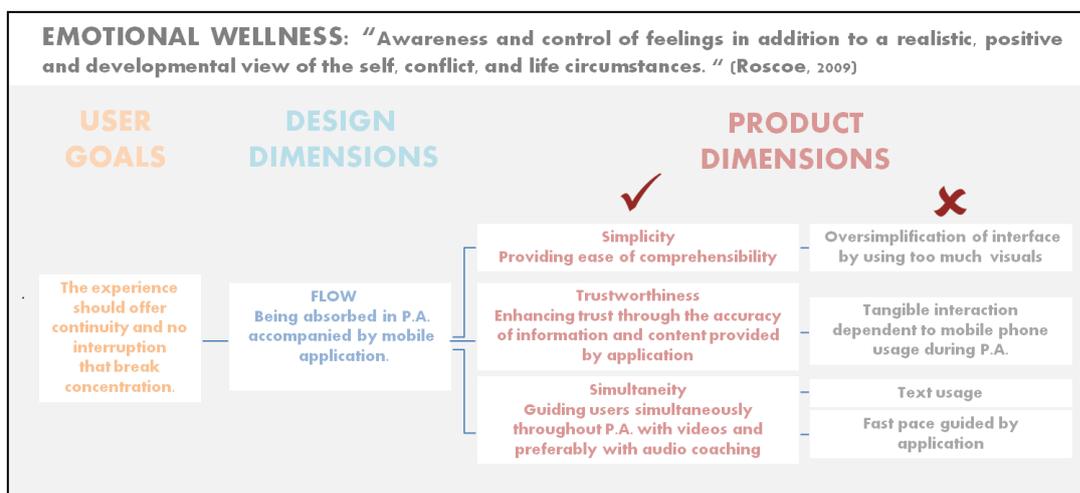

Figure 28. Product dimensions for enhancing flow for Emotional Welness

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Flow

To encourage physical activity, the user should enjoy the activity performed via the assistance of the application. In order to enjoy a physical activity, it is an important factor to experience flow. However, the barriers between the users and the product prevent experiencing flow, which are due to both product and information-related aspects.

If we look at the product related aspects of users' interaction with the applications, we observe that if the phone is part of the activity, tangible interaction with the phone contradicts with the nature of the physical activity by not taking into account the uniqueness of the users. A standard product -mobile phone-, which is primarily designed for everyone's ear and hand use, can cause displeasure when used during such a dynamic activity. In addition, any experience depending on the physical interaction of the user with the mobile phone during physical activity, causes displeasure because the flow of the physical activity is interrupted.

Simplicity

Since mobile phones are small devices with small screens, applications are likely to promote simplicity. However, oversimplification of the interface, which is seen in the form of using visuals and graphics only with no explanation for guiding users result in confusion. Therefore, use of mobile phones during physical activity which needs tangible interaction is likely to fail enhancement of positive emotions because the experience is negative. Hence, connecting mobile phones with other big screen visual devices such as a tablet PC, TV or a projector is necessary in order to give freedom to the user for indoor activities. In addition to that, instead of a tangible interaction, the use of audio elements is essential to maintain the connection between the user and the product to increase flow.

Trustworthiness

Information related aspects constitutes majority of the barriers between users and the applications. Most of the participants utter the belief they hold about technology being incapable of meeting their expectations for physical activity since technology is not that developed. Since the current technology of mobile applications for physical activity has deficiencies in controlling users' activities, they are found as untrustworthy by the users. This leads to the consequence in which they cannot establish a longer engagement with the products and cannot experience flow. Therefore, trustworthiness to mobile phones can be increased by establishing a control mechanism. The users comment about using mobile phones as a tool, which observe the moves of the user, give feedback on the accuracy of the moves and control whether the activity is performed or not.

Interestingly, dependency to phone is also perceived negatively based on not being able to sparing time for self, due not being away from technology and because of the issues with trustworthiness.

Simultaneity

In parallel to the engagement literature findings, the results show that users want to be in control of the situation both physically and emotionally. In particular to physical activity applications, simultaneity of the assistance through audio feedback makes users feel good about themselves by increasing flow, however, receiving directions about the moves but lacking personalization is evaluated as the loss of control which results as seeing the application in control not the self. This result also affected from applications' deficient personification and lacking real world feeling.

If the application is asking to perform physical activity along, it is observed that, music is a factor that eases experiencing flow. With respect to that, music, by leveraging familiarity with a personalized list of music, accompanies users to keep up their activity. In parallel, users are also in search of music either when dealing with such a hard task or to motivate themselves to engage with product through emotional benefits of music.

Accomplishment

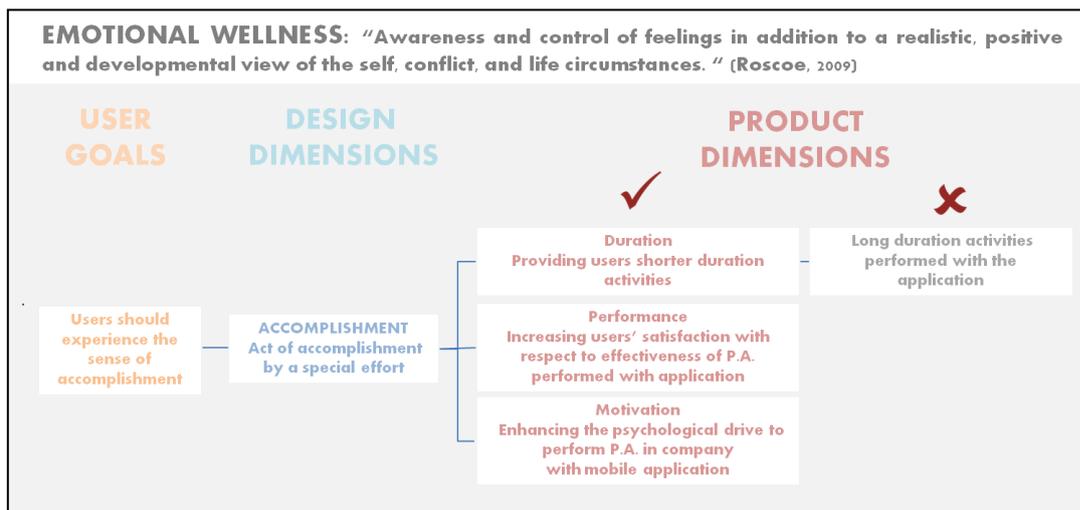Figure 29. Product dimensions for enhancing accomplishment for Emotional Welness

Duration

Users, especially the ones who are not performing physical activity as a habit stage are in search of shorter durations for performing physical activity.

Performance

An efficient performance that results in observable outcomes, eg. exertion, experienced in shorter duration increase the sense of accomplishment.

Motivation

The analysis of data shows that users' motivation affects the sense of accomplishment that enhance emotional wellness with respect to the experience of the qualities that are increased awareness, challenge, self-monitoring, feedback and goal setting. Due to the importance for physical activity interventions, the successors of motivation are given in the following figure.
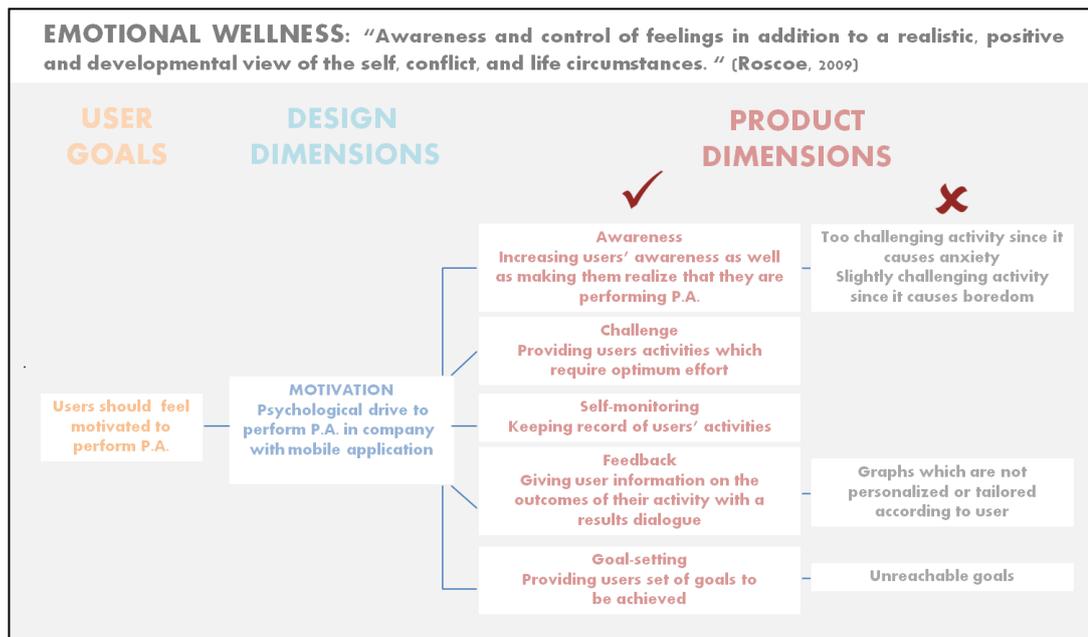
Figure 30. Product dimensions for enhancing motivation for Emotional Welness

Awareness

For users from lower stages of change levels, the applications function as a tool for increasing awareness on the activity they perform because of the change in their perception about seeing physical activity as not being only vigorous exercise.

Challenge

Providing users optimum level of challenge based on their needs gain importance when designing an application for physical activity. For game-like approaches, if the activity is too challenging, it results in anxiety and users state that they are more likely to give up using applications. In contrast, if the activity is not challenging at all, it causes boredom and users comment that they may disengage after a while.

Self-monitoring

Self-monitoring record is a strong motivator because it recalls accomplished past experiences. The literature suggests the relation of memory on behavior if it is accessible. Therefore, the quality offers self-improvement and leads motivation.

Feedback

Applications enable feedback, mostly via written information or some kinds of summaries including graphs. Users are in search of a dialogue support and particularly of praise and suggestions. On the other hand, feedback's comprehensibility and relevancy to users' interests demand attention.

Goal-setting

As part of playful interventions, reachability of the goals requires attention.

Personalization
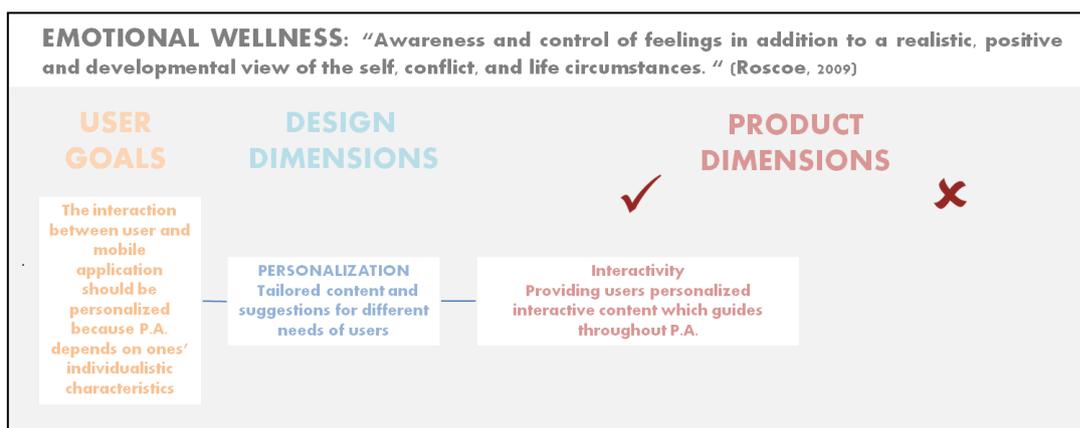
Figure 31. Product dimensions for enhancing personalization for Emotional Welness

The content offered by an application asking to perform physical activity along with mobile phone often fails to create engagement because they do not allow personalization of the content. With respect to that, users experience the issues with trustworthiness that causes disengagement. Users comment about the need to increase interactivity for personalization through an interface that keeps personal data and suggests personalized activities fitting their abilities and interests.

Social Wellness
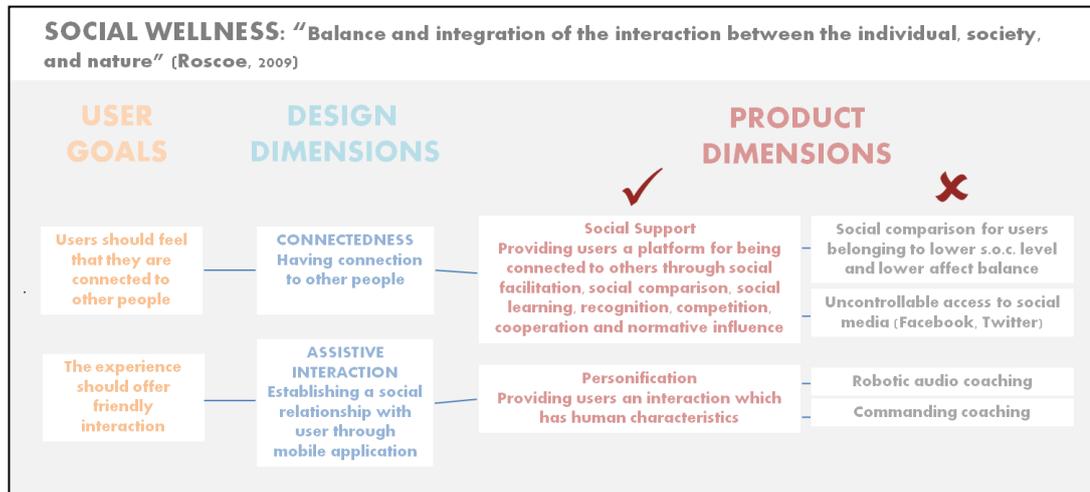
Figure 32. Product dimensions for enhancing Social Wellness

Connectedness

Most of the applications are designed in order to enhance social support and increase motivation. Other than this aim, connectedness appears as an important construct to enhance social wellness. However, for physical activity interventions, designing a social application requires attention. Enabling social comparison contains the risk to create negative emotions leading unhappiness of the users belonging to lower stages of change level and affect balance. Besides, users want to be in control of the content shared with others.

Assistive Interaction

Users are in search of friendly humanistic interaction with mobile applications. As an example, audio coaching, which has robotic voice and imperative statements, is perceived as unfriendly and commanding. By looking to the way a relationship is established, it can be said that personification provides the possibility to enhance social wellness.

Physical Wellness

PHYSICAL WELLNESS: "Physical wellness also includes the perception and expectation of wellness, as well as the acceptance of one's physical state" (Roscoe, 2009).

USER GOALS	DESIGN DIMENSIONS	PRODUCT DIMENSIONS ✓	✗
Users should feel fit by accomplishing P.A. along with application	PHYSICAL EXERTION Physical effort experienced during P.A. in company with application	Personalization Providing users trustworthy personalized P.A. content / Increasing the likelihood that the user will achieve the target P.A.	Standard content for each user

Figure 33. Product dimensions for enhancing Physical Wellness

Physical Exertion

If an application demands for too much physical effort that cause exertion, then the perceptions on physical fitness and trustworthiness of the application are negatively affected. In order not to cause an unwanted exertion, there is a need to personalize suggested workouts.

Accomplishment

Accomplishment of physical activity feeds the belief on physical fitness.

Spiritual Wellness

SPIRITUAL WELLNESS: "a shared connection or community with others, nature, the universe, and a higher power; development of values and a personal belief system." (Roscoe, 2009).

USER GOALS	DESIGN DIMENSIONS	PRODUCT DIMENSIONS ✓	✗
Users should feel the sense of meaning in the activity they perform by being related to others for a lofty goal	RELATEDNESS Being connected to something bigger than self / SOCIAL SUPPORT Being connected to other people for a lofty goal	Goal loftiness Enhancing the feeling that users perform P.A. For a lofty goal / Enhancing social facilitation for lofty goal	

Figure 34. Product dimensions for enhancing Spiritual Wellness

For physical activity, the possibilities around establishing meaning and purpose in life are associated with carrying a lofty goal and being part of a social group for this lofty aim. As an example to that, leveraging physical activity organizations for charity purposes can be given.

Intellectual Wellness

Figure 35. Product dimensions for enhancing Intellectual Wellness
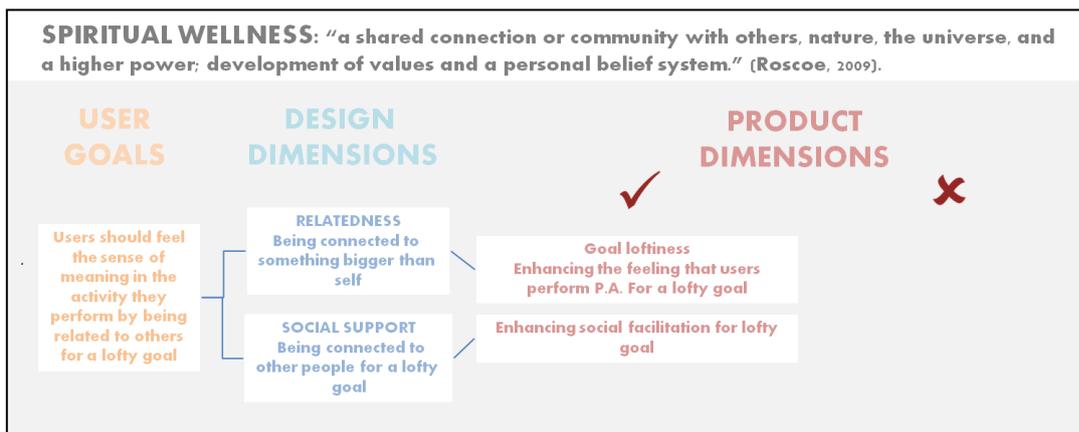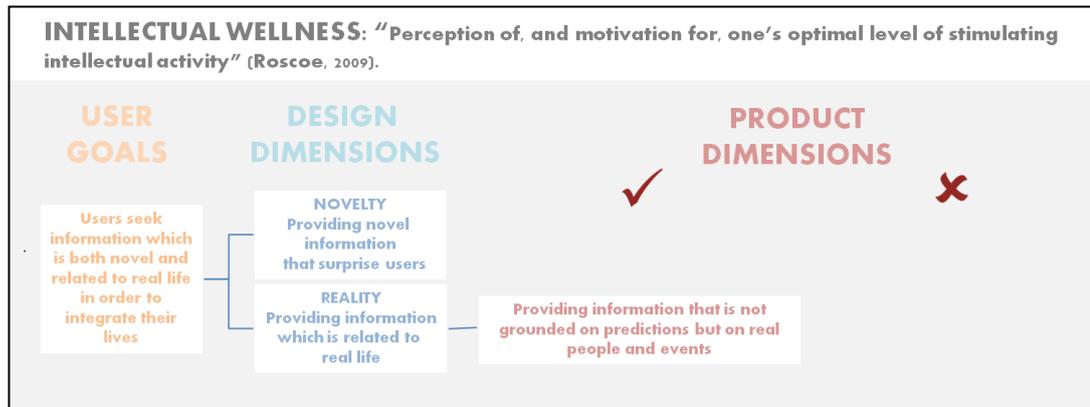
Novelty

Users are in search of novel information that surprises them. The term appears in different forms. While playful applications are expected to provide novel content in which users can experience different activities each time they use application, for coaching applications, suggestion of new activities gain importance. For tracking applications, novelty is associated with renewed self-monitoring data and social applications benefit novelty from information flow, which different users contribute.

Reality

Another dimension that makes experience with smart mobile applications for physical activity deficient to enhance positive emotions is lacking the sense of reality. This consequence comes up in the form of seeking real friends performing physical activity, using the application together through social facilitation, receiving content fed by real peoples' opinions, seeing real people coaching them through application, or most interestingly gaining rewards that establish the sense of reality which get away from artificialness in order to incorporate to their lives, and enhance their intellectual wellness.

Environmental Wellness
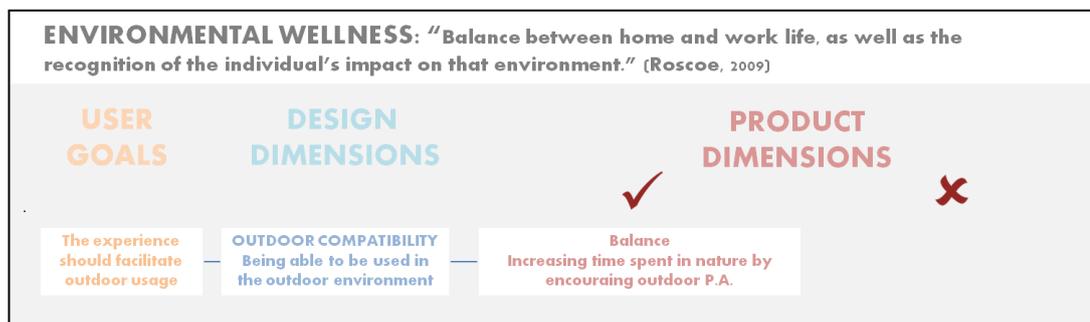
Figure 36. Product dimensions for enhancing Environmental Wellness

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Outdoor Compatibility

An application's facilitation of outdoor compatibility enhances the balance of time spent in nature.

Occupational Wellness
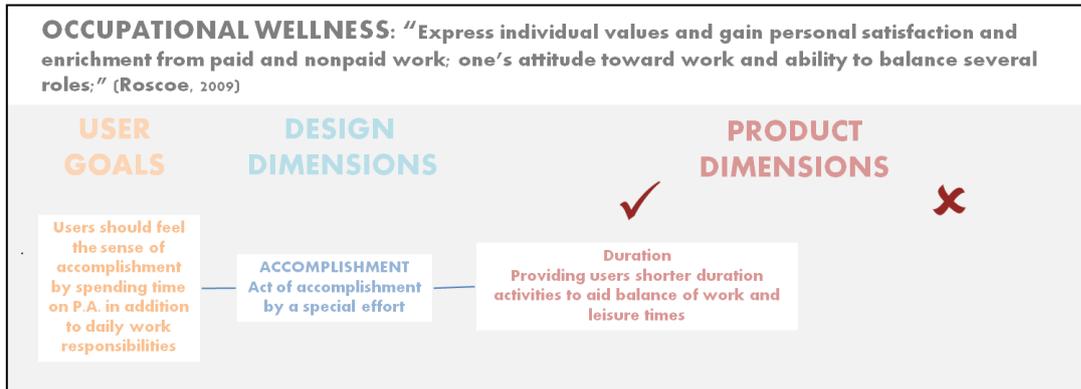
Figure 37. Product dimensions for enhancing Occupational Wellness

Accomplishment

By seeing physical activity as a responsibility to be performed in addition to work responsibilities, most of the users experience cognitive dissonance by knowing that they have to perform physical activity but they do not have time. Because occupational wellness is explained to be affected from the balance between work and leisure times, shorter duration activities are more likely to flourish happiness since they feed the sense of accomplishment
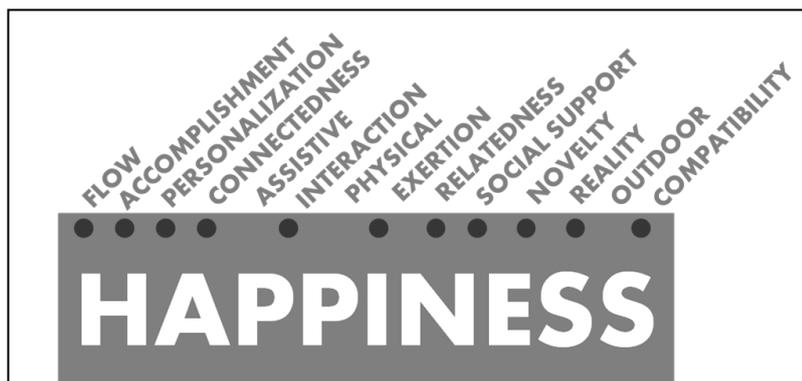
Figure 38. Design dimensions for enhancing Happiness

In relation to the deficiencies in both information and product-related aspects that persuasive mobile applications hold for physical activity interventions, leading displeasure and disengagement even in the short-term usage, this thesis makes an analysis to better understand the arising human needs and answer them with design. With this respect, this thesis has investigated users' perceptions with respect to evocation of happiness when using

mobile application for physical activity. By achieving the design dimensions shown at Figure 38, mobile applications for physical activity are believed to answer the needs, since the approach built on the enhancement of happiness in all dimensions of wellness has the possibility to engage users by not forcing them in a manipulated way as current persuasion and behavior change techniques adopt.

The findings presented within this thesis is believed to provide a knowledge source for gathering the possibilities around the constructs related with enhancement of happiness as means of obile application development for physical activity.

6.2 Further Research

Throughout different phases of the research, new questions around seveal issues have aroused. First, it would be noteworthy to conduct a study in a longer time for the better exploration of qualities with respect to eudaimonic wellbeing. For empirical study of this thesis, although one week period was useful to explore positive emotions it should be noted that despite defining usage period as one week containing three usages based on the user experience literature, the duration was extended for most of the users. As discussed at Chapter 5, due to the several comments concerning a possible disengagement users would experience in a longer usage period, a long term study would be beneficial to see the results on user engagement and life satisfaction.

Another research can be carried out by considering cultural and class differences since the findings of the empirical study in this thesis do not cover the aspects related to culture. The interviews have shown that use of smart mobile application that asks for performing physical activity within daily routine is likely to be affected from people's way of living in cultural context. Besides, well-being perspective of happiness has an association with the issues of social class and wealth. Therefore, for further studies, a cultural approach would be beneficial.

Being another opportunity for research, the applications to be used as part of the study can be selected among the paid ones with enhanced capabilities. For empirical study of this thesis, due to ease of access and download, free applications were selected. Only one application (F4R) had the paid version along with its free version that had restriction about levels' accessibility to be opened on pay or usage.

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RESEARCH METHOD

Selection of 20 People among **University Students** who

- Use an IPhone
- Interested in exercise
- Know English

and willing to participate in the study

↓

Asking their positive mood in general to understand their state of happiness

How frequently do you have positive and negative affects?
SPANE scale (Diener et al., 2009)

↓

Asking people to select an application based on their goals and personal attitudes

What are the perceptions of people
while selecting the application?

3 times usage (1 week or longer)

Physical
Activity
Enjoyment
Scale (Marcus)

↓

Sending Physical Activity Enjoyment Scale via Skitch

← Obtaining feedback after each activity

Obtaining feedback after each incident

Does the use of mobile application which promotes physical activity create happiness during the experience? If so, how?

Which qualities of applications make people feel happier?

What makes people feel happy during physical activity?

↓

Final Interview

Are there any similarities (or differences) between people's happiness related perceptions of mobile applications for physical activity?
Is there any happiness pattern?

APPENDIX B

Application Cards

Fitocracy

You can join the fitness community with this application. You can track your workouts and your workout progress while learning new exercises, and getting support from the fitness community through the application. You can earn points, unlock achievements and beat quests while following others to get daily inspiration and joining in on conversations. You can challenge others, unlock achievements and visualize your progress. Your workouts are synced between the web and the application. You can post your progress to Twitter and Facebook.

Version: 1.1.1

Application cards - Happiness Project - Phase 1 - Handa Ipık

Sports Tracker

You can track and analyze your workouts, monitor your routes and progress by using this application. You can keep track of things from calories burned to average speed and altitude. You can store all training data in your workout diary and back it up to the Sports Tracker online service. You can see your friends' profiles and comment their workouts and photos, share workout data and photos on Sports Tracker, Facebook and Twitter while exploring the globe to discover new routes and trails worldwide.

Version: 1.0.6

Application cards - Happiness Project - Phase 1 - Handa Ipık

Fit for Rhythm

You can count the number of your movements in company with a virtual coach by using this application. You can enjoy stretch/balance/aerobic/muscular exercises. The application can assist you with easy fitness exercises. You can manage your consumption calorie on a calendar. Depending on age, gender, and weight, by continuing five exercises a day for one month, in which each exercise takes about a minute, you can consume around 350 kcal. In conjunction with SNS (Twitter,Facebook,mixi), four trainers will support daily exercises.

Version: 1.0.6

Application cards - Happiness Project - Phase 1 - Handa Ipık

Nike Training Club

You can perform workouts which last for 15 to 45 minutes, based on training goals, accompanied by instructions and video demonstrations. The application consists of multi-dimensional, multi-directional drills build on the fundamentals of strength, cardio, interval and core training, and rewards including workouts. You can track details of your workout history and training progress, share your workout and reward status on Facebook and Twitter. You can use audio guidance while working out, and set your workout to albums and playlists from your own music library;

Version: 2.7

Application cards - Happiness Project - Phase 1 - Handa Ipık

Evaluation of Stages of Change

1. Is the user currently physically active? Y/N
2. Does the user plan to become more physically active in the next 6 months? Y/N
3. Does the user currently engage in regular physical activity? Y/N
4. Has the user been regularly physically active for the past 6 months? Y/N

If question 1 is N and question 2 is N then the participant is at stage 1
If question 1 is N and question 2 is Y then the participant is at stage 2
If question 1 is Y and question 3 is N then the participant is at stage 3
If question 1 is Y and question 3 is Y and question 4 is N then the participant is at stage 4
If question 1 is Y and question 2 is Y and question 4 is Y then the participant is at stage 5

Regular physical activity must add up to a total of 30 minutes or more per day and preferably be done at least 5 days per week.

First Interview

The interviews were conducted in Turkish.

Open ended questions asked in the first interview (EN):

1. Do you install the apps you need? Which type of apps?
2. Do you perform physical activity? How frequent? For how long?
3. Did you use any application for pysical activity?
4. Do you want to use any application from those introduced?
5. Why did you choose this application?
6. With which aim do you use this application?
7. Why did not you choose other applications?

Birinci mülakatta sorulan açık uçlu görüşme soruları (TR):

1. İhtiyaç duyduğunuz uygulamaları indirir misiniz? Hangi tip uygulamalar?
2. Hiç fiziksel aktivite gerçekleştiriyor musunuz? Ne sıklıkta, ne kadar süredir?
3. Daha önce fiziksel aktivite için uygulama kullandınız mı?
4. Önerdiğimiz uygulamalardan birini kullanmak ister misiniz?
5. Bu uygulamayı neden seçtiniz?
6. Hangi amaçla kullanırsınız?
7. Diğerlerini neden seçmediniz?

APPENDIX E

Second Interview

The interviews were conducted in Turkish.

Open ended questions asked in the second interview (EN):

1. How did you feel yourself about physical activity this week?
2. Do you find physical activity evoking happiness? Did it evoke happiness this time?
3. How did you feel about using an application for physical activity? How does it make you feel in general?
4. Do you think you would use an application to increase your physical activity? How did you find this application? Would you use this application from now on and why?
5. At which times did you use this application?
6. What were the things that made you happy/unhappy during the usage?
7. How would the application made you happier?
8. Did the application evoke any life satisfaction and why?
9. Did you experience positive or negative feelings during your usage, why?

İkinci mülakatta sorulan açık uçlu görüşme soruları (TR):

1. Bu hafta kendinizi fiziksel aktiviteyle ilgili nasıl hissettiniz?
2. Sizin için fiziksel aktivite genelde mutluluk verici midir? Bu sefer mutluluk verdi mi?
3. Fiziksel aktivite için uygulama kullanmak sizi nasıl hissettirdi? Genelde nasıl hissettirir?
4. Size kalsa fiziksel aktivitenizi artırmak için uygulama kullanır mıydınız? Bu uygulamayı nasıl buldun? Bundan sonra kullanır mısınız? Neden?
5. Uygulamayı kullanmak hangi zamanlarda aklınıza geldi?
6. Uygulamada sizi mutlu/mutsuz eden şeyler genelde nelerdi?
7. Bu uygulama sizi daha nasıl mutlu edebilirdi?
8. Uygulama hayatınızla ilgili bir tatmin duygusu yaşattı mı? Neden?
9. Kullanımınız sırasında pozitif mi negatif duygular yoğunluktaydı?

Scale of Positive and Negative Experience (SPANE) (Original Version)

Please think about what you have been doing and experiencing during the past
four weeks. Then report how much you experienced each of the following feelings, using
the scale below. For each item, select a number from 1 to 5, and indicate that number on
your response sheet.

1. Very Rarely or Never
2. Rarely
3. Sometimes
4. Often
5. Very Often or Always

Positive
Negative
Good
Bad
Pleasant
Unpleasant
Happy
Sad
Afraid
Joyful
Angry
Contented

Pozitif ve Negatif Deneyim Ölçeği (Türkçe)

Lütfen son 4 hafta içerisinde yapıyor ve deneyimliyor olduğunuz şeyleri düşünün. Sonra aşağıdaki ölçeği kullanarak, aşağıdaki her bir duyguyu ne kadar deneyimlediğinizi açıklayın. Her madde için, 1 ile 5 arasında bir sayı seçip, cevap kağıdında işaretleyin.

1. Çok nadiren yada asla
2. Nadiren
3. Bazen
4. Sıksık
5. Çok sık yada her zaman

Olumlu
Olumsuz
İyi
Kötü
Hoş
Nahoş
Mutlu
Mutsuz
Korkmuş
Neşeli
Kızgın
Halinden memnun

Fiziksel Aktivite Eğlenme Ölçeği (Türkçe)

Lütfen fiziksel aktivite esnasında nasıl hissettiğinizi derecelendirin. Aşağıda fiziksel aktiviteyle ilişkili duyguların listesini bulabilirsiniz. Her bir duygu için lütfen sizi en iyi tanımlayan numarayı işaretleyiniz.

		1	2	3	4	5	6	7	
1	Zevk aldım.								Nefret ettim.
2	Sıkılmış hissettim.								İlgili hissettim.
3	Sevmedim.								Sevdim.
4	Zevkli buldum.								Zevkli bulmadım.
5	Fiziksel aktiviteye kendimi tamamen verebildim.								Fiziksel aktiviteye kendimi hiç veremedim.
6	Hiç eğlenceli değildi.								Çok eğlenceliydi.
7	Enerji verici buldum.								Yorucu buldum.
8	Beni bunalıma soktu.								Beni mutlu etti.
9	Çok keyifliydi.								Hiç keyifli değildi.
10	Yaparken kendimi fiziksel olarak iyi hissettim.								Yaparken kendimi fiziksel olarak kötü hissettim.
11	Çok zindelik vericiydi.								Hiç zindelik verici değildi.
12	Beni çok hüsrana uğrattı.								Beni hiç hüsrana uğratmadı.
13	Çok tatmin ediciydi.								Hiç tatmin edici değildi.
14	Çok canlandırıcıydı.								Hiç canlandırıcı değildi.
15	Hiç teşvik edici değildi.								Çok teşvik ediciydi.
16	Çok tazeleyiciydi.								Hiç tazeleyici değildi.
17	Bana güçlü bir başarma duygusu verdi.								Bana hiçbir başarma duygusu vermedi.
18	Bunun yerine başka bir şey yapmayı tercih ederdim gibi hissettim.								Bunun yerine yapmayı tercih edeceğim başka hiçbir şey yok gibi hissettim.

APPENDIX I

Physical Activity Enjoyment Scale (Original Version)

Please rate how you feel at the moment about physical activity. Below is a list of feeling with respect to physical activity. For each feeling, please mark the number that best describes you.

		1	2	3	4	5	6	7	
1	I enjoy it.								I hate it.
2	I feel bored.								Ifeel interested.
3	I dislike it.								I like it.
4	I find it pleasurable.								I find it unpleasurable.
5	I am very absorbed in physical activity.								I am not at all absorbed in physical activity.
6	It's no fun at all.								It's a lot of fun.
7	I find it energizing.								I find it tiring.
8	It makes me depressed.								It makes me happy.
9	It's very pleasant.								It's very unpleasant.
10	I feel good physically while doing it.								I feel bad physically while doing it.
11	It's very invigorating.								It's not at all invigorating.
12	I am very frustrated by it.								I am not at all frustrated by it.
13	It's very gratifiying.								It's not at all gratifiying.
14	It's very exhilarating.								It's not at all exhilarating.
15	It's not at all stimulating.								It's very stimulating.
16	It gives me a strong sense of accomplishment.								It does not give me any sense of accomplishment.
17	It's very refreshing.								It's not at all refreshing.
18	I feel as though I would rather be doing something else.								I feel as though there is nothing else I would rather be doing.

From Motivating People to Be Physically Active, by Bess H. Marcus and LeighAnn H. Forsyth, 2003, Human Kinetics, Champaign, IL.

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APPENDIX J

Results of SPANE Scale

Age	30	26	22	21	25	23	23	23	23	27	29	22	27	24	24	24	24	20	22	25
Sex	F	F	F	F	F	M	F	M	M	M	F	F	F	M	M	F	F	M	M	M
Selected Application	NT	ST	NT	F4R	F4R	F4R	NT	Fit	F4R	NT	NT	ST	F4R	Fit	Fit	F4R	ST	NT	NT	F4R
Positive	4	4	3	4	4	4	2	3	2	4	4	4	4	4	4	4	4	5	4	5
Negative	2	2	4	3	3	2	4	3	4	4	4	3	2	2	1	3	4	2	3	1
Good	4	3	3	4	3	4	3	3	3	3	3	4	5	4	4	4	4	5	4	5
Bad	2	2	4	1	2	2	4	3	4	4	3	2	2	1	1	2	4	2	3	2
Pleasant	4	3	3	4	4	4	2	3	2	3	4	4	3	4	4	4	4	4	4	5
Unpleasant	1	2	4	5	1	2	4	4	2	3	3	1	4	2	1	3	2	1	3	1
Happy	5	3	2	4	4	4	2	3	3	4	3	4	5	4	4	3	4	4	4	5
Sad	2	2	4	2	2	1	5	3	4	5	3	2	2	2	1	3	4	2	3	1
Afraid	1	1	1	1	1	1	4	1	1	1	1	4	1	1	2	2	2	1	1	1
Joyful	4	4	3	4	4	4	2	2	3	3	4	3	5	4	4	4	4	5	4	3
Angry	3	1	4	5	4	3	4	1	4	2	3	1	3	2	1	1	4	3	1	3
Contented	5	4	3	3	5	4	2	4	2	3	3	4	5	3	5	5	3	4	5	5
Affect Balance	15	11	-4	6	11	13	-12	3	-4	1	4	10	13	13	18	10	3	16	11	19
Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Results of PACES for Nike Training Club
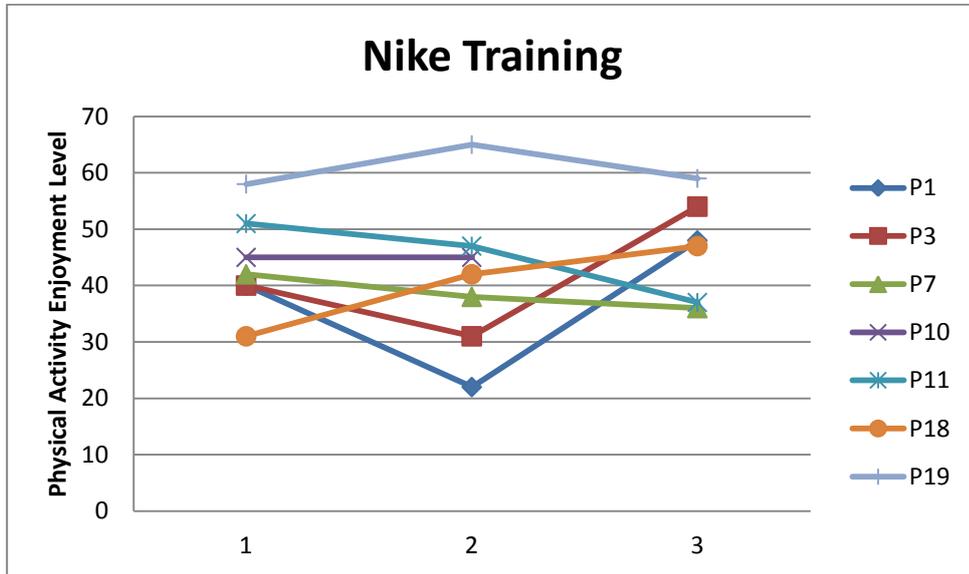
Results of PACES for Sports Tracker
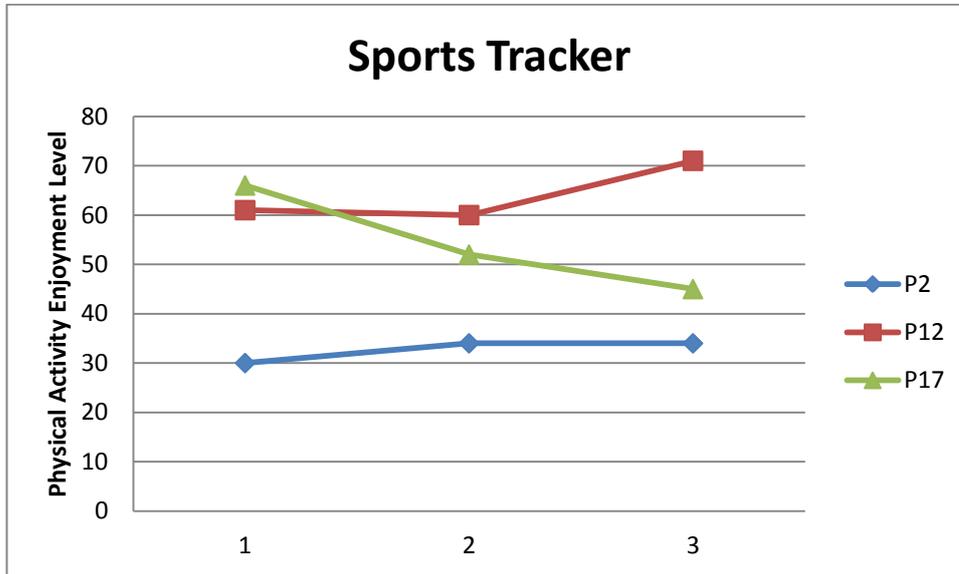
Results of PACES for Fit for Rhythm
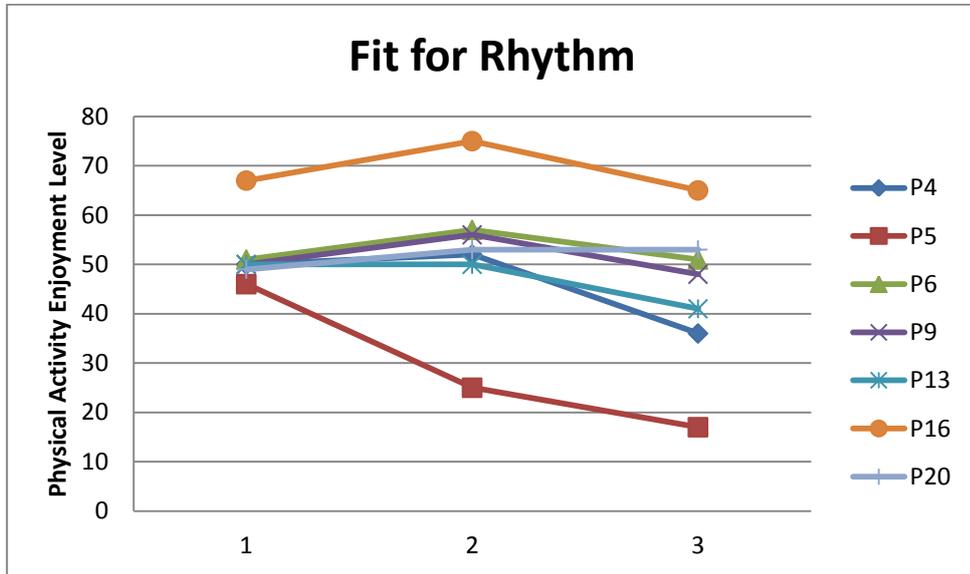
Results of PACES for Fitocracy