Happiness-related qualities of mobile apps for physical activity

Hande Işık[1]

isikhande@gmail.com

Çiğdem Erbuğ[1]

cerbug@gmail.com

[1] Middle East Technical University, Turkey

Abstract Many studies concentrate on the use of persuasive technology to encourage people for active lifestyles, yet it is a design challenge to create intrinsic motivation for users to increase or maintain healthy behaviour. Building upon the relationship between happiness and staying active, this paper presents design qualities perceived as a source of happiness. The study empirically examines data gathered from semi-structured, in-depth interviews of 20 people between the ages of 20 and 30. It applies content analysis method to analyze product qualities associated with happiness in relation to users' short-term experiences with smart mobile applications. Benefiting from the theory of wellness, the paper explores the qualities of mobile physical activity apps and proposes possibilities for happiness.

Introduction

Inactivity negatively affects human health and well-being (Warburton et al., 2006). The widespread prevalence of a sedentary lifestyle increases attention towards developing interventions for encouraging physical activity (Biddle et al., 2004). Smart mobile phones appear as efficient tools to intervene physical inactivity since they enable ubiquitous access to people (Fanning, Mullen & McAuley, 2012).

The major body of research and product development for physical activity carries the intention to increase one's level of activity via ubiquitous and mobile technology. The interventions adopt a *persuasive technology* framework (Fogg, 2002; Chatterjee & Price, 2009; Lehto & Oinas-Kukkonen, 2011). Despite such mobile persuasive strategies, studies show that people still encounter difficulties in maintaining their motivation for physical activity and there appear ethical concerns of making someone to do something (Arteaga et al., 2009; Dorrestijn & Paul-Verbeek, 2013; Fogg, 2009; Olofsson, 2010). Some studies document the importance of the role of positive feelings in users' motivation for physical activity (Fujuki et al., 2008; Arteaga, 2009), however, the literature lacks a perspective that would address the inner needs as a source of physical activity. Knowing that happier people are more active and motivated to set and achieve goals, understanding the possibilities associated with people's happiness become fundamental (Schulz, 1985; Ryan & Deci, 2000; Veenhoven, 2008). For this purpose, applying the positive psychology approach to design seems to be a relevant starting point (Schot et al., 2009; Desmet & Hassenzahl, 2012; Desmet & Pohlmeyer, 2013).

Happiness is a challenging concept and approached differently by various researchers (Diener et al., 1984, 2000; Ryff, 1989; Ryan & Deci, 2000; Csikszentmihalyi & Hunter, 2003; Seligman & Csikszentmihalyi, 2005; Seligman, 2008; Seligman, 2011). Although a global definition of happiness has not been agreed upon, affect and cognition are commonly regarded as two main dimensions of it. Taking a hybrid view of these, Seligman (2011) describes well-being in terms of positive emotions, engagement, relationship, sense of meaning, and achievement (PERMA); respectively interpreted as feeling good about one's self, living in flow, connecting with others, and having a sense of meaning and goal accomplishment.

Happiness-related qualities of mobile applications

Our empirical study explored properties of mobile phone apps that carry possibilities to address needs regarding happiness. In our results section, we present design dimensions that may contribute to happiness.

Selection of mobile applications

For this study, we selected four free iPhone apps based on probability and disproportionate sampling. Among 16,499 health and exercise apps in the iTunes store Turkey, we examined 375 most popular applications of which 142 focused on physical activity. We eliminated 56 non-free of those apps to ensure the chosen apps would be accessible to all users. The next cut was based on app scores provided by previous users; those that scored below 3.5 over 5.0 were eliminated on account of low perceived credibility. Next, considering an app's possibilities for evoking happiness, from among different categorization methods for physical activity apps (Ahtinen et al., 2008; West et al., 2012; Kranz et al., 2012), we chose Ahtinen et al.'s (2008) because it concentrates on motivation and classifies the apps into four groups: personal trainer, logger, playful applications and games, and social applications. Finally, after categorizing our remaining apps, we ranked them based on their public ratings, and chose for our study the leading app in each category: Nike Training Club (personal trainer), Sports

Nike Training Club (personal trainer app) provides users with a list of workouts based on their goals and fitness levels by showing videos by actual personal trainers. It gives rewards and allows sharing info with friends. Users can listen to music and receive audio feedback during their workouts.

Sports Tracker (logger app) keeps track of an outdoor workout on the map by using GPS, logs it automatically to system, and monitors progress of workouts.

Fit for Rhythm (playful app) counts the number of repetitions of the demonstrated exercise the user performs, accompanied by a virtual coach. The user must have the iPhone in hand for this app to work.

Fitocracy (social app) provides a platform on which to log workouts manually and track, share and learn new exercises while receiving support from the community of app users.

Figure 1. Snapshots of apps.

Tracker (logger), Fit for Rhythm (playful), and Fitocracy (social) (Figure 1).

Participants
In order to fairly represent people with different interests in and desire for physical activity, we selected participants via non-probability quota sampling by looking at their level of physical activity through a stages of change (SoC) scale (Marcus & Simkin, 1993). The scale determines people's level of activity by acquiring knowledge about their exercise routines. We selected our sample group from among people in every stage excluding Stage 1 (state of physical inactivity with a lack of intent to be physically active in the next six months).

The second criteria for participant selection was being owner of an iPhone and having enough knowledge of English to use applications well. We chose young adults because of the growing importance of sedentary habits among young people associated with health problems in later life (Owen et al., 2014) and familiarity with mobile apps. Participation was voluntary and participants selected applications they had never used.

The sample contained 11 female and 9 male undergraduate, graduate, and doctoral students between the ages of 20 and 30, with a mean value of 24.2. Among the 20 participants, P10 and P14 stopped using the applications after their second experience (of the required three), respectively due to an unrelated health problem and disengagement with the application because some exercises were unavailable for logging.

Study methods
Our empirical study consisted of three phases: (i) a semi-structured entry interview to introduce the apps and understand users' perceptions about apps, (ii) a diary for users to record their three experiences over one week in real time, and (iii) a semi-structured exit interview to probe product qualities associated with happiness (Table 2).

Because each person's level of happiness is different (Diener, 2000), before the first interview we asked participants to complete a scale of positive and

Table 1. Information on Participants and Application Preferences.

App	Nike Training Club							Fit for Rhythm							Sports Tracker			Fitocracy		
Participant	P1	P3	P7	P10	P11	P18	P19	P4	P5	P6	P9	P13	P16	P20	P2	P12	P17	P8	P14	P15
SoC	S5	S2	S4	S3	S5	S4	S5	S2	S2	S4	S2	S2	S3	S4	S3	S3	S3	S4	S5	S5
Sex	F	F	F	M	F	M	M	F	F	M	M	F	F	M	F	F	F	M	M	M
Age	30	22	23	27	29	20	22	21	25	23	23	27	24	25	26	22	24	23	24	24
Affect Balance	15	-4	-12	1	4	16	11	6	11	13	-4	13	10	19	11	10	3	3	18	13

negative experiences (SPANE) developed by Diener et al. (2009) so we could determine their affect balance. The aim of this scale is to understand a participant's positive and negative experiences (affect balance level) over the preceding month and, in our case, to determine whether past negative experiences may affect his/her experience with the app or not. Only three participants (P3, P7, P9) had negative scores for SPANE, and the exit interview determined that these participants could more easily disengage with the applications, a finding that needs further analysis.

After determining the affect balances, participants were shown the four apps and their perceptions about each app was analyzed. The apps were introduced by showing a card that consisted of the name, version number, five screen shots of the app, and a short description of the key features. Then, participants were asked to select one of the apps based on his/her usage aims.

In the second phase, participants were expected to use one of the applications three times over approximately one week and take notes right after each session, documenting what (would) made them happy during the experience. Usage duration was determined by referencing similar studies (Romero et al., 2010), which used a one-week diary method with the day-reconstruction technique to determine people's likes in their daily routines. After each session, to prevent memory bias in recalling their emotions later, participants were asked to send us their notes and to fill in a physical activity enjoyment questionnaire (PACES) (Marcus et al., 1993), a seven-point semantic-differential scale that evaluates enjoyment levels. The scale was to aid in understanding users' level of enjoyment at the moment they performed an activity with the app.

In the third phase, that is, at the end of the one-week period, participants were asked to recount their experiences so we could explore possibilities related to happiness and physical activity when using mobile apps.

Data analysis
We performed content analysis (Krippendorf, 2004) on the in-depth interviews, concentrating on product properties associated with happiness. Using a coding technique with predefined codes from the literature (Saldana, 2009), we conceptualized the patterns observed in the data into a model representing the characteristics of mobile physical activity applications that evoke happiness. An example of coding is given in Table 3.

Design qualities of mobile physical activity applications that evoke happiness
In this section, we explain design qualities related to the possibilities they hold for increasing happiness. Regarding the fact that happiness is a complex and multidimensional concept with subjective characteristics, we bring the approaches of wellness and wellbeing together to express a holistic viewpoint. Our model shown in Figure 2 represents seven domains of wellness by Roscoe (2009) (outer circle), relevant dimensions of wellbeing theory by Seligman (2011) (middlemost circle), and the design qualities in mobile apps obtained by the empirical study (inner circle). Since these qualities are likely to affect the experienced wellness type, the affected qualities of well-being vary. Each design quality is explained in the follows.

Emotional wellness
According to Renger et al. (2000) emotional wellness considers a person's degree of anxiety, depression, well-being, self-control, and optimism. Life satisfaction, interest, and enjoyment are also aspects of emotional wellness.

Table 2. Study Phases.

Phases	Method	Tool	Aim
First	First semi-structured in-depth interview	SPANE	Evaluating affect balance of participants Selection of app
Second	3 usages (~1 week)	Diary Method PACES	Keeping record of experiences in time. Measuring enjoyment in time.
Third	**Second semi-structured in-depth interview, conducted at the end of three usages.**		**Understanding app qualities that evoked positive emotions; in what ways the app created life satisfaction; in what ways the app shifted feelings into a positive/negative state.**

Table 3. Coding Example.

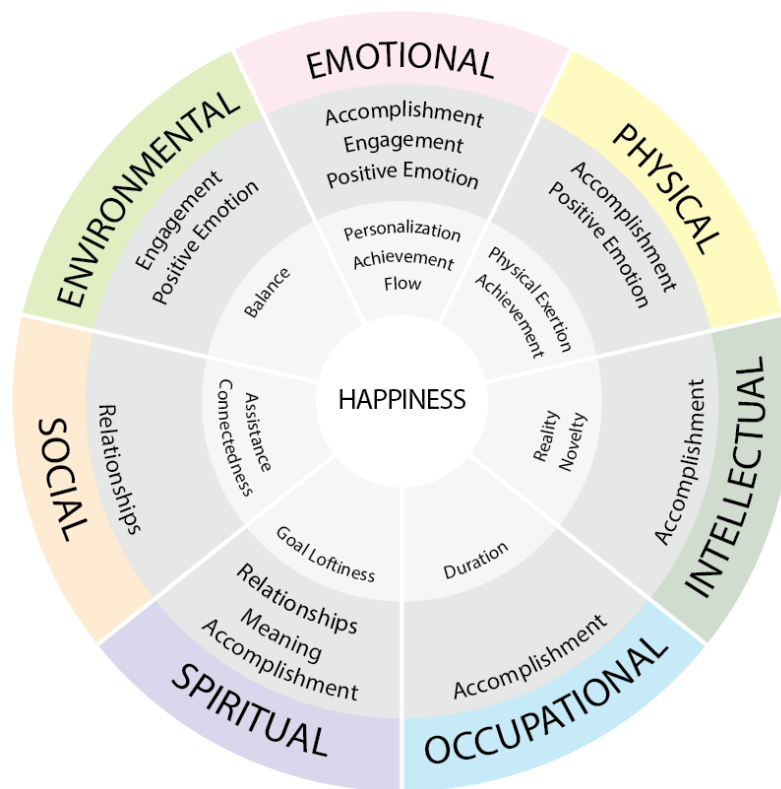| Transcription	Wellness Type	Causal	Affected	Talking About
"The reason it made me feel positive is because when I was studying, my mind was full of thoughts, and exercising with [this] simple app worked in freeing my mind and created positivity."	Emotional	Simplicity	Flow	**Experiencing flow during a simple activity with the app**

Figure 2. Model of Design Qualities.

From a well-being perspective, we observed that the apps contained the possibility of enhancing positive emotions, engagement, and life satisfaction. Positive emotions are related to emotional wellness on basis of the availability of positive emotions rather than negative ones. Engagement is associated with enjoyment of life (Csikszentmihalyi and Hunter, 2003), and this study reveals that if users enjoy the activity performed with the app, it increases pleasurable moments in their lives and encourages them to perform the activity again. Life satisfaction corresponds to a sense of goal accomplishment. As many people view physical activity as a goal to achieve, working towards this also enhances emotional wellness.

The results of our empirical study show that flow, accomplishment, and personalizing physical activity apps enhance emotional wellness. The following sections explain these qualities with respect to design dimensions.

Flow
Participants' comments regarding positive emotions associated with the apps express the connection of happiness with the flow that can occur during 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 creating at least short-term happiness.

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

Simplicity of the interface, trustworthiness of the application, and coaching given while the exercise is being performed (what we also call simultaneous coaching) are all deemed important to experience flow during physical activity performed with an app.

Simplicity
Simplicity of the interface is necessary because an app must be easy to comprehend in order to establish and maintain focus.

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."

Trustworthiness
To engage users in the activity performed, trustworthiness is important. Doubting the accuracy of the information provided by the app breaks concentration, which negatively affects flow.

P6: "There was a punching part of 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 sense I felt unhappy, [wondering] why it is not working correctly."

Simultaneity
The simultaneity of the movement visuals/videos shown together with the activity affects users in terms of flow. Instead of concentrating on the activity, by having users try to understand the move, the applications cannot guide them to an enjoyable experience. Therefore, users seek for 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.... You are stopping at each move, thinking, 'How I was doing that?' or checking the app if you are confused.... To make it easier, you should be able to watch how the coach is doing it, while the timer is on."

Achievement

Another dimension that affects emotional wellness is a sense of achievement. Selecting an activity, meeting its challenges, setting goals, self-monitoring, and seeing results contributes to a feeling of accomplishment, which feeds self-efficacy. Achievement, as a result of goal accomplishment has a long-lasting positive effect on eudemonic well-being. Achievement is also associated with higher exercise duration, performance, and motivation.

Duration

Users, especially those not habitually physically active, want shorter durations with motivating feedback when performing physical activity.

P16: "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."

Performance

An efficient performance that results in observable outcomes, for example, the feeling of exertion, experienced in shorter duration increases a sense of achievement.

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

Motivation

Our data analysis shows that a user's level of motivation affects his or her sense of achievement. A higher level of motivation enhances emotional wellness with respect to experiencing awareness for physical activity, challenge, self-monitoring, feedback, and goal setting.

Appropriate goal-setting, optimal level of challenge, and reachability of goals are necessary to increase motivation and hence happiness.

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

Gaining awareness for physical activity is found to be a motivating aspect. Especially for users in the lower SoCs, the apps can be a tool for increasing awareness of the activities they perform, because the apps can change users' perceptions about activity as being only vigorous exercise.

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 my mind, but I did not feel as if I was doing sports previously, not like people who go to a sports center or swimming. But when I used this application I felt like I was doing sports."

Applications enable feedback mostly via written information or a type of summary such as a graph. According to our results, users want a dialogue of support, and particularly praise and suggestions for improvement. From a design perspective, the comprehension and relevance of feedback to a user is extremely important. Besides self-monitoring is a strong motivator because it may recall past achievements. Therefore, it contributes to self-improvement and motivation.

Personalization

The individualistic nature of physical activity requires personalization of the app if it aims to suggest an activity to a user, and users frequently mentioned the need for personalized interaction. Most of the apps provide only standardized content; from a design perspective, a user could incorporate personal information, thus allowing the app to evaluate the user's experience and suggest moves and workouts based on that data. The application, in this respect, would be expected to be smart and like an interactive personal coach.

P1: "I wish it gave smart suggestions. I mean, I pause, for example. The application is most probably seeing that I paused, I paused for a long time, or I stopped. .... I wish it asked if the exercise was difficult, what happened, and make suggestions for the next time accordingly: "If you were not able to do that, then try this." You are doing it on your own, otherwise."

Because applications do not allow personalization to a great extent, users experienced issues with trustworthiness, causing displeasure. They also commented on the need to increase interaction through an interface that keeps personal data and suggests personalized activities fitting their abilities and interests.

Social wellness

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

Connectedness

Some users enjoyed the social facilitation and competition aspects of the apps because they made the activity fun. In terms of social learning and social facilitation, using the app with others, especially friends, was enjoyable.

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

However, some people feel that exercise is more of a personal activity, and for them, social comparison

evoked negative feelings.

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 then stop exercising. I do not think it is a thing to be shared with others."*

Applications have the capability to connect to social media and share information. Among the participants preferring to perform physical activity alone, we observed that the possibility of sharing through social media causes trust issues around the application; users expect such access to be user-managed.

P2: *"Wondering if it would be connected to the Internet or social media disturbed me. The "Connect to Facebook" inscription could be presented in the settings or it could be in a less-central location on the screen. Instead, it is in the middle of the screen, which I might press by accident…. I do not want to connect, enter the site, and open an account….I find knowing that I control it makes me feel relaxed."*

Assistive interaction
Another social aspect is the relationship between users and apps. Apps appear to make it easier for users to exercise, through periodic reminders, keeping records, and providing a suggestion dialogue. Therefore, apps establish a type of social relationship 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 the 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 relationship between the user and the app, the most desirable characteristic of the latter in that regard is a friendly, human persona who utters non-commanding statements. Personification, in that sense, is believed to positively affect social wellness.

P10: *"That robotic voice was the most irritating, disturbing thing. In the other application that I used to use, you are exercising…while the coach is visible and using a normal human voice. But here it shows you the video, closes it and has that robotic voice. It should be a human, a human voice. It would be more engaging."*

Physical wellness
Adams et al. (1997) define the concept of physical wellness as the perception and evaluation of physical fitness, and Durlak (2000) adds physical competencies and behaviours (habits and level of activity) to this definition. Based on these viewpoints, for our study we consider physical wellness as the perception of the physical state at the moment physical activity is performed with the app, and the feeling of strength that emerges as a result of the exercise.

Physical exertion
A user's comfort level will determine whether the user will be bored with the level of difficulty of the exercise or will enjoy the exercise. If there is enjoyment, there will be a feeling of flow. If the moves are too challenging or too simple, users are likely to get bored and give up the physical activity and the app.

P1: *"It does not give breaks. I am getting tired and out of breath, sweating in a meaningless way… My knees were like aching. Finally, I gave up at the twelfth 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 move was simpler. It gave breaks but it did not contribute anything. I did not feel any stretch. As I am already doing it when I am at home, I feel bored."*

Users' perceptions of their physical fitness and the app's trustworthiness were negatively affected if the moves were too challenging, not challenging enough, and/or not personalized. So as not to cause over- or under-exertion, users perceive personalization as important.

Personalization
To enhance physical wellness through apps, personalized interaction is crucial. Users seek personalization to be able to make changes to the list of suggested workouts. Even if the content is tailored to the needs of a user group, individual users can experience various difficulties or trust issues.

P10: *"The app 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 characteristics…etc. Therefore, within the exercises it sets, there are also moves that I cannot do…. For example, while doing crunches… it could say do a half crunch since a full crunch may injure you because you have a problem with your weight….But it shows a standard version to everybody."*

Another reason for personalization is users' doubts about whether the moves suggested by the app are safe. These doubts can affect the app's level of trustworthiness and in turn, flow.

P11: *"When I do not know whether I do the move correctly or not, I may also get injured. I feel unsure about that."*

Achievement
Users are likely to feel a sense of accomplishment when they experience optimal physical exertion in terms of the moves, level of 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."*

Spiritual wellness

Adams et al. (2000) define spiritual wellness as having a sense of meaning and purpose in life, and having a connection to the self, the environment and a higher power. Seligman's (2011) well-being theory, in line with that, defines meaning and purpose as "feeling of belonging and serving something larger than the self."

Spiritual wellness can be enhanced by establishing a sense of belonging and relatedness. Setting a goal with lofty manners for physical activity can both increase one's sense of accomplishment and being related to an event or activity while feeding spirituality. Combined with lofty goals, being connected to others in a common purpose may thus increase spiritual wellness.

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

Intellectual wellness

Renger et al. (2000) define intellectual wellness as an "individual's perception, one's orientation and achievement toward personal growth". Consequently, being knowledgeable about one's physical activity to achieve a goal can improve intellectual wellness.

Novelty

Novelty of information contributes to personal growth. Therefore, users feel positive about learning new information and are in search of information that surprises them. Novel can mean different things depending on the app. Playful applications are expected to provide novel content through which users can experience different activities each time they use the app. In coaching apps, suggesting new activities/moves is important, and in tracking apps, novelty is associated with new self-monitoring data. Novelty in social apps stems from new information contributed by other users.

P15: "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."

Relation to real life

Receiving novel information is more effective in enhancing intellectual wellness when the user can integrate the information into everyday life. Providing information or tips for the real world instead of giving estimations and calculations on activity leads to positive emotions and motivation. Real-life information can be in the form of seeking real friends performing physical activity, using the application for social facilitation, receiving content fed by real people's opinions, seeing real people coaching them through the app, or most interestingly, gaining rewards that establish a sense of reality in the admittedly artificial world of the app.

P13: "The app could 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 information related 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."

Environmental wellness

Roscoe (2009) specifies the concept of environmental wellness as a balance of interacting with the environment by contributing to its welfare and being aware of one's effects on nature. Encouraging outdoor physical activity via an app can increase time spent in nature.

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

Occupational wellness

Hettler (1980) defines occupational wellness as satisfaction felt through work. Crose et al. (1992), however, emphasize a balance between work and leisure. From participants' comments, a busy schedule at work/school can prevent physical activity.

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

The duration of an activity is an important factor in exercise, and even short periods of physical activity have the potential to evoke happiness and enhance occupational wellness by contributing to goal accomplishment and by improving the balance between 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 made me happy with myself."

Discussion

The preceding discussion is summarized in Figure 3. The figure describes apps' design qualities with respect to its possibilities for evoking happiness, and gives related design implications.

Conclusion

Our research has implications for designers and developers who aim to design mobile apps for physical activity with a lens of happiness. The work here frames the pool of possibilities by combining the theory of wellness, wellbeing and the outcomes of the empirical study. The contribution of this study has been to introduce the directions in which physical activity would be associated with happiness

DESIGN QUALITIES	DESIGN IMPLICATIONS
Emotional flow — simplicity, trustworthiness, simultaneity | achievement — duration, performance, motivation | personalization	A product contributing to flow stimulates concentration and feeling released from the concerns of interaction. A product facilitates autonomy if it comprises a comprehensible, simple interface, trustworthy interaction that does not cause confusion, and simultaneous guidance where the user feels in control of the situation. Personalized interaction helps to maintain user autonomy and leverages a sense of uniqueness. Achieving goals feeds self-efficacy.
Physical physical exertion, personalization | achievement	Personalized workouts contribute to satisfaction and autonomy and help to mitigate concerns around security. Experiencing a sense of achievement by accomplishing exercise tasks through optimal exercison increases competency.
Intellectual novelty | reality	Information's novelty and its relation to real life feeds personal growth and gives sense of competency.
Occupational duration	Work usually occupies the majority of working time in one's day, but the possibility of exercising with mobile apps may encourage people to take better care of self by fitting in exercise, and thus increase happiness through better balance of work and leisure time.
Spiritual goal loftiness	Through physical activity, a feeling of satisfaction by serving something larger than self may be enhanced by establishing a sense of belongingness and relatedness.
Social connectedness | assistive interaction	Because preferences for connection to other people differ depending on users' SoCs and affect balances, designing for user control over connection and socialization levels is necessary. The interaction between the user and the app itself is also an important design consideration, given the importance users placed on human-like app characteristics.
Environmental balance	Encouraging physical activity through mobile apps can increase a user's positive interaction with nature.

Figure 3. Summary of Design Qualities and Implications for Design.

enhancing design qualities. These may take many forms, ranging from emotional to spiritual wellness. Further research could examine specific user groups with a certain level of activity, and analyze the implications of using the apps in the long term.

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