Co-creation: designing a smartwatch app to help sedentary people enjoy physical activity

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Abstract

A sedentary life leads to numerous health problems, thus the need of constant motivation for a more active lifestyle. This paper presents a design process for a smartwatch app in its early stages while exploring and involving users in engaging activities. Potential users have been involved throughout the design process, in design experiments in order to co-create engaging physical activities. The key element “engaging” refers to physical activities as being fun, captivating, attractive. After an online questionnaire about physical activity and reasons for not being active, followed by an autoethnography on fitness apps, like Let’s Muv, Zombie, Run!, Coach5K, 7 min workout and Fitnet, three experiments were conducted. The experiments - interview, bodystorming, brainstorming - were performed with the focus on exploring engaging physical activities in a work environment, and therefore understand the effective features a smartwatch could have to motivate people to a more active lifestyle.
Introduction

Background

Why not daily physical activity?

Usually, when we refer to a healthy lifestyle, we tend to focus more on eating habits and physical activity. Although, to have a healthy lifestyle overall, we need to pay attention to mental health, to career success, family balance – work – personal time, social life and more.

However, according to World Health Organization fact sheet on Obesity and overweight, updated in January 2015, worldwide obesity has more than doubled since 1980. In 2014, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 600 million were obese. 39% of adults aged 18 years and over were overweight in 2014, and 13% were obese. Most of the world’s population live in countries where overweight and obesity kills more people than underweight (Obesity and overweight, 2016). The main causes behind these statistics are, of course, food habits and lack of physical activity (Reeves & Rafferty, 2005). The problem with food is that we eat more and burn less calories which leads to overcharge energy. And the inactivity, which I chose to focus on in this paper, is also due to modernization, life comfort, jobs, the hurried society we live in, the pressure of immediate results. According to Australian Institute of Health and Welfare, sufficient regular activity contributes to healthy body-weight, besides other benefits (Lifestyle factors (AIHW), 2016). “Regular physical activity is essential to maintain or even improve an individual’s health” (Reiss, 2014, p. 3).
But what does physical activity means? Through physical activity I understand any kind of body movement produced by skeletal muscles that results in energy consumption (C J Caspersen, 1985). But the reason I chose to focus on physical activity instead of food is not only because of obesity, but also for health reason. For example, I discovered quite recently after some medical investigations that an inflamed nerve from my thigh is the cause of my walking pain. The reason why has not been discovered officially, although I have an explanation, the habit of being a “couch potato”. I know theoretically how important physical activity is, but that does not imply I am no longer a sedentary person. “Research studies have shown that how often and how long a person is sedentary is linked with an increased risk of obesity, diabetes, cardiovascular disease, and all-cause mortality. Effective strategies for motivating people to become more active are now crucial” (He & Agu, 2014). A sedentary lifestyle is when the numbers of hours an individual spends sitting down in a regular day are bigger then the numbers of hours the individual expends walking or engaging in other physical activities, and also it is taken into consideration how many times per week the individual participates in an activity that induces sweating (Kermarrec, Guillodo, Mutambayi, & Ballarin, 2015).

Physical activity and wearables – efficiency or not?

“With recent advances in hardware technology related to mobile sensing and computing, pervasive and ubiquitous computing has evolved tremendously. In the past decade, a vast amount of research has been performed in these research areas, resulting in various solutions and applications affecting our everyday life” (Reiss, 2014, p. 11). Smartwatches, health monitors,
pedometers, activity trackers, virtual reality headsets, they are all wearable technology whose target is to improve the way we exercise (Stein, 2016).

These wearables promise a healthier life, a more efficient sport program or weight loss, by asking the user to act upon some screen based data, like notifications, even though what I noticed is that they already target a group who is interested in sports and concerned by their health. As of January 2014, global measurement firm Nielsen reported that “fitness apps can offer exercise information, instructional articles and videos, calorie counters, fitness news, progress tracking, and exercise motivation” (Study Casts Doubt on Effectiveness of Fitness Apps, 2016). People who do not like to exercise are more likely to quit using these tools mainly because of two psychological phenomena: “moral licensing” which makes them to overconsume and reward their effort and “reactance” which shows that people resist doing things if they feel like not doing so (Your Fitness App is Making You Fat, Here’s Why, 2015). “…fitness apps do not seem to get people to accomplish anything unless they are already determined to do so” (Study Casts Doubt on Effectiveness of Fitness Apps, 2016). So, how can we make sedentary people who do not love sports, enjoy exercising and become more active on long term?

Design opportunity

Among lack of motivation and interest which were mentioned in the previous studies, I assume that people do not engage daily in sports also because of lack of time, lack of environment with conditions for physical activity, but mostly because I think exercising and physical activities are boring and mundane. Assumption which I will be testing in the first stages of the project, through
an online questionnaire. Even so, people might have a chance to enjoy doing sports, with wearables, and more specifically, with smartwatches. The biggest advantage of wearables is that no matter where you are, or what are you doing you can wear it. The inconvenient with smartphones is that right now you have to put it in a pocket or a bag, but with the smartwatch you just have to wear it on your wrist as if it becomes an extension of your body. In the Where the action is?, Dourish explains the embodiment, saying that the objects we use, that are ready-to-hand become extensions of the part of the body we use to manipulate the object with (Dourish, 2001).

The efficiency of fitness apps is put in doubt, especially because of lack of commitment on long-term. We cannot stick to a program or routine because we do not like it, we do not enjoy it, or we do not look forward for it. So, the design opportunity I see here is how to make people enjoy doing sports and being active on long-term basis.

Research question

*How can a smartwatch app be designed in order to help sedentary people enjoy physical activities on a daily basis?*

To answer this questions, questionnaires, interviews, bodystorming, brainstorming will be use as design experiments. My interest is to find out the motivations of not doing enough physical activity, why some people do not enjoy doing sports and the most important, what are the most appropriate and appealing features to people in order to help them enjoy physical activities. The research will bring knowledge for companies or persons who are interested in creating health &
fitness apps. This paper represents a research and an exploration of a design process for a smartwatch app in its starting phase.

Related work

Apps and tracking devices

Much design and research has been done in the health & fitness sector and the interest is growing even more. The plurality of articles increasingly present in several fields like: health, sports, IT, IxD, fitness, confirm all of the above. The first wearable devices for tracking daily physical activity and used also as motivational tools were the pedometers. The pedometer detects the body movement, like the hand or the hip and through a GPS tracker it displays the traveled distance. It is said that 10 000 steps are required per day to keep fit according to the Japanese manpo-kei pedometer inventor, Y. Hatano. Even if this saying it became quite popular, there are reasons to doubt that 10 000 steps per day are enough, “preliminary evidence suggests that a goal of 10 000 steps/day may not be sustainable for some groups, including older adults and those living with chronic diseases. Another concern about using 10 000 steps/ day as a universal step goal is that it is probably too low for children, an important target population in the war against obesity” (Tudor-Locke & Bassett, 2004). Wearing a pedometer is easy and simple, you can go on with your regular schedule and you do not even realize that every step you take is being tracked. But my question is if this is enough.

There are lots of tracking devices and apps to boost efficiency and increase motivation, and also many which, claim to make sport fun, like Coach to 5k, Endomondo, Fitbit, Nike+, Runtastic, Fitocracy and more. If in the beginning these apps and devices were focused on how to gather more precise data, to differentiate between an active and an inactive state, nowadays the focus is
on how to gamify all these, to make it more fun and enjoyable for people. Although, this trend made me wonder if the gamification motivation is truly for making people enjoy being physically active or just for the sake of incentives, self-promotion, loyal users and personal interest. The gamification is now added in places where it should not be, like tax payment. (Fuchs, Fizek, Ruffino, & Schrape, 2014).

Looking at popular tracking devices and apps, it is easy to notice what they offer: the possibility to set your own goals, to share your successes and results through social media, to compete with other users, to receive rewards, the automatic feature to update and connect your data on different platforms. Social or peer to peer, rewards, competitions, leaderboards, level of achievement or rank, real-world prizes (Beresini, 2015). These features are supposed to be the key to success, the key to a healthy life and the key to commitment, although the studies shows obesity is present now more than ever (Obesity and overweight, 2016).

According to public health researcher Cameron Lister, “gamification is just a fancier way of saying motivation, or rewards and incentives” (Beresini, 2015). Adding few game elements into a non-game situation does not guarantee long term motivation and commitment. And this is what I believe, if it is not an internal motivation, even if some elements are fun and addicting, they are not shaping a behavior yet. They are great persuasive elements but for some people they are not enough. After all, one design cannot satisfy everyone (Norman, 2004).

Lister added that everybody is motivated by different things, she seems to give space and hope for the app industry, “these apps are not nearly as good as they could be at helping us stay motivated” (Beresini, 2015). As Lister said there is always time to improve and develop further the app industry from health & fitness industry.
Let us look at some of the most popular gamified apps and tracking devices. Fitbit, available on Android and iOS and a series of bracelets and accessories, puts a lot of accent on challenge and competitions. On their website, www.fitbit.com, Fitbit is presented like this: “On the walk to work, at the weight room or in the last mile. Somewhere between first tries and finish lines. Pillow fight and pushing limits. That is where you find fitness. Every moment matters and every bit makes a big impact. Because fitness is the sum of your life. That is the idea Fitbit was built on – that fitness is not just about gym time. It is all the time.

How you spend your day determines when you reach your goals. And seeing your progress helps you see what is possible” (Fitbit Official Site, 2016).

You can connect, share, compete with whomever you want, whenever you want, and this is a perfect example of how to add game elements. Every activity matters as well as every number. Everything is reduced to numbers, challenges and rewards (Fuchs, Fizek, Ruffino, & Schrape, 2014).
Atari Fit, gamified workouts, multiplayer integration, social sharing; Nike + Running, inspirational cheers, social sharing, connect with friends and family, ask for support or compete with friends or strangers; Fitocracy, keep track of your points, earn badges, level up; Strava, track your runs and rides with GPS; Map My Fitness, use goals, motivate yourself using challenges (7 Best Gamification Fitness Apps for 2015, 2015). They all contain game elements. The question is, why with all these features some people gave up after a few tries?! The efficiency of these apps is not denied, thousands of users express their satisfaction, the point is the people who do not enjoy running or exercising will not succeed to stick to a routine.

As stated earlier, people are more likely to give up something if they are not determined to do so, if their internal motivation is not strong enough.

There are some apps though which went beyond reality and added narratives. For example, Zombies, Run! combines audio storytelling with running. “You become Runner 5, a survivor of
the zombie apocalypse that has decimated the world. Joining one of few survivor camps around, Abel Township, you will be forced to earn your keep by going out on regular expeditions. Your mission objectives are explained to you through audio recordings, interspersed with music from your pre-compiled playlist, as you are sent to gather intel, supplies, and discover secrets surrounding the mysterious zombie outbreak. … In *Superhero Workout*, you are protecting earth against invasion through use of a unique battle suit, the AEGIS One. In order to save humanity, you must pilot the AEGIS One and complete various exercises in order to activate weapons, shields, and various other cool abilities” (Fitness Apps That Make Working Out Too Fun to Skip, 2016). Along with statistics, routes and steps, timing and social networking, calories and speed, you have a story as a background, a surrogate purpose: run to save the world from zombies or metahumans!

![Figure 3 Zombie, Run!, android app](image-url)
Now if you do not like running or exercising, it is up to you to use these apps or not. We have seen that apps and tracking devices are quite similar, but what about other elements which can make physical activity more fun?!

A social experiment conducted in 2009 in Sweden, showed that people preferred to use the piano stairs instead of the escalators. The conclusion was that people respond to fun (Cooper, 2015). For some, exercising is boring, repetitive, not exciting, and this is a design opportunity.

Talking about being fun and not boring, about physical activity and excitement, made me think of *Dance Dance Revolution* the arcade game. It was released in 1998 in Japan by Konami. It has one or two players who must step to the beat, matching their beat to the arrows presented to them on screen by stepping on the corresponding arrows on a dance stage (*Dance Dance Revolution*, 2016).
It is an arcade game, but the fact that calls to action, contrary to static games we used to play, it is a fact that needs to be exploited. It succeeded to make movement fun, after all, it is about dancing, unfortunately you cannot carry around an arcade platform. Although, home versions games like the ones developed by Kinect, Nintendo makes games more engaging physically speaking.

There are some fitness apps but more office oriented, which notifies the user to stand up or do some exercises in the same impersonal way as the previous apps. For example, Ladies’ Office Workout allows the user to choose the interval of working and sitting, to access the history activity and follow video routines. Or desktop apps, like DeskActive where a 3D personal trainer pops up and reminds the users to take a break and do exercises. The animation is quite attractive, but as it is stated in the research question, for a successful app more engaging elements are needed.
Another example from real world just recently published it is about arcade gyms. In New York, a fitness club transformed its space with technology into a real arcade game. For example, pressure-sensitive walls and floors are used to indicate how hard a gym-goer can throw a ball at the wall, a detail that becomes illuminated by LED lights (McQuarrie, 2016).

![Figure 8 Arcade Gym, New York](image)

The environment boost speed, reaction time, balance, endurance, strength, agility, all while having fun. The idea of this kind of game is really attractive, but again I am thinking how suited is in our daily lives with tight schedules. Not to mention the fact that these gyms might not be that easy to reproduce in every city.

Making sports fun is a subject that concerns our society, but it is not researched enough in connection with wearables.
Theory

Smartwatches and movement opportunity

The assumption this research is based on is that some people do not enjoy sports, and this is the main reason why some cannot stick to a routine on long-term basis. The motivation of being active and doing daily physical activity has to be strong and internal, and since we do not enjoy sports, we have to find solutions for making it fun and enjoyable. Thinking about motivation and how to help people do something they do not enjoy that much, I came across gamification. The apps and tracking devices are continually growing, my research is not about a new gamified app or a new tracking device, it is about using what we already have, and exploring it and improving it.

The reason I chose to focus on smartwatches and explore its attributes, is that they give more freedom of movement and culturally speaking they are more accepted than a smartphone. Its main purpose is not tracking and boosting fitness efficiency, although it has these features, making it more appealing for a larger group of people and users. “Nowadays small, lightweight, low-cost and accurate sensor units are commercially available, supporting wireless data transfer, internal data storage, etc. With this progress it becomes feasible for individuals to wear various sensor units all day” (Reiss, 2014, p. 5). Miniaturized sensors can be easily integrated in worn objects, from clothes to devices like smartwatch, which makes them unobtrusive. “Overall, with the presented advances in wearable sensing and wearable computing, the technological tools exist to develop a mobile, unobtrusive and accurate physical activity monitoring system. Therefore, the realization of long-term monitoring of individuals’ physical activities while performing their daily routine – the goal set and motivated in the previous subsection – has become feasible” (Reiss, 2014, p. 5). It is easier now to monitor and track activities like walking,
jogging, sitting, standing using embedded accelerometer not only on smartphones but on smartwatches too.

It is handier now to predict and give suggestions according to our available time, schedule and location. “Intervening at the right time” is a crucial notion regarding persuasive systems. Persuasion in Fogg conception is “an attempt to change attitudes or behaviors or both (without using coercion or deception)” (Hasle, 2011). According to Fogg, there are seven persuasive strategies, but the most important are “suggestion, i.e. intervention at the right time, instance reduction (persuading through making tasks easier), tailoring (adapting a system to the user’s profile), and conditioning, i.e. “reinforcing target behavior”, by rewarding and praising the user. Classical Rhetoric called it by the Greek word Kairos, meaning the opportune moment. Any person trying to reach and influence other persons (one or more) has to be sensitive to when they are “open to persuasion” (Hasle, 2011). Knowing these factors, it is even more relevant why smartwatches are a good opportunity to exploit.

In a paper about Huston, a mobile phone-based fitness journal that encourages physical activity by providing personal awareness of activity level, the researchers identified four key design requirements for technologies that encourage physical activity: to give users proper credit for activities, to provide personal awareness of activity level, to support social influence and consider the practical constraints of users lifestyles (Consolvo, Klasnja, McDonald, & Landay, 2012). They also said that a mobile device “such as a mobile phone can provide relevant information at the right time and place, and may help encourage opportunistic activities” (Consolvo, Klasnja, McDonald, & Landay, 2012) which I totally agree with except with the fact
that smartwatches are more embedded into our body, worn on a wrist, than a smartphone. Two terms in their paper caught my attention, opportunistic physical activities and structured exercise. Through opportunistic physical activities is understood those activities from everyday life that can be done to consume more energy like taking the stairs instead of the elevator, walking to school instead of taking the bus etc. And structured exercise is when a person intentionally chooses to “elevates her heart rate for an extended period” (Consolvo, Klasnja, McDonald, & Landay, 2012) like going to the gym, swimming, going for a run etc. We are so busy and always under pressure, that having a regular and/or daily physical activity it is not quite possible. That is why, with wearables today we can increase daily physical activities by combing opportunistic activities with structure exercises at the right time. The assumption of using opportunistic activities as a way to increase daily physical activity will be tested in the design process.

“A sedentary lifestyle is one in which people engage in very little physical activity or exercise, leading to obesity. The activities performed by sedentary individuals daily do not increase their energy expenditure substantially above resting levels. Activities such as sitting, lying down, sleeping, watching television, playing video games, and using the computer—are typical examples” (Consolvo, Klasnja, McDonald, & Landay, 2012). Sedentary lifestyle studies show that sedentary is connected with a higher risk of diabetes, cardiovascular disease, and all-cause mortality. “Specifically, higher levels of sedentary behavior are associated with a 112% increase in the Relative Risk (RR) of diabetes, 147% increase in cardiovascular disease, 90% increase in cardiovascular mortality, and 49% increase in all-cause mortality” (He & Agu, 2014).
As stated before, “gamification” refers to designing nongame activities using game design elements that could be described as “gameful.” A better understanding of basic principles of behavior might lead to more effective identification of successful strategies. “Behavior analysis might also benefit by observing more general examples of how everyday activities could be redesigned, and consider how those redesigns relate to behavior concepts and principles” (Morford, Witts, Killingsworth, & Alavosius, 2014). The piano stairs are a provocative example of how conventional activities might be redesigned.

What is fun? In the Dictionary of English Language, it is shown that fun originates from Middle English *fonnen, to fool*. With time, fun was used to express adjectives like *amusing* or *enjoyable* (American Heritage® Dictionary of the English Language, Fifth Edition, 2011). However, fun represents a “source of enjoyment” (Koster, 2005). The opposite of fun is boredom.

Since the studies shown previously, say that adding game elements it is not enough and that motivation has to be internal, this research will focus on making physical activity fun using smartwatches.

**Methods**

**Online questionnaire**

Questionnaires are a fast method of gathering data, especially online questionnaires. They are easy to distribute, although it cannot give you much control over respondents once it is published online. Still, you can adjust the target group by sharing it on specific groups with common
interests. Because questionnaires offer more anonymity and more time to reply, the respondent might show more sincerity. But being based on questions it is important to pay extra attention to formulating the questions, the respondent cannot ask for assistance, as such the meaning of the questions must be easy to understand (Consolvo, Klasnja, McDonald, & Landay, 2012).

It was significant to understand people and what they think about physical activity. Therefore, I created an online questionnaire where I combined personal questions with a quiz with standard answers and a system of evaluation from Barriers to Being Physically Active Quiz from Promoting Physical Activity: A Guide for Community Action (U.S. Department of Health and Human Services 1999), in order to reach more people and faster. In the same time being a questionnaire with preformed answers it was expected high accuracy. A short introduction was stated in the beginning explaining the reason of the questionnaire, “Some of us manage to take time for sports, others remain glued to the chairs. With these questions I want to find out what factors are decision-making in physical activity and whether health and fitness applications can have a role in the future.” The online questionnaire link was distributed to acquaintances, colleagues and Facebook groups, in four days 42 answers were received. A sample from the online questionnaire, including the Barriers to Being Physically Active Quiz, it is available in the appendix.

Autoethnography

The autoethnography is a research method used to describe and critique a personal experience, based mostly on self-reflection – an introspection of personal thoughts and emotions. Therefore, it is a qualitative method which produce personal private knowledge instead of general
information. Qualitative research is about human intentions, motivations, emotions, actions, and not about general knowledge like demographic information. The autoethnography appeared because of the need of new ways of learning and brought a new acknowledgement of emotions in design. Ethnographic methods are known for objectivity and realism, so the role of emotions in research has been highlighted once with autoethnography. As Kathryn Blee says, “we are more honest scholars when we acknowledge the myriad ways in which our personal lives and emotions are intertwined with who, what and how we study”. (Adams, Holman Jones, & Ellis, 2015) Autoethnography as ethnography is done through an empirical method, observation and experience based. Its goal is to critique, to make contributions, to make research accessible to a varied audience (Adams, Holman Jones, & Ellis, 2015).

I tried myself some android and smartwatch apps, Coach to 5K, Fitnet, 7 min workout, Let’s move, Zombie, Run!, and paid attention to notifications, actions and my emotions, the motivations and the quantity of daily physical activity, while using them for a week and a half.

The method was chosen because as a sedentary person myself I was representing the target group and it gave me the opportunity to get an overview image on the available apps.

**Design experiments**

Three design experiments were conducted in order to explore with the intended users, efficient features for the smartwatch. The element of co-creation was chosen to receive more insights directly from targeted users, to understand in a better way their needs and reactions (Fullerton, 2009). The participants were international students aged between 20 and 36 years. They
matched the target group of people with sedentary lifestyle, because both their work experience and student life requires many hours of sitting.

First design experiment – open discussion

- **Participants**: four international students, one boy and three girls, with ages from 24 to 28 years;
- **Time**: the open discussion lasted about one hour, in the morning;
- **Location**: a private room in the Orkanen Library building, with chairs, tables and canal view;
- **Goal**: to find out their lifestyle, if they are physical active or nor, if they used health & fitness apps, to understand and get an overview image of the intended users attitude towards physical activity and technology;
- **Questions**: Do you consider yourself an active person? What kind of physical activity you do daily? If would describe one day, using only action verbs, what would be those? Are you still considering yourself an active person? Have you ever used fitness apps or tracking devices?

Second design experiment – bodystorming

- **Participants**: nine international students, seven IxD students, two other majors. Six females and three males with ages between 20 and 36 years;
• **Time:** each individual session lasted around 15 minutes; the sessions were organized during three days with time slots in the morning from 10:00 – 12:00 and in the afternoon from 14:00 – 16:00;

• **Location:** two study private rooms in Orkanen Library, with table and chairs, one office chair and one universal static chair, with transparent windows;

• **Goal:** to find out common behavior patterns regarding exercising in a work environment;

• **Task:** act out and play with chairs, based on two questions: what playful actions can you do while sitting in a chair? And what playful actions can you do while standing up but still using the chair?

**Third design experiments – brainstorming**

• **Participants:** four international students, three women and one man with ages from 20 to 36 years; the session was collective, with teams of two;

• **Time:** the session lasted about one hour in the afternoon;

• **Location:** a study room in Orkanen Library with transparent windows;

• **Goal:** to develop smartwatch games based on the verbs discovered in the previous workshop;

• **Task:** choose randomly from each pile with colored paper, one attribute from each and ideate with your partner in order to came up with one smartwatch game app; one pile represented the verbs discovered in the previous workshop, e.g. stretch, push, pull from the common playful moments participants did, one pile with locations, e.g. home, work, and the third pile with rules like: use only your left arm, do this action for five minutes, use a pencil etc.
Results

Online questionnaire

The respondents were 32 females and 10 males with following ages: 6 people 16-19 years old, 19 people 20 – 25 years old, 10 people 26 – 30 years old and 7 people over 30. The questions were about how much physical activity they do daily, they were asked to describe their activities and explain why are they enjoying sports if they do. If not, they were asked to rate some statements taken from *Barriers to Being Physically Active Quiz* from *Promoting Physical Activity: A Guide for Community Action* (U.S. Department of Health and Human Services 1999). In the end they were asked what kind of health & fitness apps have they tried or used, if they did, what did they like about them or did not like, and of course to choose their sex and age.

15 people answered that they do physical activity daily one hour, 21 people less than 30 minutes, two people two hours, one person more than three hours and three did not answer.

The most common activities for the less than 30 minutes were walking, biking and jogging. For the longer periods of time, activities with structured exercises were included like: aerobics, swimming, fitness at the gym. When asked if they enjoy sports and why, only four people wrote that they do not like doing sports and that they hate it, and 31 people mentioned health, stress relief and satisfaction as main reasons. Only 16 people used apps, just 6 of them stated clearly that they were satisfied with those apps, and only 2 – 3 people brought up the inconveniences and that is to say the fact of giving input manually and the need of carrying around the phone.

Now, the results from Barriers to Being Physically Active Quiz, showed that the main reasons for not doing enough sports are: lack of energy (322 points), lack of skill (231 points), lack of willpower (190 points), lack of time (187 points), social influence (135 points), lack of resources
(131 points), fear of injury (41 points). For a better understanding of the reasons, let us look at the statements from the main three categories.

*Lack of energy:* I am just too tired after work to get any exercise; I do not get enough sleep as it is. I just could not get up early or stay up late to get some exercise; I am too tired during the week and I need the weekend to catch up on my rest.

*For lack of skill:* I am not good enough at any physical activity to make it fun; I really cannot see learning a new sport at my age; I do not get enough exercise because I have never learned the skills for any sport.

*And for lack of willpower:* I have been thinking about getting more exercise, but I just cannot seem to get started; It is easier for me to find excuses not to exercise than to go out to do something; I want to get more exercise, but I just cannot seem to make myself stick to anything.

(Barriers to Being Physically Active Quiz)

These results confirmed the assumptions from the beginning: people do not have enough intrinsic motivation to be more active, exercising is not fun. Even if they are aware of the healthy benefits physical activity has, their daily physical activity consists major in walking and running and their duration is less than 30 minutes. The lack of time shows once more the need of opportunistic exercising, along with the fact that it is a big gap between awareness and being physical active. The questionnaire pointed out that exercising is not fun, that daily physical activity has a short time in our schedules, so for the next steps I focused on discovering the daily routines which can offer a design opportunity: which actions and activity are more common and how to improve them and make them fun and physical provocative.
Autoethnography

Zombie, Run!, Fitnet, 7 min workout, Couch to 5K, Let’s move, were tested by me for about a week and a half. Five apps were android based for smartphones, and one built for Pebble smartwatch. The android ones were more for structured exercise like running or working out, and the Pebble app was more like a tracking device, a pedometer.

Let’s Muv, showed mainly the steps taken in a day, and if I sat for too much time, a notification with a little man was telling me “Stand up and walk a little”. On the first day I used the smartwatch app, I was quite enthusiast, checking the number of steps and making excuses to walk to reach 10 000 steps. For a couple of days, I had to walk a lot from external objective reasons, therefore my steps number was way bigger making me very happy. I could also saw the walked distance. But then, it came the day where I had to work on my laptop for hours, I had no reason to go out to exercise, I immersed myself into work, forgetting to walk, unless it was the walk to the supermarket. On that day I received the notification for the first time, “Stand up and walk a little”. I was so surprised, without checking the notification properly I left my laptop and
walked a few steps in my room, although I did not know how much should I walk until the notification would disappear.

After few steps, not knowing what to do exactly, I ignored it and returned to work. The Pebble app, Let’s Muv, I am still using it as a curiosity for the days when I must walk. I liked the simple static interface, but the notification itself it was not motivating enough. I had days when I wanted to walk more just to increase the number of steps, and days when I did not care, because what I was doing was more important than walking around without a purpose besides the steps number. The notification missed clarity and a purpose, like specific instructions.

Zombie, Run!, the running app with narratives was the most appealing app, because I like stories. The concept behind it I found it quite engaging, except with the fact that I am not good at running, I do not have enough endurance. Fitnet, even if it is a workout app, it brought an interesting element: camera vision. The smartphone camera analyzed my synchronicity with the Trainer for five minutes, in real time, and gave me feedback. It really succeeded in giving me the impression that I was not alone. 7 min workout and Couch to 5k, as Fitnet and Zombie, Run! represented the structure exercising, something you schedule a few times a week, and they are not highlighting the opportunistic exercising, they do not promote, from my personal opinion, the idea of continuous movement during the whole day.

So, as a next step I considered important to focus on the opportunistic exercising smartwatch apps can emphasize more.
Design experiments

First design experiment – open discussion

In the first experiment I talked with four people about sedentarism and physical activity. The goal was to find out more about their lifestyle and personal opinions about physical activities. They all confirmed that they sit for hours when working, and one person said actually when asked to write down the most common activities from a usual day, “I’ve never realized that I sit that much!”, although he runs a few times a week. The conversation showed that people are aware that sitting for hours is not healthy but they are not bother to change anything. When asked if they used apps, one person said actually that she had a tracking device, but she never listened to the notification, “I’ve never walked when it told me to”. After talking more about notifications and motivations, all the participants said that they needed clear instructions on what to do, how to do it or where, specific tasks and even positive feedback, like: “you can increase your life expectancy if you do this short exercise”, “if you do this, you do not longer need to go to the gym today”. Also, from this session I understood that it is hard for people to leave their space/desk when working, for doing exercises. That is why, for the next design experiment I focused on physical activities in working spaces.

Second design experiment - bodystorming

The second design experiment consisted in bodystorming. Individually sessions, lasting about 15 minutes, with nine international students, seven IxD students and two other majors, with ages from 20 years and 36 years old. Given that many people spend the majority of their time at a table and sitting on a chair, I chose to find out what kind of playful activities a sedentary person
can do while not leaving the space he/she is working in, therefore becoming more physical active. In a room with tables and two different chairs, one solid static chair and one office chair, the participants were asked two questions: What playful actions you can do while sitting on a chair? and What playful actions you can do standing up but still using the chair? The focus of this second workshop was the chair, because it is the predominant factor in a sedentary work space. Plus, in the previous workshop the participants expressed the need for guidance and precision, therefore in this second design experiment the participants began their co-creation activity starting from a concrete task.

The participants played with the chairs, and acted like children ready to discover what they could do with the chairs, being silly and having fun. Laughing by their movements, some ordinary some more daring. Trying even to make sounds and play music with the chairs. At first sight, almost every participant claimed that the ergonomic office chair allows more creative movement, but what I have seen is that they show more creativity using the static universal chair. Going
under the chair, laying on the chair, lifting up their feet and keeping the head down, stretching
the feet, the back, doing pushups with the chair and other movements.

All nine participants instinctively repeated the same movement patterns, having also their own
personal movements, therefore eight common verbs were selected: spin, rotate, move, walk, lift,
stretch, pull, push. These verbs could have been game mechanics, actions, behaviors the player
can do and have in a game context. Along with game content (levels, assets etc.), the mechanics
maintain the gameplay dynamics. For example, in a card game, the mechanics are: shuffling,
betting. In a shooting game, the mechanics are, for instance, shooting, taking cover (Hunicke,
Leblanc, & Zubek, 2004). In other words, game mechanics are verbs, they can be player centric
mechanics when the focus is on player actions, and system centric mechanics when the focus is
on the system actions. At the same time, a question arose: any verb can be a game mechanic or it
is just an action?! For a verb to be more than an action, to be a game mechanic, it needed a game
context.

The third design experiment - brainstorming

In the third workshop, which was a group brainstorming session with four international students,
I asked the participants to come up with game ideas around the verbs discovered from the last
workshop. Since the task was difficult to accomplish, we opened up and talked freely about
sedentary lifestyle and how engaging and playful activities, can be a greater motivator for people
to become more active. The discussion showed that for the participants, the playful actions can
be done also with other office objects like: books, bottle of water. And as rewards for performing
the suggested physical exercises, they would like the app to play their favorite songs, jokes or
simply positive healthy message – “Hooray! You’ve just reduced the risk of cardiovascular disease with 5%! Well done, mate!” The notifications and the rewards should be written in a personal and amusing tone. And as a stronger motivator to do the physical activities, they would like the app to display a character who represents their person and who can mimic their actions, making them feel that they are not alone. This third workshop highlighted the need of affecting computing in health & fitness industry. The participants desire to have personal notifications, real life communication show that an emotional output, needs also an emotional input.

Design Process

The design process started from the premise that some people do not enjoy physical activities therefore they needed a greater motivator, which I thought the answer to sedentary could be the playfulness of physical activity. Redesigning physical activities was the base for answering the research question.

_How can a smartwatch app be designed in order to help sedentary people enjoy physical activities on a daily basis?_

The online questionnaire with preform answers based on Barriers to Being Physically Active Quiz, was the first step of the design process. I created the questions, expecting to confirm my assumptions: people not doing enough physical activity, people finding physical activity boring and not fun, physical activity not being fun as a main factor for sedentary. From 42 answers, 21 people were active less than 30 minutes per day, which is almost half of the respondents. The other half being active an hour or more. The surprise came when only four people admitted that they hate physical activity and not enjoying it. At first sight, according to the numbers, it might appear that my assumption was wrong. But I doubt the results. If 31 persons declared how many
benefits physical activity brings, why so many, half of them, were being active less than 30 minutes per day?! It seemed to be a little contradiction between knowing and doing. Analyzing further the results, it came out that people do not have extra energy for physical activity, they do not know how to enjoy physical activity and cannot stick to something. So, these results, after all, confirmed my hypothesis: physical activity needs to be redesigned as playful and engaging. Because the second barrier of not being active was the lack of time, it made it clear that opportunistic exercises needed to be a characteristic of the design process.

In parallel with the online questionnaire, the autoethnography was conducted around few apps, Let’s Muv, Zombie, Run!, 7 min workout, Fitnet, Couch to 5K. The believe stated in the introduction, that the successful available fitness apps target a more likely sport loving community got confirmed. After experiencing these apps, I understood there is a need for diversification and promotion of daily physical activity. Also, it showed me that more development in terms of physical activities for smartwatch applications is needed, to show that being active can be done anywhere and it can be fun. However, I chose to take as indicator the application for Pebble, Let’s Muv, for it represents a tool for opportunistic exercising. The app notification suggesting walking after sitting too much, was not convincing enough, so I got deeper into this topic.

In the first design experiment, the discussions about sedentary and tracking devices, pointed out the missing factors in an app like Let’s Muv: the lack of clear instructions and motivating explanations. It represented a confirmation of the need for people to give up the sedentary life.

Hence, for the second workshop I tried to focus on playful action a person can do in the same environment where she/he works. Since we get stuck to the chairs, and as a participant said “when I work I want to focus on working. If I go do something else, I lose my ideas”, I wanted
the physical activity to be in the same working space, for not disconnecting too much from work. The verbs found from the playful activities participants did, the common behavior patterns they had executed, could act like game mechanics in a game context. Because a verb can represent just an action if it is not put in a game context.

As a result, the final experiment, was planned for game ideation with a group of people. But since they did not have game experience, the task of coming up with games ideas was too difficult. After a free discussion, the participants told what they would need for a smartwatch app to work: character who imitates their movements or telling them what to do, rewards, like playing the favorite song or having instructions/suggestions of activities with objects from the environment, like a book, a bottle of water, friendly and amusing notifications. The participants’ feedback and insights confirms the need and trend of affecting computing, of emotional human computer interaction, the smartwatch becomes a friend and part of our lives, it is no longer just a device.

Reflections

The questionnaire to find out what people thing about doing sports, how much physical activity they do, what barriers hold them to be more active, it gave me access to data in real time. Although, the way some questions were formulated created some confusion, the respondents continued answering the questionnaire. The results were useful, proved the assumption that people do not have time for sports and do not spend enough time exercising was true. Though, straight answers about physical activity not being fun, and not deducted, would have been more conclusive.
From the design experiments two things caught my attention: the space and the participants. The exterior wall of the room I booked for the experiments, was transparent. I wanted to offer the participants privacy, to play around with the chairs but I could not find another space. I hoped that the participants would not be bother by the staring eyes from outside, but unfortunately they noticed being watched with curiosity by people passing by. In spite of this space inconvenience, the participant’s effort and commitment was not disrupted, they still managed to do crazy movements, while having fun. Regarding the participants, two of them with no interest in IxD showed more understanding of the task, by playing with the chairs without questioning the reason behind it. But the IxD students looked more willingly to offer suggestions, ideas, needed more context. This fact, made me realized that when in trouble with ideation or brainstorming is good to ask for help from colleagues or friends with experience in the same field. When needed specific results, like the actions I was looking for, it is better to search for regular people.

In the third experiment I asked participants to come up with game ideas, although they did not have experience and neither did I, that was quite a big challenge. If I had experience in game ideation, the workshop could had been held as planned, because I would have used my knowledge to help and guide the participants. Thus, we should not ask our participants do something we do not know how in first place and prepare a backup plan. The last experiment for the game ideation was modeled after a workshop made by game design students, but without taking into account participants' experience.

The participant’s profile was international student who spends most of his/her time sitting, for the reason that he/she resembles the end user: people at the office with a sedentary life. Another type of participants who could have become co-creators in the design workshops could have been physiotherapists. The big difference is that in this case the co-creators would have been
professionals and influenced by their education to perform specific well-known movements for physical recovery. Though, they could have been consulted to give medical reassurance for performing the actions discovered in the experiment.

Conclusion

*How can a smartwatch app be designed in order to help sedentary people enjoy physical activities on a daily basis?*

Redesigning everyday activities and making them playful and engaging for maintaining an active lifestyle is something we should further look into it. With nowadays technology and ubiquitous computing, suggesting activities based on the personal profile, schedule, location, time, and at the right time it is possible and it will be even more in the future. Being physical active it does not mean only structured exercising, going to the gym, running, but also opportunistic exercising, taking the elevator, standing up while watching a video clip. Being physical active it also means to have fun, to enjoy what are you doing. We can notice, from the online questionnaire results, the higher number of female participants, and learn also that women are more concerned with physical activity, therefore the females could receive more attention as a user target in the health & care industry.

The co-creation aspect of this entire design process, it is not characterized by creative methods, but by collaboration. Nine different people came up with the same body movement ideas for the office - spin, rotate, move, walk, lift, stretch, pull, push. All these action verbs are easy to reproduce, perform, given that they instinctively came from people, the exercises are easy to remember and have a low degree of complexity. Therefore, requires no specialized supervision.
The advantages of this smartwatch app are closely related to the degree of freedom it offers. It is easier to access and view the smartwatch notifications than the phone. More, its embedded sensors like accelerometers, gyroscopes, pulse/heart sensors, temperature sensors and others, make possible and easier to suggest physical activities according to the user’s body state. It can learn the user’s habits and schedule, and also check the accuracy of typed or performed answers. One recent example that can show how quickly technology develops and how much it can improve the user’s experience in the future is this article which demonstrates how a PIN can be revealed with a smartwatch, by detecting the arm movement while accessing an ATM machine ("Friend or Foe?", 2016). This example raises concerns about the privacy of personal data, but in the same time shows the benefits it can bring in the healthcare industry.

From the participants we discovered that a smartwatch app designed to increase the level of activity and maintain in the same time a high level of amusement and enjoyment, needs to:

- display notifications and suggestions in a friendly manner, developing a personal emotional communication - “Great job, Ash! You burnt so much energy that you could skip gym the whole week! 😊 Hi! Hi! Just joking!”; to make use of characters, self-representations; to show motivational messages raising awareness for the body effects their actions can have – “So proud of you! You just reduced the risk of osteoporosis with 3%! Long live Chris! 😊; to reward the user with favorite songs, jokes; to be suggested exercises based on their schedule, place, environment – opportunistic exercises; not asking manually confirmation, but making use of technology to sense, detect the body movement.

Developing a smartwatch app for making physical activity more attractive and engaging, playful, is not only about giving direct, strict directions, tasks. Sometimes is about the joy of discovery, the surprise of success, of doing right, just like it happened in the second workshop with the
bodystorming session. The participants were asked to play with the chairs, and they did. They did not know by heart some moves, but they thought, they tried, I watched them laugh on their childish, silly movements, but they had fun. An example where surprise, the joy of discovery and the simply action of walking transformed into a massive world-wide played game is Pokémon Go (http://www.pokemongo.com/), a location based augmented reality.

In the future, the knowledge gathered in this process can be further developed and integrated in game contexts like:

- A character who resemble the user, like the ones from Miitomo app developed by Nintendo. The character behaves like a Tamagotchi, instead of a pet the users find themselves in a smartwatch screen. If the user sits too much, the character becomes fatter and fatter and reminds the user the health risks which is subject to. However, once the user listens to the character notification to do some specific actions like spinning the chair, walking around the room while rotating the arms, stretching the legs, the character mimics the user. As a trainer, it shows the user what to do and how much.

- Still a character who keeps the user’s curiosity high, by telling him/her half of a short joke or a motivational message. If the user wants to find out the rest he/she needs to do some amusing activities, the character will tell him/her to do. Of course, if the user does the exercises, the character also mirrors the user’s actions.
References


Appendix

Online Questionnaire Sample

Some of us manage to take time for sports, others remain glued to the chairs. With these questions I want to find out what factors are decision-making in physical activity and whether health and fitness applications can have a role in the future.

It only takes a few minutes of your time and you will bring a valuable input to my thesis. Forever grateful!

start
1 How much physical activity you do daily?

○ less than 30 minutes  ○ one hour  ○ two hours  ○ three hours
○ more than three hours

2 Please, describe your physical activity.

eg. long walks, jogging, boxing etc.

3 If you enjoy doing sports, can you explain why?

4 If doing sports is difficult for you, please answer the next questions.

The questions are from Barriers to Being Physically Active Quiz.

a. My day is so busy now, I just don’t think I can make the time to include physical activity in my regular schedule.

○ Very likely - 3  ○ Somewhat likely - 2  ○ Somewhat unlikely - 1  ○ Very unlikely - 0

b. None of my family members or friends like to do anything active, so I don’t have a chance to exercise.
Barriers to Being Active Quiz

What keeps you from being more active?

Directions: Listed below are reasons that people give to describe why they do not get as much physical activity as they think they should. Please read each statement and indicate how likely you are to say each of the following statements:

<table>
<thead>
<tr>
<th>How likely are you to say?</th>
<th>Very likely</th>
<th>Somewhat likely</th>
<th>Somewhat unlikely</th>
<th>Very unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My day is so busy now, I just don’t think I can make the time to include physical activity in my regular schedule.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>2. None of my family members or friends like to do anything active, so I don’t have a chance to exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<td>3. I’m just too tired after work to get any exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<td>4. I’ve been thinking about getting more exercise, but I just can’t seem to get started</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>5. I’m getting older so exercise can be risky.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>6. I don’t get enough exercise because I have never learned the skills for any sport.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>7. I don’t have access to jogging trails, swimming pools, bike paths, etc.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>8. Physical activity takes too much time away from other commitments—time, work, family, etc.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>9. I’m embarrassed about how I will look when I exercise with others.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>10. I don’t get enough sleep as it is. I just couldn’t get up early or stay up late to get some exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>11. It’s easier for me to find excuses not to exercise than to go out to do something.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>12. I know of too many people who have hurt themselves by overdoing it with exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>13. I really can’t see learning a new sport at my age.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>14. It’s just too expensive. You have to take a class or join a club or buy the right equipment.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>15. My free times during the day are too short to include exercise.</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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<tr>
<td>16. My usual social activities with family or friends to not include</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
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</tbody>
</table>
17. I’m too tired during the week and I need the weekend to catch up on my rest. | 3 | 2 | 1 | 0 |
18. I want to get more exercise, but I just can’t seem to make myself stick to anything. | 3 | 2 | 1 | 0 |
19. I’m afraid I might injure myself or have a heart attack. | 3 | 2 | 1 | 0 |
20. I’m not good enough at any physical activity to make it fun. | 3 | 2 | 1 | 0 |
21. If we had exercise facilities and showers at work, then I would be more likely to exercise. | 3 | 2 | 1 | 0 |

Follow these instructions to score yourself:
- Enter the circled number in the spaces provided, putting together the number for statement 1 on line 1, statement 2 on line 2, and so on.
- Add the three scores on each line. Your barriers to physical activity fall into one or more of seven categories: lack of time, social influences, lack of energy, lack of willpower, fear of injury, lack of skill, and lack of resources. A score of 5 or above in any category shows that this is an important barrier for you to overcome.

<p>| | | | | |</p>
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<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>15</td>
<td>Lack of time</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>16</td>
<td>Social influence</td>
<td></td>
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<tr>
<td>3</td>
<td>10</td>
<td>17</td>
<td>Lack of energy</td>
<td></td>
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<td>4</td>
<td>11</td>
<td>18</td>
<td>Lack of willpower</td>
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<tr>
<td>5</td>
<td>12</td>
<td>19</td>
<td>Fear of injury</td>
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<tr>
<td>6</td>
<td>13</td>
<td>20</td>
<td>Lack of skill</td>
<td></td>
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<tr>
<td>7</td>
<td>14</td>
<td>21</td>
<td>Lack of resources</td>
<td></td>
</tr>
</tbody>
</table>

Verbs, second design experiment

https://goo.gl/ADsxsp