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# EHEALTH AND ITS MOTIVATORS FOR LONG-TIME USAGE.

*An explorative study into indicated motivation and Self Determination Theory based needs and motivation for health app usage for long-time health app users*

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Enschede 26/08/2019

## Abstract

**Introduction:** eHealth generates health related information, health related services and resources. A common way to start an eHealth intervention to live a healthier lifestyle is by using an application (app) on a smartphone. The eHealth intervention is most effective when it will be completed, but this is generally not the case. This study explores the experience of motivation for health app usage of people who use a health app for over a year. The theory for the understanding of human motivation is the Self Determination Theory (SDT). This theory is used to look at how the needs for self-determination and the five SDT motivation types come forward in the experience of motivation.

**Method:** To answer these three questions five semi-structured interviews were conducted, focused on the experienced motivation for the app usage. The inclusion criteria for participation were that the health app user used the app for over the period of a year and that the user is over the age of 18. The interviews were analyzed inductively with the help of created code schemes. The found motivation was further deductively analyzed for the three needs for motivation (competence, relatedness and autonomy) and for the five types of motivation (intrinsic motivation, integrated regulation, identified regulation, introjected regulation and demotivation).

**Results:** The most common finding about experienced motivation was the importance of insight in the journey of goal pursuit. It also showed that the interviewee found motivation in the people around them. The three needs for motivation were present but also the lacking of the needs were mentioned. When it comes to the five types of motivation, intrinsic motivation was very strongly represented.

**Discussion:** The findings suggest that the user is intrinsically motivated. For some this motivation already existed and for some this is because of external motivation via the app. Another finding is that when the app gives negative feedback, the user reports feelings of incompetence.

**Conclusion:** Long-time health app users were intrinsically motivated for the app usage, which is confirmed by the finding of the three SDT needs. The app provides insight in their health journey which is an important motivator. Another reported motivator are the people around the health app user; they can motivate them in real life or via the app.

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# 1. Introduction

## 1.1 A healthier lifestyle via eHealth

Because of the aging of society there is a growing group of help needed citizens (Gemert-Pijnen, Peters & Ossebaard, 2013). Within the Netherlands this group is growing so quickly, that to provide the needed healthcare for all the Dutch in the year 2040, 25 percent of the working Dutch population must work in healthcare (Faber, Geenhuizen & Reuver, 2017). To keep healthcare costs low, it is important to keep the group that is in need of healthcare as small as possible. Enhancing physical activity, eating habits and sleeping behavior are important because they can reduce healthcare costs (WHO, 2009). Improving the health of citizens can be done via eHealth. Because eHealth is a tool to support a healthier lifestyle which can be relatively low in costs, is easy accessible via smart phone and can reach a wide range of people.

eHealth stands for a broad group of activities that involves electronic action which generates health related information, health related services and resources (WHO, 2018). These eHealth interventions can be just as effective as face to face or paper based interventions (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004; Gollings & Paxtion, 2006). These effective eHealth interventions concern a lot of different topics. For example topics of enhancing physical activity, sleeping behavior and eating habits.

Many of these eHealth interventions are web based interventions and applications (apps); for example physical activity trackers. This can be an app or an app connected? device which is worn mostly on the wrist. These apps provide empowerment, and responsibility for one's health to generate engagement in desired behavior (Antypas & Wangberg, 2014; Choe, 2011; Chomutare, Tatara, Årsand, & Hartvigsen, 2013). This self-directing behavior is a trend found in the health industry, the client becomes more and more independent in their health journey (Epstein & Street, 2011). The apps can help the user to reach their health related goals, like for example weight loss or quitting smoking habits. Despite of all the benefits that these health apps have to offer, the health apps aren't used well enough (Gemert-Pijnen, Peters, & Ossebaard, 2013).

To successfully reach these health related goals, the app should be used as prescribed. But there is a high rate of early quitting for eHealth interventions; the adherence to an intervention is as low as 50% (Gemert-Pijnen et al., 2013). Studies show that increased usage of the health related apps correlates positively with reaching health related goals, such as weight loss or quit smoking habits (Perski, Blandford, West, & Michie, 2016). However, a

common problem with eHealth apps is that people don't use the app after downloading it. And when they do start to use the app, they quit using the app before they reach the benefits of the health intervention. Three quarter of the health app users open the app less than ten times after downloading (Consumer Health Information Corporation, 2011) and the typical medical or fitness apps are used for 90 days by only 30% of the people after downloading it (Birnbaum, Lewis, Rosen, & Ranney, 2015). People do seem motivated for the eHealth interventions. Nearly 1 in 10 smartphone users have downloaded a health related app on their phone, but one third of these app users only opens the app once after downloading it (Cowan, Van Wagenen, Brown, Hedin, Seino-Stephan, Hall,& West, 2013; Fox, Vazquez, Tonner, Stevens, Fineman,& Ross, 2010). An example of apps that aren't used as sustainably as desired, is the use of apps that track physical activity. Physical activity trackers are most commonly found in the form of an app on a mobile phone whether or not accompanied by a device worn on the wrist. A third of the owners of commercial physical activity trackers discarded the tracking of activity within 6 months. For people who track physical activity on their mobile phone without a device worn on their wrist, this is even less a third (Karapanos, 2015).

The motivation for long-time usage of the health apps is low, although modern lifestyle related diseases can be prevented with the use of these health apps (Lopez & Murray, 1998). Because of this off balance within problem and solution, a lot of research has been conducted with the goals to increase the use of eHealth. However, the high rate of early quitters within eHealth interventions is an obstacle in modern research. A thing that is still lacking, is the evidence regarding the long term effects of eHealth interventions (Muellmann, Forberger, Mollers, Broring, Zeeb, & Pischke, 2018). Arguments for quitting the app are: difficulty in entering data in the app, loss of interest, data security and confidentiality (Krebs & Duncan, 2015). At the same time there has been a lot of research for ways to increase the usage of eHealth. It shows that motivation is of importance for adherence to eHealth, but we know too little about the motivators for the long-time usage of eHealth (Muellmann et al., 2018). The Self Determination Theory (SDT) could be a useful theory because it has been used a lot to increase motivation (Deci & Ryan, 2000).

Within eHealth, one of the strategies that is used to increase usage is gamification. SDT is often used in this context to explain how gamification can lead to more motivation. For example; motivation for physical activity can be increased in the workplace through points, badges and leaderboards (Sanaul Haque, Jämsä, & Kangas, 2017). Gamification is the application of game-like thinking and game techniques in non-game environments. In

gamification, elements of games are used to motivate users and enrich their experience (Kam & Umar, 2018). Commonly the Self Determination Theory and motivation are mentioned when talking about health related gamification (Hall, Caton, & Weinhardt, 2013; Hamari & Koivsto, 2015; Riva, Camerini, Allam, & Schulz, 2014; Spillers & Asimakopuolos, 2014; Zuckerman & Gal-Oz, 2014). The SDT is a very influential and well used theory to increase motivation. Therefore the SDT will be used in this study to analyze the motivation for health app usage.

## 1.2 The Self Determination Theory of Human needs

It seems that people are motivated to download a health app intervention. But apparently there is no motivation to start it or to keep using it as prescribed. Therefore SDT provides an understanding of the human motivation, this motivation contains of three psychological needs, namely competence, autonomy and relatedness (Deci et al., 2000). These three needs may provide insight in why people do or do not keep using health apps. Self-realization arises when autonomy, competence and relatedness is experienced. When these three basic needs are met, the quality of motivation will increase which will lead to self-realization. The result will be that the person is committed and intrinsically motivated. This motivation cannot be continuously at the same level. Life comes with ups and downs and the emotional state of people is not a stable one, so the level of motivation can shift. When the three needs are met, people are curious, vital and motivated. The majority of these people strive to learn, explore and apply their talents, the nature of people is positive and persistent. So the quality of the motivation to keep using a health app will be increased when these three needs are met (Deci et al., 2000). Most contemporary theories concerning motivation take on the believe that people initiate and maintain behavior to a degree that they assume will lead to the desired outcome. However, this does not show in the current adherence to health apps (Muellmann et al., 2018). People are motivated to download these apps, but they apparently aren't motivated enough to use the app for a long time. The SDT is a theory about human motivation that focuses on human personality development and behavioral self-regulation. This process of human personality development and behavioral self-regulation arises when the three needs are met: the needs for competence, the need for relatedness and the need for autonomy (Harter, 1987; Baumeister & Leary, 1995; Deci, 1975).

## 1.3 Motivation in the Self Determination Theory

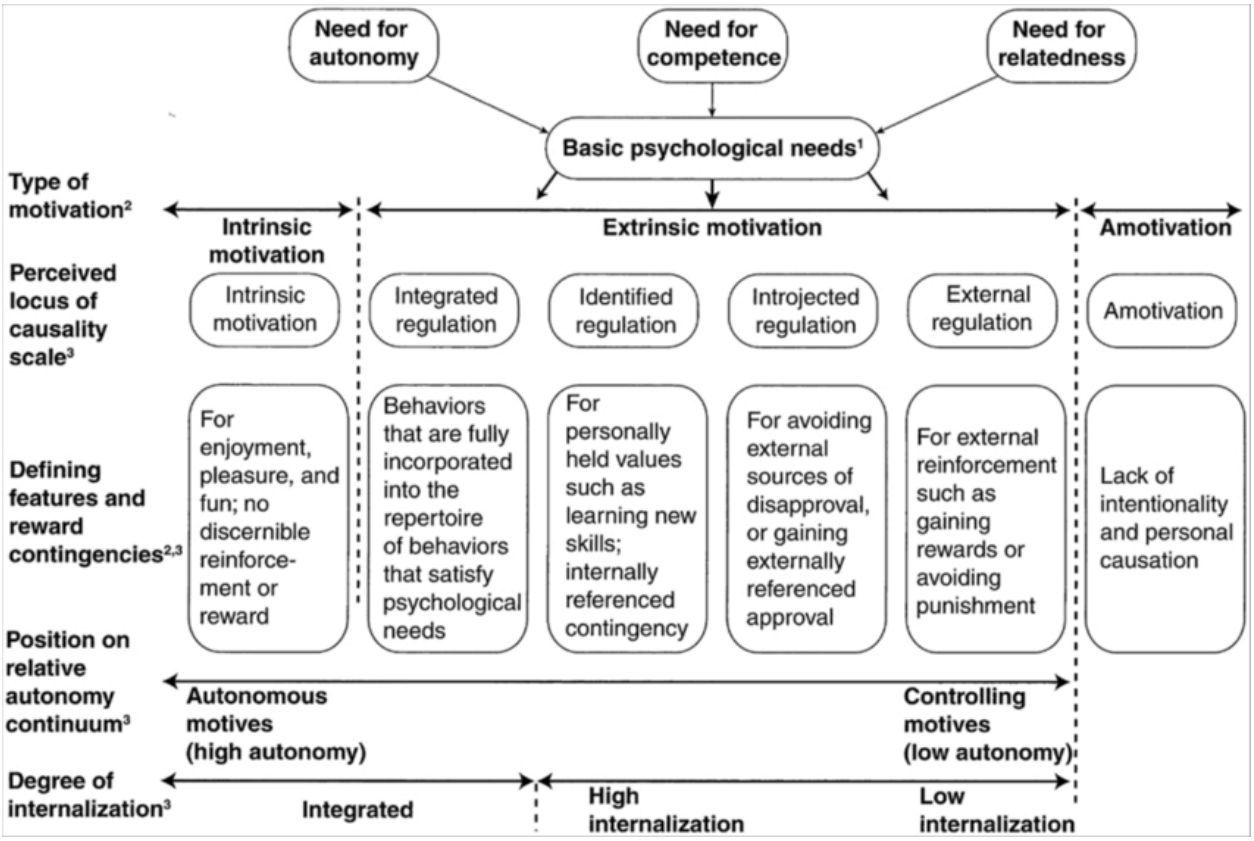
The SDT is developed in 1975 and is a macro theory for motivation, because the concept of the three needs is a general one. The theory evolved; they found that the self in SDT isn't a general and stable concept; intrinsic motivated behavior is a result of the nascent self, extrinsic motivation, cultural norms and emotional regulations. The SDT is therefore further developed and zoomed in on the types of motivation (Edward, Deci and Ryan, 2000). This focus on the types of motivation that a long-time app user has, may provide insight in why they stick to the usage of the app.

According to Deci et al., (2000) motivation is often seen as a standalone concept, but it is build up by many factors. These factors generally can be categorized in two main pillars: internal motivation and external motivation. Motivation is internal when a product of three needs is fulfilled as explained with the SDT. When the drive comes from within, there is the tendency to learn and explore, to seek out novelty, to look for challenges, to exercise and extend one's capacities. Motivation is external when the drive is imposed for example by others. This can be done positively by a reward or negatively by a punishment or threat. Therefore it seems possible that the long-time health app users are internally motivated. These users experience more positive consequences then users who are externally motivated. Internally motivated people have more interest, excitement and confidence, what manifests in better performances, persistence and creativity. People who are internally motivated also show heightened vitality, self-esteem and general wellbeing. This also shows when people have the same level of perceived competence or self-efficacy for the activity they are motivated for. (Deci & Ryan, 1991; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997; Nix, Ryan, Manly, & Deci, 1999; Deci & Ryan, 1995). So internal motivation has a lot of benefits for the potential health app user. External motivation also can be used to self-determinate. Motivation even has the ability to shift from external to internal. For example: a health app user which is externally motivated by his doctor to start exercising, can experience internal motivation and all its benefits over time when the values are internalized. Studies show that when autonomy is supported, intrinsic motivation increases. Within an health app this can be done by giving the user choice when using the health app (Kowal & Fortier, 2001). To confirm this shift from external to internal motivation with the usage of health apps, more research needs to be conducted.

The SDT distinguishes four types of external motivation: integrated regulation, identified regulation, introjected regulation and external regulation. These are relevant when

looking at the quality of internalization. Motivation can be internalized, which will lead to a better performance. However an app can contribute to motivation, highly autonomous motivation, which is the most efficient motivation, comes from within the consumer. The most positive type of motivation is intrinsic motivation, followed by the four extrinsic motivation types (shown in figure 1).

**Figure 1.** Types of motivation




The extrinsic motivation ‘integrated regulation’ is for example training weekly to run a certain distance. Right after the goal of the set distance is met, the behavior is incorporated. But the enjoyment of running that certain distance will come when stamina and strength is build up for a longer period of time and running the distance will become easier. ‘Identified regulation’ stands for personally held values such as learning new skills. This kind of motivation can be experienced when a runner wants to set a new goal, for example a faster speed during a run. The runner is already able to run a certain distance but wants to improve itself because of curiosity. The third kind of external motivation is ‘introjected regulation’ which stands for avoiding external disapproval or for gaining external approval. The need for

competence, the need for relatedness and the need for autonomy transcend gender, culture and time. For example, the importance for humans to fit in. This fitting in is also an example of 'introjected regulation'. This can be running to lose weight, because of the fear of disapproval of one's friends. The last kind of extrinsic motivation is 'external regulation' which stands for external reinforcement such as avoiding punishment or getting a reward. This kind of motivation has the lowest amount of autonomy. An example can be a friend who is motivating a person to run a certain distance by rewarding the person with a cinema ticket if they complete the run. The motivation is not likely to be sustainable over time, but health behavior is met. 'Amotivation' stands for the lack of intentionally and personal causation, for example when a person does not go running, due to a lack of time (Ryan, Deci, & Grolnick, 1995; Baumeister, & Leary, 1995; Reis, 1994; deCharms, 1968; Deci, 1975).

Competence is an SDT need which, when stimulated, increases intrinsic motivation. Within an app, this can be done by positive feedback about people's performance. This will increase the feeling of competence and therefore will amplify intrinsic motivation (Deci, 1971). So with the internalization of the values of health behavior, support of autonomy and competence, people can shift from extrinsic to intrinsic motivation. Benefits are more interest, excitement and confidence, which manifests in better performances, persistence and creativity. People who are internally motivated also show heightened vitality, self-esteem and general wellbeing.

## 1.4 Current study

The current study is investigating motivation of the long-time health app user. Getting insight in this motivation can be of great importance, because of the possible reduction of healthcare costs. When we know what motivates long-time health app users, we can search for ways to make this motivation available for other health app users and future health app users. This leads to the questions: 'What motivates the long-time app user to use the app for long periods of time?'. 'Do they meet the needs for self-determination via competence, autonomy and relatedness and what kind of motivation is driving them to work towards their health related goals?' 'Is this intrinsic motivation, integrated regulation, identified regulation, introjected regulation or external regulation?'

The study is conducted around these questions:

1. How do long-time health app users experience motivation for the health app?

2. How do the needs from the SDT come forward in the experience of motivation for long-time health app users?
3. How do the five types of motivation from the SDT come forward in the experience of motivation for long-time health app users and will this be mainly intrinsic or extrinsic motivation?

# 2 Method

## 2.1 Participants

Participants for the study were long-time health app users. The app they use can be health related in any form. The inclusion criteria were that the health app users are using the app for over a period of a year of time, also should they should be over the age of 18. The final sample consist of five individuals aged between 21 and 36, four participants being female and one male. All participants are living in Twente and are all highly educated; they all completed a study at a university.

## 2.2 Instruments

Before conducting the interview, the participants are asked to fill in a short questionnaire concerning the topic of demographic information. The interview is semi structured (appendices A and B). The interview contains a set of 33 questions, divided into 7 sets of questions. All the sets are designed to get a broad insight in possible motivation for the usage of the app. The first set contains questions concerning which app is used, and for how long the app is used. The next set of questions concerns the subject of how the app is normally used and exists of 5 different questions, such as what functions of the app are used and if there are functions which are not used. The third set of questions covers the subject of app usage, it concerns questions like how the app is used and when this app usage is taking place. The fourth set of questions concern topics of daily usage and breaks form this daily usage. The importance of the app to the user is the topic of the next set of questions, it contains subjects as relatedness, meaningfulness, personality and enjoyment. The sixth set of questions concerns dislikes about the apps and ways to improve it. And the seventh and last set of questions concerns the subject of relatedness to the app and relatedness to others through the app.

## 2.3 Procedure

Participants were invited to join the interview by phone or in person. The interview takes place in a calm environment where the participants cannot be interrupted and has an average duration of 45 minutes.. Prior to the interview the participants were given an informed consent. The researcher is familiar with the SDT concerning motivation and went into detail when the participants touched subjects within this theory by echoing the words of the interviewee concerning the topics of SDT. This echoing of key words did invite the interviewee to talk into more detail about the subject.

## 2.4 Data-Analysis

To answer the first research question the interviews are transcribed verbatim. To ensure the privacy of the interviewee, all personal information was anonymized. The interviews were analyzed, they were read and two interviews which contain the broadest representation of motivation were selected. The interviews were coded, they were uploaded to the software program Atlas.ti; a software program for the qualitative analysis of large data such as text (ATLAS.ti. 2019). The two interviews were coded inductively, segments which are relevant to the first research question were given descriptive labels. Based on these descriptive labels a first code scheme was established. This code scheme was used to code the other three interviews. During this process the codes were adjusted; this iterative method resulted in the final code scheme.

The fragments of text belonging to the previously identified main code were analyzed deductively for relevancies to the theme of the second research question. The code was analyzed to find the SDT needs, which are the three components autonomy, relatedness and competence (Deci et al., 2000). For the SDT components we looked at their presence and the presence of their opposites, this was labelled as positive and negative presence of the SDT needs.

This deductive analyzing was also done for the third research question. The codes were analyzed for components of the five different sorts of motivation (Edward et al., 2000) which were intrinsic motivation, integrated regulation, identified regulation, introjected regulation and demotivation. Because of the difficulty of distinguishing the four extrinsic types of motivation, we divided the motivation types into two categories; intrinsic and extrinsic motivation.

# 3 Results

### 3.1.1 Motivation as experienced by the users

First the results of the inductive coding of the interviews are processed into a code scheme that is represented in table 1. Visible are the theme, the sub-theme, the definition of the sub-theme and the frequency of the codes mentioned in the interview. The overall topic is motivation; this includes the 4 themes and the 15 sub-themes.

Then the findings of the three SDT needs are represented. The needs autonomy, relatedness and competence that are found in the fragments belonging to the code will be visible in Table 2. The themes and the numbers in which the three needs were found in the coded text are represented.

Thirdly there were two different types of motivation found in the coded text. These are intrinsic motivation and extrinsic motivation. A representation of how these motivation types occurred within the fragments of the code can be found in table 3.

**Table 1**.

*The themes, their definitions and the number of times this theme was identified in all interviews for motivation to use an app*

| Theme | Sub-theme | Definition | Frequency |
|---|---|---|---|
| App functions | Insight | Motivation for the usage of the app because of the insight that it brings. | 39 |
| | Push messages | Motivation for app use because the app sends push messages that either remind or motivate the user. | 24 |
| | Reward | Motivation for app usage through a rewarding system. This can be a sound, vibration or visual stimulation | 13 |
| | Guide | Motivation for the usage of the app because of its guiding functions such as a digital coach. | 11 |
| | Ease of usage | Motivation for the usage of the app because of the usability. | 9 |

| | | | |
|---|---|---|---|
| | Other use | Motivation for usage of the app because of additional app functionalities that are not health related such as telling time. | 6 |
| | Alternation | Motivation for app usage because there are offered multiple methods for health gain. For example, a different running route. | 4 |
| | Connection through other apps | Motivation for the usage of the app because it can be linked to other apps | 1 |
| Motivators | Motivation by others | Motivation for the usage of the app because of the involvement of others in the usage of the app. | 26 |
| | Motivation by self | Motivation for the usage of the app because of intrinsic motivation. | 19 |
| | Weight | Motivation for the usage of the app because maintaining or losing weight is of importance for the user. | 6 |
| | Physical condition | Motivation for app usage because building of maintaining physical condition is of importance for the user. | 5 |
| Usage of the app | App usage | Intensity or time of app usage. | 23 |
| | Emotion | Emotions which were mentioned when talking about app usage. | 11 |
| Demotivation | Inconvenience | Demotivation for app usage because of inconvenience. | 4 |
| | Internalization | Demotivation for app usage because the required information is internalized. | 4 |

| | | | |
|---|---|---|---|
| | Negative feedback | Demotivation for app usage when the app provides the user with negative feedback. | 3 |

Table 2.

*The motivation themes and the negative and positive mentioning of SDT needs*

| App function code | Autonomy | Relatedness | Competence | Total positive | Total negative | Total |
|---|---|---|---|---|---|---|
| App function | 33(+=28;-=5) | 10(+=8;-=2) | 25(+=20;-=5) | 56 | 12 | 68 |
| Motivated by | 14(+=14;-=0) | 23(+=22;-=1) | 24(+=17;-=7) | 53 | 8 | 61 |
| Usage of app | 28(+=25;-=3) | 8(+=8;-=0) | 26(+=22;-=4) | 55 | 7 | 62 |
| Demotivation | 7(+=6;-=1) | 1(+=1;-=0) | 9(+=9;-=0) | 16 | 1 | 17 |

Table 3.

*The motivation themes and the mentioning of intrinsic of extrinsic motivation*

| Theme | Intrinsic motivation | Extrinsic motivation | Total |
|---|---|---|---|
| App function | 55 | 28 | 83 |
| Motivation | 26 | 18 | 44 |
| Usage of app | 19 | 3 | 22 |
| Demotivation | 5 | 6 | 11 |

## 3.2 Theme analyses

The overall topic of motivation includes the 4 themes and 15 sub-themes. Firstly the sub-themes will be explained in-depth per theme. Secondly within each theme the most striking findings of the deductive SDT analysis are presented. These are autonomy, relatedness and competence that are found in the code. Thirdly per theme the most striking findings of the deductive analysis of the motivation types (intrinsic or extrinsic) will be explained.

### 3.2.1 App function

There are eight different functions of the app that motivate the user; the most common one is the sub-code “insight”. It seems of great importance to the interviewees that the app provides them with information (insight) about their health. This insight is so important for the user

that without the app the main goal seems less important. Quotes from the interviewee confirming this are: *"When I went for a run, what my run was like. I am someone who can totally look that up and compare it"* (interview 5). *"I always run with my watch, without it I wouldn't even go for a run"* (interview 4). The kind of insight the interviewee talk about is information like mileage or the speed of the run, information about their sleeping pattern or calorie intake.

The second app function that motivates the user is "push messages". "Push messages" are messages send by the app that remind and motivate the user. Interviewee talk about getting messages from the app when they don't stick to the schedule, this motivates them to stick to their schedule: *"he is now also shaking completely"* (interview 2). They also get push messages when they do achieve or almost have achieved goals or sub goals, which is motivating them. The Fitbit has a setting that sends a push message within office hours. During these hours it is more difficult to stick to movement goals. The interviewee get motivated by the extra push messages the Fitbit sends 10 minutes before every hour when they didn't meet their goals so that they can still achieve that goal within the hour. The interviewee talk about what they do when they receive these messages: *"Then I walk an extra round or go to the coffee machine to grab a coffee"* (interview 1). The push messages are sent when something needs to be changed, for example that the user needs to move but it can also mean that the user is running too fast or his heartrate is too high. In that case the user gets informed that he needs to slow down. The push messages are mostly seen as positive stimulation, one interviewee even compared their app to a loyal friend: *"Look, it is exactly the same as if you are going to walk with a loyal friend, that pulls you along. Who pushes you, that's how you should see it. And that is what the Garmin does"* (interview 4).

The third kind of app function is "reward". In 4 different interviews the subject of "reward" is mentioned; the user gets a reward when a goal of sub goal is achieved. The motivation for app usage through a rewarding system is mentioned 13 times. This "reward" can be given by a sound, vibration or visual stimulation such as a visual representation fireworks on the app screen. The interviewee explained how they felt rewarded:*"… So he motivates by telling you that you reached a goal or that you are doing well… "*(interview 2) *"if you have reached 10000 he says good job. Then he is he going to celebrate by throwing a nice party"* (interview 5).

The fourth kind of app function that motivates the user is guidance, the theme "guide" is mentioned 11 times. The guidance function of the app can be a plan or scheme to reach a goal, a digital coach who tells the user what to do via pre-recorded video messages or the app

that comes up with a route for the user which he can follow or a meditation exercise. This guidance is perceived as pleasant as one of the interviewees said. *"It is nice to have something that tells you what to do…. Instead of coming up with your own plan"* (interview 5).

The fifth section is "ease of usage". Motivation for the usage of the app because of the ease of usage is mentioned 9 times in the interviews. Ease of use is found in the way the app keeps track of health performance or the access to the health statistics. The interviewee are for example talking about the easy access to their watch on which they can monitor their health related behavior: "*Yes it's easy. Haha I think so, yes. I like easy things. It shouldn't be difficult, most things in life are difficult enough as it is."* (interview 3).

The sixth sub-code is "other use". Interviewee talk about other use of the app as a motivator, because of the app functionalities that are not health related. This is mentioned by the people who are wearing a health tracking device on their wrist. This other use of the app can be in the form of time telling, playing music or receiving text messages or phone calls on their wrist device. One interviewee said: *"I find it also useful because WhatsApp-messages appear on it or normal messages show up"* (interview 5).
The app is still used by the interviewee even when they do not use the app for its originated health related goals. One interviewee spoke about how she listens to music on her device: *"You can listen to music on it… and then you are able with your Fitbit to direct the songs, or go to the next song or stop the song."* (interview 3).

The seventh app function is "alternation", the health app user seems to get motivated for app usage because they are offered multiple methods for health gain. For example, a different running route of the possibility for multiple kinds of sports. Running the same route or practicing the same sport over and over can be boring and the app user seems to enjoy alternation. *"Plus you can do all kinds of sports with it, I am someone who loves different kinds of sports. Different kinds of sports, that suits my personality, sporty but also easily bored with constantly the same thing."* (interview 1).

The eight app function is "connection through other apps". Some apps can be linked to other apps. This can be a social media app such as Instagram or Facebook but also other health apps such as Strava. There is motivation for the usage of the app because of the motivation that the other apps give the user. One of the interviewee stated: *"Friends who have … who have sport on the same kind of priority list, they do motivate."* (interview 1).
The interviewee talk about different kinds of apps. There are two groups of apps, the ones who keep the information about your health private and apps that function like social media

and share the information about your health and give other people the opportunity to comment on that. The interviewee where divided talking about the sharing of health information. For some it was not interesting at all, they like to keep their information private. Some just like to look at other people's health but do not feel the need to share. Others share their health information and talked about motivating one and another, and some even talked about a responsibility to motivate others: *"I stimulate other people, I try to stimulate them… not to stimulate myself."* (interview 4).

### 3.2.2 SDT needs in app function

Looking at the fragments all the three needs are represented, Autonomy was the need that is mentioned most frequently, this is done mostly positively since there was only one negative mentioning. Most of the Autonomy fragments where of the code "insight" and "push messages". Positive Autonomy is mentioned by choosing to reach goals by training, walking the dog for an extra mile or taking the stairs instead of the elevator. One of the interviewee within the code "insight" said: *"I think it's fun to look at the achievements of my training sessions afterwards…"* (interview 2). The second most represented need is Competence. The fragments that fall within Competence are mostly of the code "push messages"; after that comes "insight". Competence was mainly talked about in the manner of reaching goals or in a negative way, by not knowing what the app has to offer. Within the code "push messages" one of the interviewee said: *"When I reach a 10000 steps it (the app) will give you fireworks…"* (interview 3). The need Relatedness are the fragments that have the least amount of codes in it. The most common code within Relatedness is also the code "insight". Within all the fragments there are few negative mentions of the three needs. Most negative mentions are found in "push messages", mostly within Autonomy. A negative mention of Autonomy stands for not being able to skip a training session or that a person could not reach their goal. For example: *"Every once in a while, when I'm not doing so well, when I'm not exercising as much, I think it's irritating when the app keeps on sending me reminders.* (interview 1).

Table 4.

*The negative and positive SDT needs found in the sub-themes of the app functions*

| App function code | Autonomy | Relatedness | Competence | Total positive | Total negative | Total |
|---|---|---|---|---|---|---|
| Insight | 12(+=12;--=0) | 5(+=5;--=0) | 6(+=5;--=1) | **22** | **1** | **23** |
| Push messages | 8(+=6;-=-2) | 0 | 8(+=6;--=2) | **12** | **4** | **16** |
| Reward | 3(+=3;-=-0) | 1(+=1;--=0) | 4(+=4;--=0) | **8** | **0** | **8** |
| Guide | 3(+=2;-=-1) | 0 | 1(+=1;--=0) | **3** | **1** | **4** |
| Ease of usage | 0 | 0 | 4(+=4;--=0) | **4** | **0** | **4** |
| Other use | 0 | 0 | 1(+=1;--=0) | **1** | **0** | **1** |
| Alternation | 2(+=2;-=-0) | 1(+=1;--=0) | 2(+=1;--=1) | **4** | **1** | **5** |
| Connection through other apps | 0 | 1(+=1;--=0) | 0 | **1** | **0** | **1** |
| **Total** | **28(+=25;-=-3)** | **8(+=8;-=-0)** | **26(+=22;-=-4)** | **55** | **7** | **62** |

### 3.2.3 Motivation types in app function

Within the theme app function, "insight" provides half of the intrinsic motivation. One of the interviewees said: *"I think it's fun to look at … to look at how active I am during a day"* (interview 1). "Push messages" contains mostly of extrinsic motivation. The app user gets motivated by the messages the app sends. One of the interviewee said: *"The app stimulates me … It tells me how many steps I have to take that hour"* (interview 3). Within "reward" intrinsic motivation and extrinsic motivation is equally divided. Within "other use" and "alternation" only intrinsic motivation is found and within "connection through other apps" no specified intrinsic or extrinsic motivation is found.

The theme "insight" contains 30 motivation related codes. Gaining insight in the journey of the health related goal seems of great interest for the user. 5 times the user was extrinsic motivated by the app notifying them that they should exercise.

The sub-theme "reward" was mentioned in regard of intrinsic and extrinsic motivation both 7 times. Extrinsic codes mostly referred to "reward", such as rewards in the form of visual stimulation. The 7 intrinsic motivation codes mostly contained values such as reaching the national average of activity. When talking about the perceived "ease of usage" no extrinsic motivation is mentioned.

Table 5.

*Intrinsic and extrinsic motivation types found in the sub-theme of app functions*

| App function | Intrinsic motivation | Extrinsic motivation | Total |
|---|---|---|---|
| Insight | 25 | 5 | 30 |
| Push Message | 1 | 14 | 24 |
| Reward | 7 | 7 | 14 |
| Guide | 6 | 2 | 8 |
| Ease of usage | 7 | 0 | 7 |
| Other use | 5 | 0 | 5 |
| Alternation | 4 | 0 | 4 |
| Connection through other apps | 0 | 0 | 0 |

### 3.3.1 Motivators

Users are able to motivate themselves, they find motivation in others or in goals such as weight of physical condition. "Motivation by others" stands for motivation for the usage of the app because it involves others in the usage of the app; it is a topic that is mentioned 37 times. This motivation can come through face to face contact, for example sharing health statistics with a partner to start a debate on doing chores based on their health statistics: *"If we both don't feel like walking the dog in the evening, I say: show me how many steps you've taken*" (interview 1). The motivation can also come through others who are online, for example by viewing posts of the achievements of others. An interviewee mentioned: *"during the week I can also see how much they move. Yes, you will receive a push message when they have reached their goal and then you are behind, you can actively watch them… with friends it is teasing each other, when I know I will move a lot that day I will probably throw in a challenge… and then it really becomes a sort of competition. … then I go for an extra walk with the dog and walk around a little further"* (interview 1).

Motivation can also come from the fact that others can see the achievement of the interviewee through the app. An interviewee mentioned: *"So if you post something after 3 months, then others will think that you did not do a thing… so that is a good motivator."* (interview 1). For some motivation is indirect, they get motivated by their online sharing of

health statistics. But their goal is to motivate others with their own posts. They feel responsible to keep up their goal achievement to motivate others: *"I stimulate other people, I try to stimulate them… I wake people up, I have finished my run, are you going to run? Haha"* (interview 4).

The "motivation by self" is mentioned 19 times, motivation for the usage of the app because of intrinsic motivation. The interviewee talked about their personal motivation for health related goals: *"Because of a car accident I gained a lot of pounds. And those should leave, hahaha."* (interview 3). *"I'm a person who thinks it is important to be active and to stay fit."* (interview 1). The interviewee are motivated for the kind of exercise and the achievements they accomplish. As one of them stated: *"ehh yes it does motivate me because ehh for example ehh, Sunday … I'm going to run 16 miles and I ran my personal record there last year. … and of course I want to match that. Hahaha"* (interview 4).

The goals the app users talked about can be divided into two sections, the first one being "weight". The app is used to maintain or lose weight as stated by one of the interviewee: *"Well, I am very much concerned with losing weight, that in combination with health and being fit, so not just weight loss"* (interview 2).

The second topic is "physical condition", interviewee talked about wanting to maintain their level of stamina, wanting to have more energy or being able to perform better. The subject of "physical condition" is mentioned 5 times in the interviews. There seems to be motivation for app usage because building or maintaining physical condition. One of the interviewee said: *"Yes conditionally I just want to keep it a bit up to standard"* (interview 1).

### 3.3.2 SDT needs in Motivators

The code "motivators" has all three needs mentioned; only relatedness and unrelatedness does not occur by "motivation by self". "Motivations by others" contains all of the three needs. Competence stands for reaching goals or not reaching them. Autonomy is mentioned mostly by talking about enjoying different kinds of sports. Relatedness is represented by challenging friends or following others via the app which makes the interviewee insecure or motivates them. In the code "motivation by self", competence is found in pride by reaching goals or feeling incompetent when not achieving them. Autonomy is found in what the user finds important health wise and reaching for these personal goals.

For the topics "weight" and "physical condition", only intrinsic motivation is found. For both sub-themes there is no visible extrinsic motivation. Both sub-themes consist of 5 intrinsic

motivated codes. The theme "weight" concerned topics as being motivated to maintain or lose weight. The theme "physical condition" exists of topics like maintain physical condition or working on a better physical condition.

Table 6.

*The negative and positive SDT needs found in the sub-themes of the motivators*

| **Motivators** | **Autonomy** | **Relatedness** | **Competence** | **Total positive** | **Total negative** | **Total** |
|---|---|---|---|---|---|---|
| Motivation by others | 5(+=5;--=0) | 23(+=22;--=1) | 8(+=6;--=2) | 33 | 3 | 36 |
| Motivation by self | 7(+=7;--=0) | 0 | 8(+=5;--=3) | 12 | 3 | 15 |
| Weight | 1(+=1;--=0) | 0 | 0 | 1 | 0 | 1 |
| Physical condition | 1(+=1;--=0) | 0 | 0 | 1 | 0 | 1 |

### 3.3.3 Motivations types in Motivators

The theme "motivators" consists of four sub-themes. Within "motivation by others" mostly extrinsic motivation is found. Relatedness to others motivates the user to use the app. One of the interviewee said: *"It becomes a game… when we are going out for drinks we'll run to see who has taken the most steps"* (interview 1). Within the sub-code "motivation by self", mostly intrinsic motivation is labelled. For the sub-code "demotivation" the divide is about equal.

Looking for the topics "weight" and "physical condition", which relatively have a small number of mentioning, it stands out that only autonomy is mentioned. Both in the sub-themes of "weight" and "physical condition", the needs for relatedness and competence do not occur.

Table 7.

*Intrinsic and extrinsic motivation types found in the sub-theme of motivators*

| Motivation | Intrinsic motivation | Extrinsic motivation | Total |
|---|---|---|---|
| Motivation by others | 5 | 15 | 20 |
| Motivation by self | 9 | 1 | 10 |
| Weight | 5 | 0 | 5 |
| Physical condition | 5 | 0 | 5 |

### 3.4.1 Usage of the app

The topic "usage of the app" is divided in three sections, the first one is "app usage". When talking about motivation, the intensity or time the app is used was mentioned 23 times. The app users talked about how they use their app during work, or only in their spare time. The interviewees used the app ranging from 2 times a day to every 3 hours: *"all day long reminders that your Fitbit gives you every hour… in between office hours, 9 to 5 or so. … I think that's standard because then people take far too few steps. Then I look at it.* (interview 1). The Fitbit is an app which is worn at all times, some interviewee talked about physically missing the watch when they were not wearing it. *"Euh you miss it on your wrist ... yes hahaha that is special. Hey there's nothing on my wrist*" (interview 3).

The second topic is "emotion". During the interview, while the interviewee was talking about motivation for app usage, "emotions" were mentioned 11 times. All of the mentioned emotions were positive emotions, such as pride, content and motivated. One of the interviewee stated: *"hmmm important, important, it's just fun"* (interview 5).

### 3.4.2 SDT needs in Usage of the app

The mentioning of the three needs in "usage of the app" is little; relatedness seems to be mentioned rarely. The theme "usage of the app" contains two needs. First, the need for Competence, represented by knowing all about the app and making a healthy lifestyle your own. And second, the need for Autonomy is found in adjusting a standard goal in an app or looking at the app to adjust goals for the day after.

Table 8.

*The negative and positive SDT needs found in the sub-themes of the usage of the app*

| Usage of app | Autonomy | Relatedness | Competence | Total positive | Total negative | Total |
|---|---|---|---|---|---|---|
| App usage | 5(+=4;--=1) | 0 | 2(+=2;--=0) | 4 | 3 | 7 |
| Emotion | 2(+=2;--=0) | 1(+=1;--=0) | 3(+=3;--=0) | 6 | 0 | 6 |

### 3.4.3 Motivation types in Usage of the app

In the theme "usage of the app", intrinsic motivation is mostly found. When talking about how the app is actually used in the sub-code "app usage", no extrinsic motivation is mentioned, only in the sub-code "emotion" extrinsic motivation is visible.

Table 9.

*Intrinsic and extrinsic motivation types found in the sub-theme of usage of the app*

| Usage of app | Intrinsic motivation | Extrinsic motivation | Total |
|---|---|---|---|
| App usage | 13 | 0 | 13 |
| Emotion | 6 | 3 | 9 |

### 3.6.1 Demotivation

For the long-time app users reasons to get discouraged by the app, are a theme within the interviews. Looking at the interviews there are three kinds of demotivation. The first one is because of "inconvenience", for example because of the charging of the device's battery or synchronization fault which makes it impossible or inconvenient to use the health app. *"yes that was just laziness I think, he had to be charged … and then he stays in the drawer."* (interview 2). Interviewee who wore the Fitbit talked about not using the app for days because of the battery charge time or a synchronization fault.

The second kind of demotivation is because of the gain of knowledge. The health behaviors are "internalized" and the app is no longer needed for this kind of information. The user knows for example how many calories there are inside their food pattern or the user knows what kind of exercise is needed to reach their goals: *"Your daily pattern always looks the same… that is just like eating, you first enter it very fanatically and at a certain moment you*

*know what is in everything and what you eat and then you no longer enter…yes to learn something from it…. and once you know it, it's fine. You can stop…"* (interview 5).
The third kind of demotivation is because the device confirms that the user is not doing well. The goals are not met and the app is a reminder for this failing. An interviewee talking about the consequences: *"As long as I don't get obsessed, that every minute and the calories and the inches, I shouldn't exaggerate. Because then he will only demotivate. And then I am only concerned with that thing. I can quickly lose myself in it. I can get a bit obsessive."* (interview 2).

### 3.6.2 SDT needs in demotivation

In the theme demotivation no relatedness is found; interviewee do not talk about the presence or absence when they mention demotivation. When talking about "negative feedback", the interviewee do mention autonomy in the sense that they make a decision to catch up on health related behavior later. The feeling of incompetence is mentioned when "inconvenience" stands in the way of app usage, but also when talking about "internalizing" the standard goals of the Fitbit because that is experienced as not enough for the interviewee.

Table 12.
*The negative and positive SDT needs found in the sub-themes of demotivation*

| Demotivation | Autonomy | Relatedness | Competence | Total positive | Total negative | Total |
|---|---|---|---|---|---|---|
| Inconvenience | 1(+=0;-=1) | 0 | 4(+=0;-=4) | 1 | 4 | 5 |
| Internalization | 0 | 0 | 3(+=1;-=2) | 1 | 2 | 3 |
| Negative feedback | 2(+=2;-=0) | 0 | 0 | 2 | 0 | 2 |

### 3.6.3 Motivation types in demotivation

The motivation distribution for demotivation tends to be completely intrinsic or completely extrinsic. Only the theme "negative feedback" has both intrinsic and extrinsic motivation. The theme "internalization" has nothing but intrinsic motivation. The app user talks about knowing how to execute a certain type of health behavior and therefore no longer needs the app. For inconvenience and negative feedback the motivation is mainly extrinsic. Within the sub-theme of "inconvenience", the app users talk about the wrist device needed to be charged

which makes it impossible to use the app. Within the theme of "negative feedback" the app user talks about getting demotivated when the app shows that sub-goals aren't being met.

Table 13.

*Intrinsic and extrinsic motivation types found in the sub-theme of demotivation*

| Demotivation | Intrinsic motivation | Extrinsic motivation | Total |
|---|---|---|---|
| Inconvenience | 0 | 3 | 3 |
| Internalization | 4 | 0 | 4 |
| Negative feedback | 1 | 3 | 4 |

## Discussion

Within this research the main questions are, for long-time health app users, how do they experience motivation for the health app? Do needs from the SDT come forward in the experience of motivation for long-time health app users? And do the five types of motivation from the SDT come forward in the experience of motivation for long-time health app users?

Notable findings regarding the three questions that are asked within this study are that long-time health app users were intrinsically motivated for the app usage. This kind of motivation the user experienced is the highest level of motivation. Intrinsically motivated people are curious, vital and motivated. The majority of people strive to learn, explore and apply their talents; the nature of people is positive and persistent. The finding of intrinsic motivation is confirmed by the finding of the three SDT needs, which are autonomy, relatedness and competence. The app provides insight in the health journey of long-time health app users, which is an important motivator. Another frequent reported motivator are the people around the health app user; they can motivate them in real life or through the app.

The experienced motivation of long-time health app users for the health app are divided in four different categories: App function, Motivation, Usage of app and Demotivation. Within the found motivation types the main type of motivation found is intrinsic motivation. This shows that the long-time app user seems to have internalized the values for app usage. Extrinsic motivation was also found, this was mostly in the form of "push messages", "reward" or "motivation by others". These external motivators can both

increase and limit intrinsic motivation if this is experienced as hinder or as support of competence and autonomy. (Deci, Koestner, & Ryan, 2001). Since intrinsic motivation was so predominantly found, it is very plausible that the external motivators are perceived as an increase of competence and autonomy. For example, the interviewee reported that rewards were perceived as a form of insight or a small goal met in the pursuit of a bigger goal such as a healthy lifestyle, which for them increased intrinsic motivation. The positive reinforcement after reaching a goal or the given insight can be seen as a form of gamification (Kam et al., 2018). These game-like elements of the app seem to motivate the app user. A double positive is that this process of insight leads to the evaluation of the self within the learning progress which supports motivation and self-efficacy (Dale, 2003). How the long-time app users got intrinsically motivated seems to differ. Some talk about things that needed to change about their health and others talk about being sporty. Apps contribute to motivation because the goals and preferences can be personalized (Larsen et al., 2013). The long-time health app users all seem to have a different starting point when it comes to the type of motivation they had, but at this moment they are all intrinsically motivated. A result of the internalization of the motivations is that people have more interest, excitement and confidence, what manifests in better performances, persistence and creativity (Deci et al., 1991) As the interviewee confirmed talking about their improved health performances. External motivation seems to help the users to get intrinsically motivated, this process is also called gamification. Rewards and push messages or competition with other app users are motivating the user to reach their health related goal as long as the type of external motivation suits the user and they are being perceived as an increase of competence and autonomy.

An interesting topic is demotivation, the long-time app users talked about demotivation for the usage of the app. The app users talked about not meeting their goals and being very discontent with this. For example, one interviewee talked about discontent and made it clear that the user was wearing the Fitbit and she was more than daily looking at her specifications. She was meeting all the standard set health goals, but she wanted to reach a higher level of sportiness just as she did in the past. She found her own performance not good enough, although her level of physical activity was up to standard. It is possible that the interviewee experienced negative feedback when looking at lower reached goals and therefore felt less competent. The feedback in itself is not negative, but may be perceived as negative because of the goals the users has achieved in the past being higher than they are now. This perceived negative feedback on one's sport performance can generate a decrease in one's intrinsic motivation by obstructing people's need for competence (Vallerand & Reid,

1984). It is also possible that the upward comparison of the app users who are more sporty then the interviewee generated demotivation and negative emotions (Salovey & Rodin 1984). Upward comparison was directly mentioned by one of the interviewee. She referred to not looking at the posts of app users who were far more sportier that she is because it demotivated her. Social interaction is known to positively influence the physical activity (Maher et al., 2015) but it seems the long-time app user also experiences the feeling of incompetence. The feeling of not being good enough, shows in the levels of competence that the users experienced. The negative competence related subjects are found within the category of push messages. The push messages confirm that the user is not being as sporty as desired. This negative feedback on sport performance can generate a decrease in one's intrinsic motivation by obstructing people's need for competence (Vallerand & Reid, 1984). Negative mentions of competence are also found in the theme of motivators. Here the sub-themes mostly contain not being sporty enough or not reaching goals. Perhaps there is a link to the social media because the social part of the apps is very similar to social media. The user can place reached goals with or without a photo. The feeling of incompetence which comes with the usage of the app, can be compared to the more negative self-perception users of social media perceive, which is indirectly related to the use of social media (de Vries & Kuhne, 2015). Although the long-time app user is meeting the standard health requirements, the users experience feeling incompetent, possibly due to negative feedback or upwards comparison.

An interesting finding is that the long-time app users only speak of the need for autonomy within the subjects of weight and physical condition. The other two needs, which are the need for relatedness and the need for competence, were not mentioned. It seems that the long-time health app users finds information considering weight and physical activity a matter that they do not share. In the fragments, it shows that the user feels that he can make informed, uncoerced decisions with the app. However, the user does not speak of feeling competent or related to others in the fragments coded as weight and physical activity, which they do mention for all the other codes. There is also a difference when looking at the type of motivation the users talks about when mentioning weight and physical condition; only intrinsic motivation was found. There are no other people or extrinsic stimulation found in the fragments when talking about weight and physical condition. Because there is intrinsic motivation you can assume that the needs for autonomy, relatedness and competence are met (Deci & Ryan, 2000). So it is very possible that the reason that the need for relatedness and competence are not discussed in the subject of physical condition and weight, are because

these are sensitive subjects. Health information in general is labeled as sensitive information; corporations must handle this information with great care (Knoppers & Thorogood, 2017). The long-time app users do mention feeling incompetent when talking about their own health related performance. It is plausible that the subjects of weight and physical activity could be perceived as shameful information for the app users. The coping strategy of not discussing shameful topics when feeling shame, occurs very commonly (Parikh, Parker, Nurss, Baker, & Williams, 1996). Because of this reported feelings of incompetence for health related performances, it seems plausible that the group of app users who are very focused on health behaviors, there is a discrepancy between a person's ideal weight or the level of physical activity and the achieved weight or level of physical activity. Study shows that a discrepancy between body ideals and one's actual body can lead to feelings of discontent. When it comes to body ideals the internalization of these body ideals may be an important part of the emotional consequences (Bessenoff & Snow. 2006). It is very plausible that the long-time health app users feels that information considering weight and physical activity is a shameful or private matter and therefore they do not share it. This can lead to negative feelings of relatedness and competence when it comes to these specific topics which can have a negative effects on motivation.

## Strengths and limitations

A strength of this interview is the inclusion criteria for the interviewee to use the health app over a year of time. This makes it most likely that the interviewee are motivated for the usage of the health app which is of great value for the study.

Another strength of this study is that during the process of interviewing the long-time health app users, echoing was used to get more information. When the interviewee talked about a subject that in some way touched the subject of the SDT, the interviewee echoed the SDT related word. The result was that the interviewee gave more personal information about the SDT related subject, without having to ask a directing question which may lead to biased answers.

A limitation of the study is that there were different kinds of apps used within this interview. Some people owned different kinds of apps and switched between them. The interview however was structured on one device. This can bring some confusion to the table, because different apps have different functions, which the specific app the interviewee used might not have. It is possible that there were more functions discussed then the app mentioned has to offer. However, the diffusion in the different health apps is not of

relevance, because the app users talked about parts of the apps that either motivated or demotivated them.

The creation of the coding scheme and the process of coding might also be labeled as a limitation of the present study. Only one researcher was engaged with analyzing the data. This may arise concerns in regards to the reliability (Cornish, Gillespie, & Zittoun, 2013). When multiple coders create a coding scheme, a inter-rater reliability may be reached; agreement between coders is usually evidence of the strength of an analysis (Lu & Schulman, 2008). However, Cornish et al. (2013) state that the agreement between coders does not automatically stands for objectivity, because two coders may also agree with each other because of a shared understanding of the study. Therefore, having only one coder is not seen as a disadvantage.

A limitation of the study is that the study sample only consist of highly educated people; this is a characteristic which is strongly associated with health app users. The main users of health related apps are younger individuals with high levels of education, higher income and a self-reported excellent health status (Carroll et al., 2017). To give a broad and honest representation it is desirable to have a mixed sample to give a true reflection of society.

## Further research

Some of the interviewees talked about their usage of the app in relation to negative feedback on one's health achievements. This negative feedback can generate a decrease in one's intrinsic motivation because of the obstructing of one's need for competence. The confirmation of not reaching set goals may be an interesting topic for further research, because in the long run the long-time health app users get faced with either their own disappointing performance, or higher performance of other health app users. The long-time health app users get faced with negative feedback one way or another. How they cope with this potential threat of decreasing motivation, can be of interest for other health app users.

"Physical activity" and "weight" seem to be topics where only autonomy is mentioned. There was no mentioning of relatedness or feeling competent in the interviews. Therefore it may be possible for the long-time app user, there is room to move up in the motivation scale from extrinsic to intrinsic motivation. It is possible that the app user is not mentioning relatedness and competence, because "physical activity" and "weight" can be more of a personal matter. It is also possible that the user does not feel competent about "physical activity" and "weight", because there might be shame or a stigma when it comes to

these topics. A third option for not mentioning relatedness or competence can be the lack of information to accomplish health related goals. Why the long-time app user does not talk about relatedness or competence may be an interesting subject for further research.

## Conclusion

The present study expanded the limited research on long-time health app usage by exploring how these users experience motivation for the health app. And how the needs from the SDT come forward in the experience of motivation for long-time health app users. And lastly how the five types of motivation from the SDT come forward in the experience of motivation for long-time health app users, is this mainly intrinsic or extrinsic motivation? A better understanding of long-time health app usage, may result in the development of health apps that all users will use as prescribed. This might lead to an effective health related intervention. These effective health related apps may reduce the rising healthcare costs.

The present study showed that the kind of motivation the app user mostly mentioned is "insight" in the process of the pursuit of health goals. The user finds it of great value to get information on their health journey. Another highly mentioned form of motivation is the motivation by other people. The long-time app user finds the motivation he gets from the people around him of great value. These people can be the people in real life or the people on the health app. The kind of motivation that is found within the long-time health app users is intrinsic motivation. A logical consequence of the found intrinsic motivation is that all of the three human needs for motivation are mentioned by the long-time health app users. The long-time health app user has fulfilled all three needs; the need for autonomy, the need for relatedness and the need for competence. On the topic of motivation, the long-time health app user seems intrinsically motivated while talking about the app usage. Extrinsic motivation is also well represented in the app usage; the user is stimulated by visuals, vibrations and other users. These game-like elements in the app motivate the user; this is also called gamification of the app. With the wide range of health related apps currently available and continuously growing, and the need for a way to stop health care costs from growing, effective health related apps may reduce the health care costs significantly in the future.

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1st International Workshop on Data-Driven Gamification Design, DDGD 2017; Tampere; Finland; 20 September 2017 through; Code 131662

# Appendices

## Appendix A: interview guide in Dutch

*Welke App gebruik je?*

*Hoe lang gebruik je deze App al?*

*Waarom gebruik je deze app?*
*Welk doel wil je bereiken?*
*Heb je andere Apps gebruikt? Zo ja waarom blijf je wel bij deze app?*
*Wat is je motivatie om deze App te gebruiken? (beginnen te gebruiken/blijven gebruiken)*
*Welke functies vind je expliciet motiverend voor het App gebruik voor langere tijd?*

*Kun je uitleggen/laten zien hoe je de App normaal gesproken gebruikt?*
- *Wat doe je met de app?*
- *Wanneer?*
- *Zijn er andere functies die je af en toe gebruikt?*
- *Denk je dat je je alle functies van de App kent?*
- *Kun jij alle functies gebruiken?*

*Hoe vaak gebruik je de App in het dagelijkse leven?*
- *In welke context gebruik je de app?*
- *Heb je breaks gehad gedurende het gebruik van de app?*
- *Waarom nam je de breaks?*
- *Wat zorgde ervoor dat je de App weer ging gebruiken?*

*Je hebt aangegeven dat deze App op een bepaalde manier belangrijk voor jou is. Kun je hier over vertellen?*
- *Wat betekent de App voor jou?*
- *Waarom is het belangrijk voor jou?*
- *Is het een gedeelte van je leven geworden?*

*Is het iets dat bij jou als persoon past?*
*Voel je je verbonden met de app?*
*Heb je plezier van het gebruik van de app?*
*Is het betekenisvol voor jou?*
*Vertel je anderen over het gebruik van de app?*

*Zijn er onderdelen van de App die je niet leuk vindt?*
*Welke functies zorgen ervoor dat je de App niet lange tijd gebruikt?*
*Heb je suggesties waarmee de App verbeterd zou kunnen worden?*

*Voel je je verbonden met anderen via deze app?*
*Waarom past deze App zo goed bij jou persoonlijkheid?*
*Hoe stimuleert de App jou?*

## Appendix B: interview guide translated from Dutch to English

*Which App do you use?*
*For how long have you been using the app?*

*Why do you use this app?*
*What is the goal you wish to achieve?*
*Have you tried other Apps and if yes, why did you stick with this one?*
*What was your motivation to start using the app? (keep using the app)*
*Which functions do you find explicitly motivating for using the App over a long time?*

*Can you explain/show how you usually use this app?*
- *What do you do with it?*
- *When?*
- *Are there other functions you occasionally use?*
- *Do you think you know all its functions?*
- *Are you able to use all the functions?*

*How often do you use the App in your daily life?*
- *In which context do you use the app?*
- *Have there been breaks during your usage?*
- *Why did you take a break?*
- *What made you start using it again (more intensively)?*

*You have indicated that this App is in some way important to you. Can you elaborate on this?*
- *What does the App mean to you?*
- *Why is it important to you?*
- *Has it become a part of your life?*

*Is it something that fits with you as a person?*
*Do you have the feeling that you are connected to the app?*
*Do you enjoy using it?*
*Is it meaningful to you?*
*Do you tell others about the app?*

*Are there any aspects of the App that you dislike?*
*Which functions interrupt you from using the App for a long time.*
*Do you have any suggestions for improving the app?*

*Do you feel connected with others true this app?*
*Why does this App suits your personality so well?*
*How does the App stimulate you?*

## Appendix C: Codes compared to SDT needs table

*Codes compared to SDT needs*

| **Motivation code** | | **Autonomy** | **Relatedness** | **Competence** | **Total** |
|---|---|---|---|---|---|
| App function | Insight | 12(+=12;-=0) | 5(+=5;-=0) | 6(+=5;-=1) | 23 |
| | Push messages | 8(+=6;-=2) | 0 | 8(+=6;-=2) | 16 |
| | Reward | 3(+=3;-=0) | 1(+=1;-=0) | 4(+=4;-=0) | 8 |
| | Guide | 3(+=2;-=1) | 0 | 1(+=1;-=0) | 4 |
| | Other use | 0 | 0 | 1(+=1;-=0) | 1 |
| | Alternation | 2(+=2;-=0) | 1(+=1;-=0) | 2(+=1;-=1) | 5 |
| | Connection through other apps | 3(+=1;-=2) | 3(+=1;-=2) | 3(+=1;-=2) | 4 |
| Motivation | Motivation by others | 5(+=5;-=0) | 23(+=22;-=1) | 8(+=6;-=2) | 36 |
| | Motivation by self | 7(+=7;-=0) | 0 | 8(+=5;-=3) | 5 |
| | Demotivation | 2(+=2;-=0) | 0 | 3(+=1;-=2) | 5 |
| Usage of app | App usage | 5(+=4;-=1) | 0 | 2(+=2;-=0) | 7 |
| | Emotion | 2(+=2;-=0) | 1(+=1;-=0) | 3(+=3;-=0) | 6 |
| | Ease of usage | 0 | 0 | 4(+=4;-=0) | 4 |
| Goals | Weight | 1(+=1;-=0) | 0 | 0 | 1 |
| | Physical condition | 1(+=1;-=0) | 0 | 0 | 1 |