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How to Persuade Youths to Adopt a Healthy Behavior for a Period

A Design Guide

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Abstract

Research on persuasive technology and designs are in continuous need, and there are not many conceptual models available, certainly in persuading youths to perform healthy behaviors. B.J. Fogg's Blue Span behavior, which states that one perform a familiar behavior for a period of time, is accounted in a case study conducted on 30 youths for two months. The results were used to create a design guide with a conceptual model, which guides the researcher or designer on how to create applications for persuading youths to be physical active for a period. Push-ups was selected as the healthy physical behavior, and the results states that the majority of the informants took daily push-ups, all the participants used the application and did the behavior for two weeks, and some used the application for two months.

Acknowledgment

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I would like to thank my supervisor Babak A. Farshchian for guidance, suggestions, feedback, and help during my study with the thesis.

Acronyms

AI Artificial Intelligence. 69, 70

BC Behavior Change. 9, 10, 14, 16, 18, 20, 22, 24, 29–31, 39, 47, 66, 68

FBM Fogg Behavior Model. 16, 22, 54

ICT Information and Communications Technology. 10, 39

NSD Norsk Samfunnsvitenskapelig Datatjeneste. 72

PT Persuasive Technology. 7, 9, 10, 13, 14, 16, 18, 20, 22, 47

RQ1 Research Question 1. 9, 65
RQ2 Research Question 2. 9, 65

SCT Social Cognitive Theory. 24, 25

TTM Transtheoretical Model. 27, 29, 62, 63, 65, 68

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Chapter 1

Introduction

While a behavior is the actions of individuals in response to the environment, a habit is a routine of behavior. It occurs when a behavior is repeated regularly. When you engage a habit, you are not conscious of the routine of behavior.

People have thousands, maybe millions of habits, ranging from how we brush our teeth, to how we formulate ourselves when speaking. Everything we do regularly can be a habit, but not all habits are good. Bad habits or behaviors can be health related like sleep, food, physical activity or nicotine. The list goes on, but one problem is that we are probably only aware of a small fraction of them. There is potential to help people get rid of the unhealthy habits and get some new healthy habits.

In this Master's Thesis, we will use persuasive technology and Gamification to find methods for how youths can be persuaded to adopt a health-beneficial behavior. A conceptual framework will be used to organize concepts and theories, and a case study will be conducted on youths to collect findings that will be used to create a final design guide. The design guide will be a guide to how persuasive technology can be used to persuade youth for a period. It is directed at youths, but can also be beneficial for adults. Because habits are made from behaviors, we will look at the behaviors and how a behavior can be repeated with the help of technology.

Strategies from Gamification (Deterding et al., 2011) and Persuasive Technology (PT) (Fogg, 2002) will be explored and used to increase motivation for the users to adopt the new behaviors. The research process has been qualitative and has followed the Case Study Process.

This chapter will first introduce the motivation for the thesis, then introduce the problems and the research questions. The method used will be briefly introduced, before the contribution and structure for the rest of the thesis.

1.1 Motivation

Habits start at a point and one would expect that many habits begin in an early stage of life, when people are still adapting to their environment. The more one behavior is repeated, the more likely it is that it will become a habit. The more we repeat a habit, the harder it will be to counteract it. The field of psychology have since early 1900 said that habits develop if they are repeated (Murdock, 1919). According to (Lally et al., 2010) it is registered that people can use up to eight months to change a habit, while others only used days. There is a possible difference — motivation. If the motivation is low, there is harder to change a habit, it is easier if the motivation is high. According to (Fogg, 2012) there is a connection between motivation and the complexity of the desirable behaviors, which will be explained in Chapter 2.1.2.

A design guide on how to create persuasive technology for persuading youths into adapting healthy behaviors could lead to less traffic in the health care system because the health risks can be decreased. For example, a person with a sedentary lifestyle could use such a persuasive application designed to make them less sedentary and as a result decrease their chance of getting problems with their back.

According to research by (Torning and Oinas, 2013) there are several fields that need future research. Persuasive design methods will need research on predictable persuasive designs, and methods for clearer measurement of successful design. There are not many conceptual models or persuasive system design methodologies, empirically proven models would be valuable for the field. Different behaviors might need different design because they should aim at one thing, changing or adapting that particular behavior. This means that many applications may have to be created, and a design guide is a good way of creating a standard for how to create such applications. For example, make young males in an urban environment drive slower with their cars might need a different system than people who need a running application to decrease their chance of a heart disease.

Children and youth have a special propensity for games and show great mental capabilities and great skills to play games. If you train children/youth and give them motivation, they will learn quickly. They normally reach the highest score in games and are the largest and most enthusiastic fans of game activities (Biddiss and Irwin, 2010). Therefore, Gamification can be a key factor of how to persuade youths and it is essential to find the right game mechanics that triggers and keeps the youths using a persuasive application.

By creating a design guide of what functionality and in what order information is given to the user, we are one step closer to achieve the goal of helping youth to make healthy behavioral choices and help them to maintain the behavior.

1.2 Goals and Research Questions

This research seek to persuade youth into changing a behavior from something bad into something better, by introducing them to physical activity with the help of a system. To achieve such a goal, there are some questions that first has to be answered, which are presented in this section. We have to focus on a specific behavior and apply known theories, strategies and techniques on a user group that will perform a case study for generating results. The case study will give us qualitative data which can be used to create a design guide that will help researchers and developers to create persuasive technology for youths. The chosen behavior have to be specific and easily performed by the majority, but still require some amount of motivation. It is expected that not all informants will complete the case.

Goal *Create a design guide, specified to get youths to be persuaded to Gamification healthy behaviors for a period.*

To reach our research goal, we have to answer some essential questions, which are:

Research Question 1 (RQ1) *How can we use Gamification and persuasive technology to persuade youths to be physical active for a period?*

There has been done a lot of studies on Gamification and persuasive technology with the aim to make people more physically active. But in Fogg Behavior Grid 2.1.4 there is one type of behavior which needs more research, namely the *Blue Span* behavior (Fogg and Hreha, 2010). This is a behavior the participant have done before that is carried out for a period, such as taking push-ups every day for thirty days.

Research Question 2 (RQ2) *How can Gamification and persuasive technology be used to keep youths using an application for a period?*

We would like to find out what Gamification mechanics and what strategies from the field of persuasive technology that have to be applied for persuading youths for a period of time. Again, this is a blue span behavior and is a suggested method on how to start creating a habit (Fogg and Hreha, 2010). The idea behind Gamification is to create an innovative approach to foster motivation within youths because the majority of youths have a big interest in games.

This research question in comparison to RQ1, seek to find an answer on how to keep the users interested in an application with the use of Gamification, contra how to use Gamification to make youth perform a physical activity.

1.3 Research Method

A conceptual framework will be used as research method, with background from literature on PT, Gamification and different psychological theories and strategies on Behavior Change (BC).

Case studies will be used as a research strategy, where the case is a set of students trying to achieve a BC with the help of an Android application designed for a specific goal, taking push-ups every day for two months. Interviews and questionnaires will be used as data collection method. Quantitative data analysis will be used to collect statistics on which approaches within Information and Communications Technology (ICT) that could have an effect on the BC.

A conclusion will be made, and a concept will be created based on the results from the data analysis. Figure 1.1 shows the development of the conceptual framework, and will be explained in section 4.1.

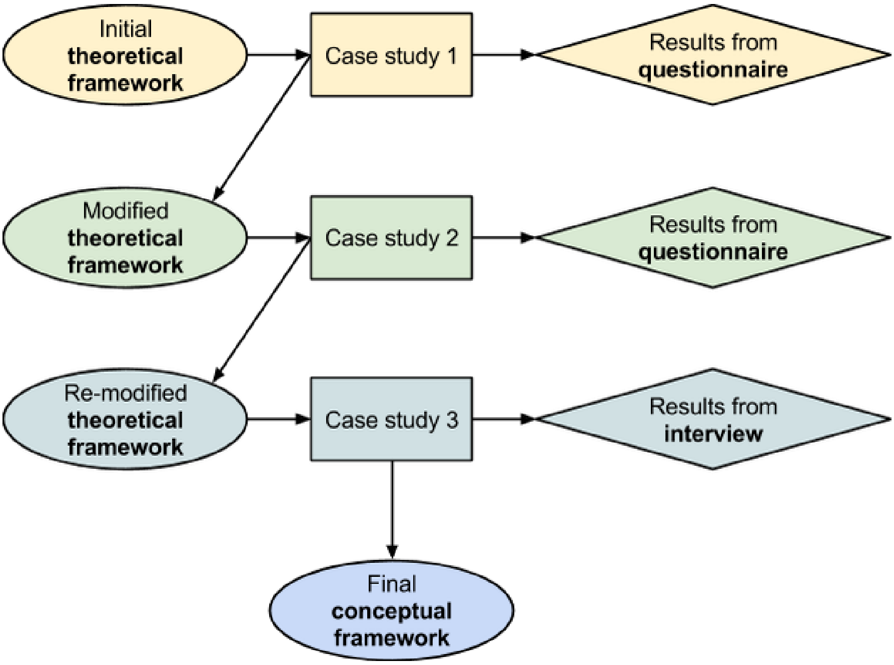
Initial **theoretical framework**
Case study 1
Results from **questionnaire**
Modified **theoretical framework**
Case study 2
Results from **questionnaire**
Re-modified **theoretical framework**
Case study 3
Results from **interview**
Final **conceptual framework**

Figure 1.1: Development of the conceptual framework

The reason for choosing conceptual framework as method and case study as the strategy was because the problems have psychological aspects in them, which requires to study participants and their behavioral outcomes.

1.4 Contributions

The plan for this research is to contribute with new or improved theory on how to use technology to change a behavior of youth for a period. This is because of the lack of existing theories (Fogg and Hreha, 2010) on certain types of BC, namely the BlueSpan behaviors. By answering the research questions, we are one step closer achieving behavior change with the use of PT and Gamification among youth.

1.5 Structure of the Report

In Chapter 2 the background theory will be presented, and the related work will be described in Chapter 3. Chapter 4 describes the research method and research strategy while the next Chapter 5 presents the results. The design guide created from the results will be presented in Chapter 6 and discussion on the research will be presented in Chapter 7. The last Chapter 8 describes the contribution, conclusion and future work.

Chapter 2

Background Theory

This chapter will describe the background theory in different fields which is necessary to meet our research goal and to answer our research questions.

The first section introduces the persuasive technology and focuses mostly on theories from B.J. Fogg, which is the leading researcher in this field. Section 2.2 describes Gamification mechanics and how we can use Gamification in a health-related context. Section 2.3 presents different theories on behavior change and how we can achieve it.

2.1 Persuasive Technology

Technology has in recent years been used in pursuit of persuading people and motivating them towards various individually and collectively beneficial behaviors. PT[1] (Fogg, 2002), (Oinas-Kukkonen, 2013), (Oinas-Kukkonen, 2009), (Hamari et al., 2014a), and Gamification (Huotari and Hamari, 2012), (Deterding et al., 2011), (Hamari, 2010), are the two dominant approaches for this. The former is a longer-established approach where there exists more literature (Hamari et al., 2014b), and Gamification are a more recent approach and increasing in popularity.

It is important to note that persuasion is associated with rhetoric, a singular perspective that might or might not be correct. In other words, rhetoric techniques are effective persuasive elements, which may help to circumvent rational thinking (Atkinson, 2006).

Persuasive Technology (PT) is the study of how technology can be used to change behaviors or attitudes of people through persuasion and social influence (Fogg, 2002), (Oinas-Kukkonen, 2009), (Fogg, 1998), (Hamari, 2013). There have been done a lot of previous work within PT and a recent paper (Hamari et al., 2014a) reviews 95 studies on empirical research on PT. The paper categorizes the reported results into “positive”, “partially positive” and “negative or other” results. Within these categories, the resulted papers are sorted in “quantitative” and “qualitative” types of studies, and “mixed methods”. We will focus on the “positive” and “qualitative” types of studies, as they are relevant to this research. One issue that is discussed in (Hamari et al., 2014a) is that it seems that PT’s are implemented in a context where people are willing to undertake the target activities but find it difficult to start or continue working toward them. Among these were healthy habits.

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[1] Captology or "computers as persuasive technology" is also often used instead of PT

It remains unclear what the actual empirical studies have investigated as persuasive stimuli, psychological mediators/outcomes, and behavioral outcomes. As a consequence, there is still a dearth of coherent understanding of the field of PT in respect to these research outcomes. The qualitative studies reviewed in (Hamari et al., 2014a) mainly consisted of questionnaires and interviews carried out with users of the implementation, which can be used as documents for the data collection in this research. The psychological mediators (outcomes) studies in the reviewed papers mainly aimed at a design that increases engagement, encouragement and motivation through persuasion. Studies also researched PT to increase user’s awareness of health. Studies also had negative attributes of the PT’s, which can be used to prevent the same type of failure in this research. Some of those negative results were psychological outcomes as frustration (Albaina et al., 2009), cognitive overload (Baylor and Kim, 2009), anxiety (Chittaro and Zangrando, 2010), perceived amateur (Fogg et al., 2001), peer pressure (Parmar et al., 2008), the threat to personal autonomy (Roubroeks et al., 2010), and feelings of guilt from neglecting the behavior one is being persuaded to perform (Thieme et al., 2012). In overall, the results from the reviewed papers are shown in Table 2.1.

Another study which is related to PT, is the study of *Captology*, which is the study of computers as PT (Fogg, 2002). This includes the design, research and analysis of interactive computing products created for BC. Unlike PT — which can be a digital bracelet that vibrates every time one should take a medicine — Captology is an overlap between persuasion/behavior change and computer technology, like software.

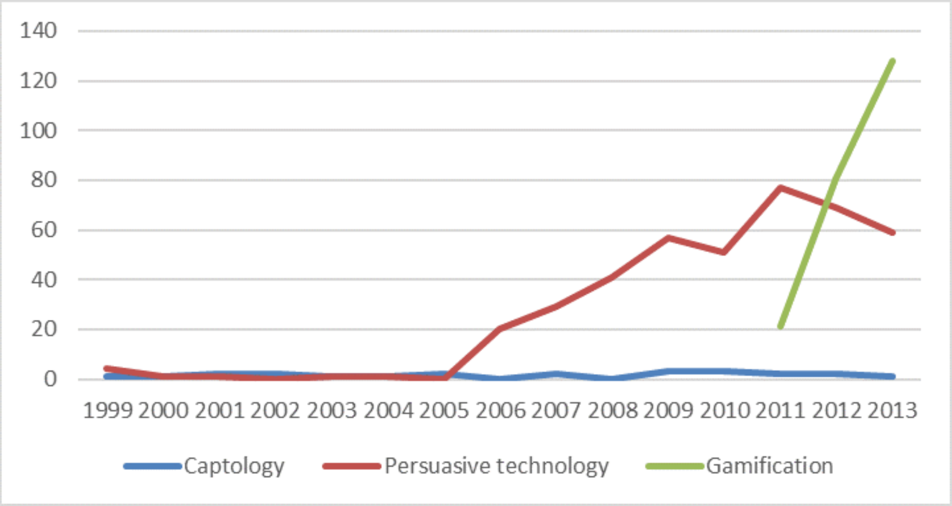
While PT focus on social persuasion, communicative persuasion and behavior (or attitude) change, we have a third study that is closely related, namely *Gamification*. Gamification focuses more around invoking person’s intrinsic (motivation) through gameful experiences and affordances (Hamari and Koivisto, 2013). More on Gamification is described in Section 2.2.

In Figure 2.1 we see the comparison of search results from the article (Hamari et al., 2014a) that PT and Gamification are popular studies, while Captology is not so popular. Because Captology have little background and research compared to the others, it will not be much focused on in this thesis.

Important aspects with PT and Gamification is whether the encouraged activity

Table 2.1: Domains of target behaviors. The numbers are the amount of studies reviewed in (Hamari et al., 2014a).

	Studies with results that were		
	Positive	*Partially positive*	*Negative*
Health, exercise	25	17	3
Ecological consumption and/or behavior	11	8	1
Education, learning	5	4	1
Econimic, commercial, marketing	2	3	1
Security, safety	4	2	0
Entertainment	2	0	0



Hamari, J., Koivisto, J., & Pakkanen, T. (2014). Do Persuasive Technologies Persuade? – A Review of Empirical Studies. In: Spagnolli, A. et al. (Eds.), PERSUASIVE 2014, LNCS 8462, pp. 118-136. Springer International Publishing, Switzerland.

Figure 2.1: Search result from (Hamari et al., 2014a)

is something the user is trying to accomplish, or if the user is persuaded towards a behavior that is valuable for the designer of the system.

One of the leading researchers within PT is Dr. B. J. Fogg, which have done much work in the field. He directs the Persuasive Tech Lab at Standford University and is a psychologist and innovator. His work empowers people to think clearly about the psychology of persuasion and has created a new model of human BC, which guides research and design. His students have created Facebook Apps, which motivated over 16 million user-installations in 10 weeks. Many of his strategies, taxonomies and theories will be used in this thesis and can be read about in the following sections: *Fogg's Behavior Model* 2.1.1, *Fogg's Functional Triad* 2.1.3, *Fogg's Motivation Wave* 2.1.2, and *Fogg's Behavior Grid* 2.1.4.

2.1.1 Fogg's Behavior Model

The Fogg Behavior Model (FBM) (Fogg, 2009a) shows that three elements must meet at the same time, for a behavior to occur, namely *Motivation, Ability*, and *Trigger*. In other words, if a behavior does not occur, at least one of those three elements are absent. The FBM is designed as a guide to help designers and researchers to identify what stops people from performing behaviors that is intended. The three principal elements in the FBM outlines three core motivators (Motivation), six simplicity factors (Ability) and three type of triggers (Triggers). The core motivators are shown in Table 2.2, the six components of ability is listed in Table 2.3, and the three types of triggers are shown in Table 2.4.

Table 2.2: The three core motivators with a description of them

Pleasure/Pain	A primitive response which functions adaptively in hunger, sex, and other related activities to self-prevention and propagation of our genes.
Hope/Fear	The anticipation of an outcome, something good or bad. Hope is considered the most ethical core motivator.
Social Acceptance/ Rejection	People can get motivated by doing things to win social acceptance, or by avoiding being socially rejected.

Table 2.3: Table with the six components of ability

Time	The target behavior requires time, which we do not have. This makes the behavior not simple.
Money	People can have limited financial resources, and a target behavior like golf is costly, so the behavior is not easy to do. There is often a trade-off between time and money.
Physical Effort	A behavior that require physical effort might not be simple. Your behavior might be to go to jazz concerts every Friday, but the nearest bus-stop is 3km away.
Brain Cycles	The behavior requires to think hard, but you are exhausted after work. This can be your new behavior of going to chess clubs after 10 hours of hard thinking-work.
Social Deviance	This is behaviors that are breaking the norms, like going in pajamas to work, because it is good for your health condition.
Non-routine	It is easier to do routines. If you normally buy gasoline at the same station, it is easier to continue doing it, even if it is more expensive.

Table 2.4: The three types of triggers

Spark as Trigger	When a person lacks motivation to perform a target behavior, a trigger should be designed in tandem with a motivational element. For example a text that highlights fear, or a video that inspire hope.
Facilitator as Trigger	Appropriate for users that have high motivation but lack of ability. The idea is to make the ability easier to do, like a questionnaire “it only takes two minutes”.
Signal as Trigger	A reminder that tells you what to do. You have the ability and the motivation, so a facilitator or signal is not necessary, but they can be either annoying or condescending.

In addition to the three types of triggers, we have *hot triggers* and *cold triggers.* The hot triggers are triggers for things you can do right now, like checking your Facebook status, what time it is, and checking your email. The cold triggers are for things you cannot do right now, like drinking milk because you saw a milk-advertisement on the bus-stop.

It is not only about the motivation for the study of PT first assumed, but about the triggers, ability and the motivation to do it (Fogg, 2009a). He also says that it is not about motivating behavior change, but rather facilitate behavior change. These are the three elements of the Fogg Behavior Model and have a prioritized order of applicability. If a user is not performing the targeted behavior, the first thing to modify is the triggers. If the user is still not doing the behavior we have to modify the next element, ability. The last element to encounter is the motivation.

2.1.2 Fogg's Motivation Wave

The Motivation Wave is a concept that shows the correlation between ability and motivation (Fogg, B. J., 2012b). An action line is separating whether a behavior will be performed or not, depending on the motivation and the ability to do it for an user. Peoples motivation are sometimes low and have a peak of high motivation other times, in other words, continuously changing. That means that people sometimes have a temporarily opportunity to do hard behaviors, and other times they have so low motivation to do even the simplest behavior. The trick is here to help people succeed on the most desirable health behavior that matches their current motivation. *Most desirable health behaviors* can be beneficial habits, structured behaviors, positive change in the environment, fitting to the moment. This is different among people. One of the factors in the BC model is the motivational factor. If the motivation is high, you can do harder things like exercising two hours a day. If the motivation is low, you can do easier things like go out with the garbage. If you do not know about the motivation of people, you have to make the target behavior easy to do in the beginning, and increase it over time, like beginning with a 10 minutes jog once a week, then increase the length after a month. The motivational wave is illustrated in Figure 2.2. Here you see that a behavior that require lots of motivation have to be easy to do, while a behavior which require low amount of motivation can be harder to do. Examples of behavior are blue dot behaviors which can be structured behaviors with small steps. These behaviors are easy to do and therefore does not require much motivation. They can always be performed.

A question is how we can exploit the users motivation when it is naturally high. According to (Fogg, B. J., 2012b), there are three priorities for action on how to help people succeed in their behaviors. First priority is that you should do hard things that structure the future behavior once your motivation is high. This is to make it difficult to avoid the behavior later. For example, if you are motivated to exercise everyday, hire a personal trainer and make her come to your home every day, this way it is harder to avoid doing the training. Another example is to make an appointment with your friends or colleagues to hit the gym.

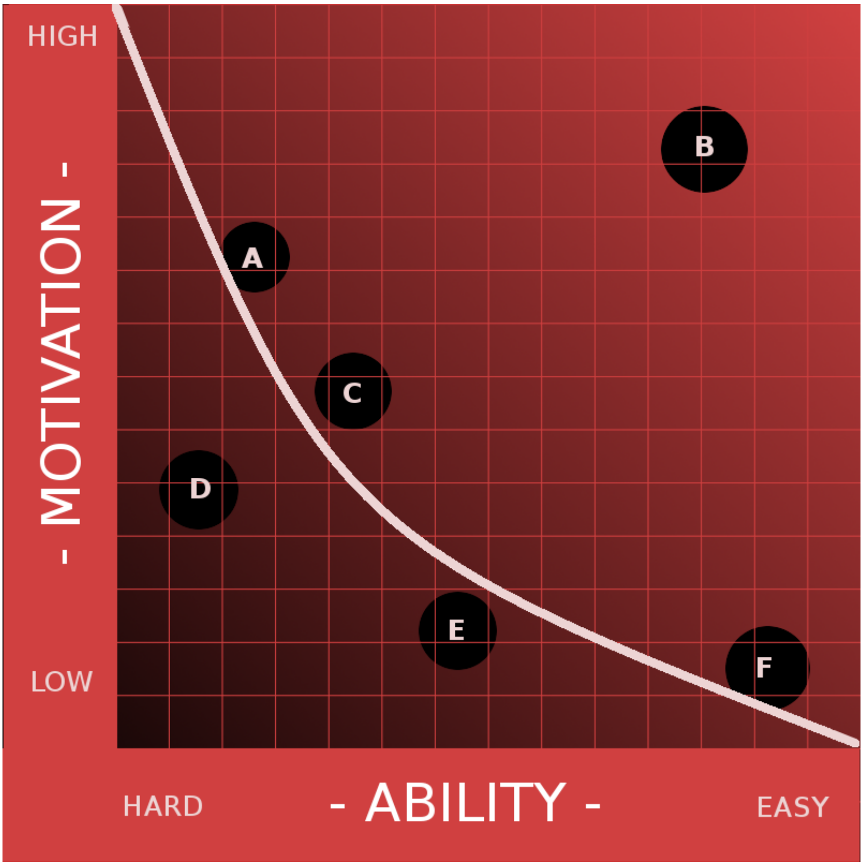


Figure 2.2: Fogg's Motivation Wave. The letters represent behaviors, where D and E are behaviors which will not be done, because they require too much motivation and is at the same time too complex to perform. This is a motivation wave for a fictive person, where the white line is the limit for the co-relation between motivation and ability for this fictive person. Behavior A, C, F and B are all behaviors which the fictive person can perform 'right now', because they are on the outer side of the white line. F is a BlueDot behavior, because it requires low motivation and is easy to do.

The second priority is to do hard things that reduce barriers to behavior. For example, when your motivation is high, buy vegetables, cut them in peaces and put them in boxes placed easily available in the fridge. When your motivation is low, it is easier to eat them because they are present.

The third priority is to do hard things that increase people's capability. When you want to learn a new cooking recipe, it can be hard in the beginning, but your motivation is high so you do it. The next time you want to make the same recipe, it is easier to do because you have done it before.

2.1.3 Fogg's Functional Triad

Fogg proposed the *Functional Triad* as a classification of three basic ways that people view or respond to computer technology. PT can function as tools, media or social actors or in a combination (Fogg, 2002).

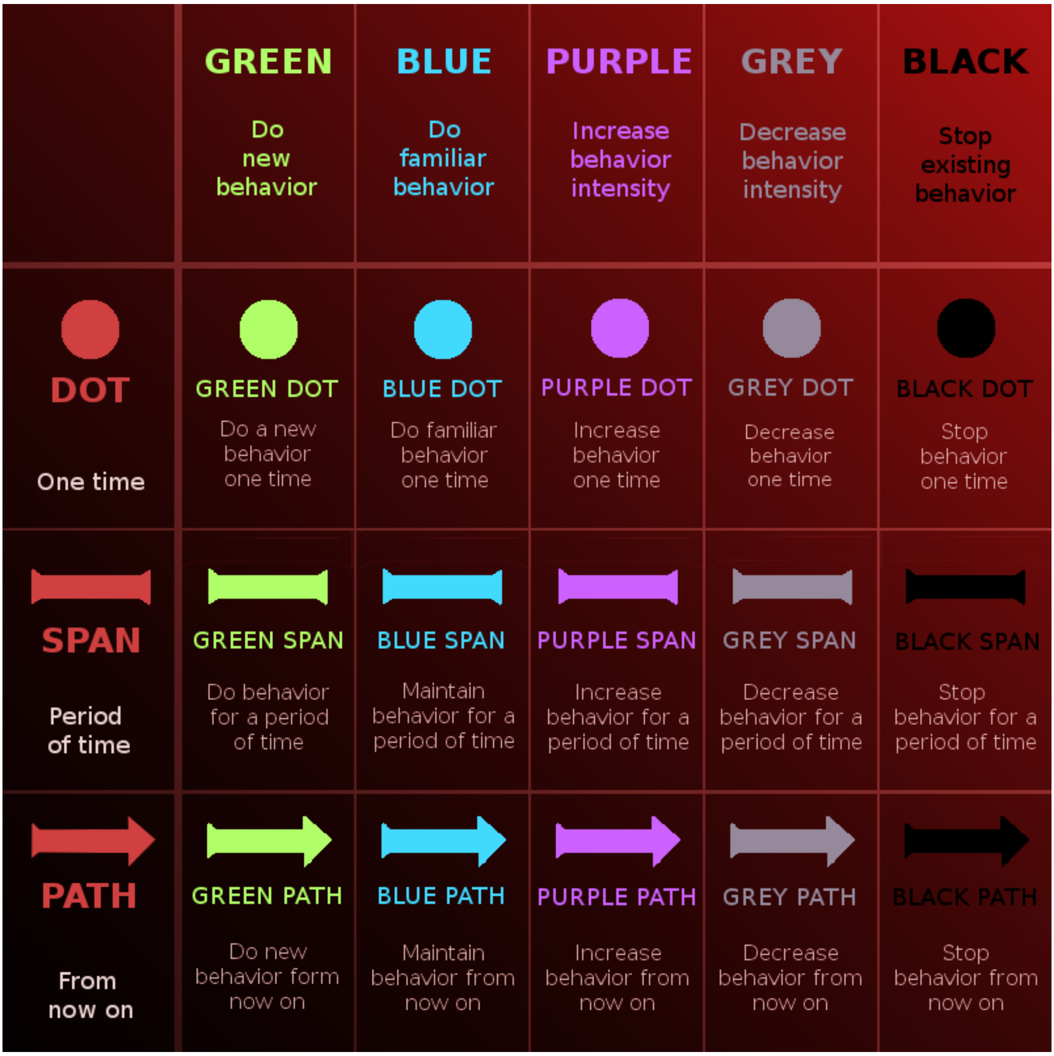
PT as a tool, means that it makes the target behavior easier to do. There are many ways of doing this, but a good practice is to help leading the users through a process and performing calculations or measurements that are motivating. PT as media means that it should allow users to explore cause-and effect relationships by providing them with experience that motivate. PT as social actor are when interactive technologies reward people with positive feedback or act as a social cue to give responses for example through their use of language. They are modeling a target behavior or attitude and provides social support. A paper (Atkinson, 2006) criticize Fogg's article on PT. Atkinson says that computers are not subjects, they are objects, and therefore cannot persuade on their own, but machines that perform their designers' intent.

2.1.4 Fogg's Behavior Grid

(Fogg and Hreha, 2010) have designed a behavior grid that describes 15 ways that behavior can change, where each behavior type uses different psychological strategies and persuasive techniques. This grid is illustrated in Figure 2.3.

Each type of behavior have their set of triggers that leads to performing the behavior, and relevant theories and techniques that can be applied. Some types of behavior also have the same triggers (Fogg and Hreha, 2010). In the rows we have *Dot*, *Span* and *Path* where dotted behaviors are behaviors performed one time. The Spanned behaviors has a specific time duration, that can range from one week to months (the limit are individual). The Path behavior is a permanent change, and is a behavior we do from now on, like quit smoking forever. The columns represent five different ways of BC. Green behavior means that you perform a new behavior, one that is unfamiliar. A Blue behavior is a known behavior. A purple behavior is one you want to increase the intensity or duration of, and a Gray behavior is one you want to decrease the intensity or duration of. At last we have the Black behavior which represent that you want to stop doing a behavior.

Figure 2.3: Fogg's Behavior Grid defines 15 types of behavior change.



	GREEN Do new behavior	BLUE Do familiar behavior	PURPLE Increase behavior intensity	GREY Decrease behavior intensity	BLACK Stop existing behavior
DOT One time	GREEN DOT Do a new behavior one time	BLUE DOT Do familiar behavior one time	PURPLE DOT Increase behavior one time	GREY DOT Decrease behavior one time	BLACK DOT Stop behavior one time
SPAN Period of time	GREEN SPAN Do behavior for a period of time	BLUE SPAN Maintain behavior for a period of time	PURPLE SPAN Increase behavior for a period of time	GREY SPAN Decrease behavior for a period of time	BLACK SPAN Stop behavior for a period of time
PATH From now on	GREEN PATH Do new behavior form now on	BLUE PATH Maintain behavior from now on	PURPLE PATH Increase behavior from now on	GREY PATH Decrease behavior from now on	BLACK PATH Stop behavior from now on

Research published in previous PT conferences have been organized by behavior types by (Fogg and Hreha, 2010). We see here that most research have been done on the path behaviors. There is no mapping of research in BlackDot behavior and few studies in BlueSpan and GraySpan behaviors. The Behavior Wizard is a guide for for how to select the right behavior type in the Behavior Grid. This is done by asking some simple control questions. Based on your answer a behavior type like e.g. BlueDot behavior is recommended. It is important to note that the Behavior Wizard only provides a common approach to categorizing behavior, but it gives an deeper understanding and overview of the patterns in BC (Fogg and Hreha, 2010). Fogg also states that this is not a complete or perfect grid, but a good draw for further research. The grid and parts of the wizard will be used in this work as a guideline. It is not guaranteed that it will work.

2.1.5 Fogg Method

Fogg's Method is a three step process on how to change a behavior. The steps are based on the Fogg Behavior Model by taking the elements from the FBM with precaution. This means that you don't try to find out where the bottleneck is when a person is not performing a behavior, but you make sure from the start that the person will perform the behavior by asking the following questions (called steps):

Step 1: Get specific What behavior do you want? Translate target outcomes and goals into behaviors, and be specific.

Step 2: Make it easy How can you make the behavior easy to do? Simplicity changes behavior.

Step 3: Trigger the behavior What will prompt the behavior? Some triggers are natural, while others must be designed. No behavior happens without a trigger.

2.2 Gamification

Gamification is to make a system more game-based by introducing aesthetics and game-thinking to engage people, motivate action and solve problems. Gamification can take many forms like competition based mechanics for making two users compete towards some goal (Byron Reeves, 2013), making a jogging session into an interactive story or embedding a scoring-system into an existing system. Other techniques as introducing achievement, badges or levels (Hamari and Eranti, 2011) and progress-bars to show progress (O'Brien, 2010) are also popular approaches.

The paper (Hamari et al., 2014b) reviews peer-reviewed empirical studies on Gamification, where the literature review covers the results, *independent variables* and *dependent variables*, the context of Gamification and the types of studies that performed Gamification (Hamari et al., 2014b). The independent variables examined motivational affordances, while the dependent variables examined psychological and behavioral outcomes from Gamification.

There have been mapped some elements of Gamification (Palmer et al., 2012) which is applicable for health-related solutions. These are:

Progress path The tasks and objectives have to be concise, and the rules must be clear and fundamental. The degree of complexity or difficulty of the objectives can increase over time, so it is easier for new users and harder for the more experienced ones.

Feedback and reward You need feedback and rapid rewards like badges, points or statues. They must occur at the right time and represents success, which are important for motivation.

Social connection When connected with internet social networks, mobile applications or other types of connection with other users. They support communication, interaction and support from other players.

Interface and user experience The users have their expectations, and this need to be followed, whether it is cross-platform integration, mobility support, usability or fun.

Other popular game mechanics, like the ones from badgeville [2] are the following: *Achievements*, *Appointments*, *Behavioral momentum*, *Blissful productivity*, *Bonuses*, *Combos*, *Cascading information theory*, *Community collaboration*, *Countdown*, *Discovery*, *Epic meaning*, *Free lunch*, *Infinite gameplay*, *Levels*, *Lottery*, *Ownership*, *Progression*, *Quests*, *Reward Schedules*, *Status*, *Urgent optimism*, and *Virality.*

2.2.1 Health-Related Contexts

According to (Pedro et al., 2014) Gamification strategies are becoming frequent in health-related contexts, which can help individuals to adopt healthy life habits like weight control, eating habits, exercise, smoking, hand hygiene and much more. Gamification can be used to help people to make sound decisions which are beneficial for their health and wellness.

Children and youth have a special propensity for games and show great mental capabilities and great skills to play games. If you train children/youth and give them motivation, they will learn quickly. They normally reach the highest score in games and are the largest and most enthusiastic fans of game activities (Biddiss and Irwin, 2010).

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[2] Badgeville: `https://badgeville.com/wiki/Game_Mechanics`

2.3 Behavior Change

First off, we have to make sure we know the difference between a behavior and a habit. A behavior is the actions of a living being or a system in response to the environment. A habit, is on the other hand a routine of behavior. While behaviors can be made conscious, the habits occurs subconsciously. So, in other words, a habit is a behavior repeated so many times, that you do it by automation, like tying your shoelaces, brushing your teeth, or walk with your feet instead of your arms.

A BC for an individual can be thought of as "interventionists" whose goal is to design and implement programs (not computer programs but psychological programs) or interventions that produce the desired behavioral changes (Glanz, K., Lewis, F. M., & Rimers, B. K., 2008). There are three major models of behavioral change, namely: *Social Cognitive Theory* 2.3.1, *Theory of Planned Behavior* 2.3.2, and *Transtheoretical Model* 2.3.3.

2.3.1 Social Cognitive Theory

Social Cognitive Theory (SCT) is a theory developed by Albert Bandura (Bandura, 1986). It states that learning occurs in a social context with dynamic reciprocal interaction of the person, environment and behavior. Several constructs have been developed as part of the SCT (Boston University School of Public Health, 2013a).

SCT suggests that individuals are driven by external factors and not inner forces. This model proposes that human functioning can be explained by a triadic interaction of behavior, personal and environmental factors (Bandura, 1988). Figure 2.4 shows this triadic interaction.

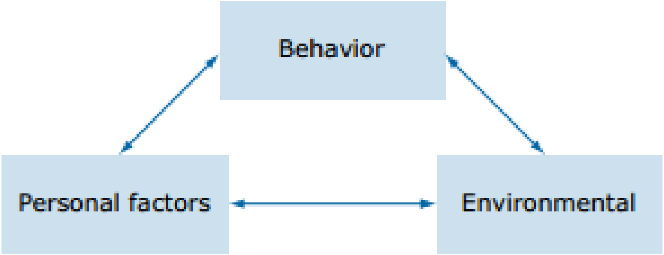

Figure 2.4: Triadic reciprocal causation

Environmental factors represent the situational influences and environment where behavior is performed. Personal factors includes instincts, drives, traits and other individual motivational forces.

However, there are limitation of SCT, that should be considered when using this theory in public health. The theory assumes that the changes in the environment will lead to changes in the person, which might not always be true. It focuses on the processes of learning, and avoids the biological and hormonal predispositions that can have an influence on the behaviors. It does not focus on motivation or emotions, other than through past experiences.

1. **Reciprocal Determinism** Reciprocal determinism is a theory explained by the psychologist Albert Bandura which says that a person's behavior both influences and is influenced by personal factors and the social environment (Bandura, 1989). This is a central concept of social cognitive theory. Bandura says that an individual's behavior is conditioned through the use of consequences, and that personal factors such as cognitive skills or attitudes can have an impact on the environment. Research shows that patients with a doctor-patient relationship tend to be more passive in their decision making, and relies on their doctor to make their choices for them. While self-reliant people takes a more active role in deciding which health options would suit them better (Makoul, 1998), (Boston University School of Public Health, 2013a).

2. **Behavioral Capability** This refers to an individual's actually ability to perform a behavior through essential knowledge and skills. In other words, a person need to know what to do and how to do it. This is learned from the consequences of their behaviors, which also affects the environment in which they live (Boston University School of Public Health, 2013a).

3. **Observational Learning** People can observe and witness a behavior of another person and reproduce those actions. If a person see a successful demonstration of a behavior, they can also complete this successfully (Boston University School of Public Health, 2013a).

4. **Reinforcements** A persons internal or external responses to a behavior that affects the likelihood of continuing or canceling a behavior. Reinforcement can be self-initiated or come from the environment, and can be positive or negative. This is the construct of SCT that is closest to the reciprocal relationship between behavior and environment (Boston University School of Public Health, 2013a).

5. **Expectations** This construct refers to the expected consequences of a person's behavior. The outcome expectation can be health-related. An expectation derive often from a previous experience (Boston University School of Public Health, 2013a).

6. **Self-efficacy** When it comes to self-efficacy, research shows that reciprocal determinism may not be the appropriate model in all cultures, but does in most. Self-efficacy is an assessment of an individuals competence to perform a specific task. Self-efficacy results from success or failures in attempt to learn a task. Bandura defines this as a person's belief/confidence in their capability to successfully perform a behavior certain task (Bandura, 1989), (Boston University School of Public Health, 2013a).

2.3.2 Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is a theory concerning the relation between beliefs and behavior. It is a concept proposed by Icek Ajzen to improve the theory of reasoned action by including perceived behavioral control (Ajzen, 1991). This theory have been applied to studies of the relations between beliefs, attitudes, behavioral intentions and behaviors in fields like healthcare.

In addition to be an improvement of reasoned action, the theory of planned behavior adds the concept of *perceived behavioral control* which have its origin in the self-efficacy theory by Banura (Bandura, 1977).

The TPB is a theory to predict and explain a wide range of health behaviors and intentions, which includes smoking, drinking, health services utilization, breast-feeding, substance use, etc. (Boston University School of Public Health, 2013b). It is dependent on the motivation factor and the ability (behavioral control) of the individuals, and distinguishes between three types of beliefs, namely: behavioral, normative and control. See Figure 2.5.

1. **Attitudes** This is the degree to which a person has a favorable evaluation of the behavior of interest or unfavorable (Boston University School of Public Health, 2013b).
2. **Behavioral Intention** The motivational factors that influence a behavior where the stronger the intention to perform this behavior, the more likely the behavior will be performed (Boston University School of Public Health, 2013b).
3. **Subjective Norms** An individual's beliefs about whether people of importance to the individual thinks he or she should engage in the behavior (Boston University School of Public Health, 2013b).
4. **Social Norms** This construct is about the behaviors in a group of people or in a larger culture. It is considered normative or as a standard in a group of people (Boston University School of Public Health, 2013b).
5. **Perceived Power** "*This refers to the perceived presence of factors that may facilitate or impede performance of a behavior. Perceived power contributes to a person's perceived behavioral control over each those factors*" - Boston University School of Public Health (2013b).
6. **Perceived Behavioral Control** The persons perception of the ease or difficulty of performing a behavior (Boston University School of Public Health, 2013b).

Regardless of the intention, this theory assumes that a person has acquired the opportunities and resources to successfully performing a desired behavior. Another limitation is that it excludes variables as fear, threat, mood or past experience (Boston University School of Public Health, 2013b).

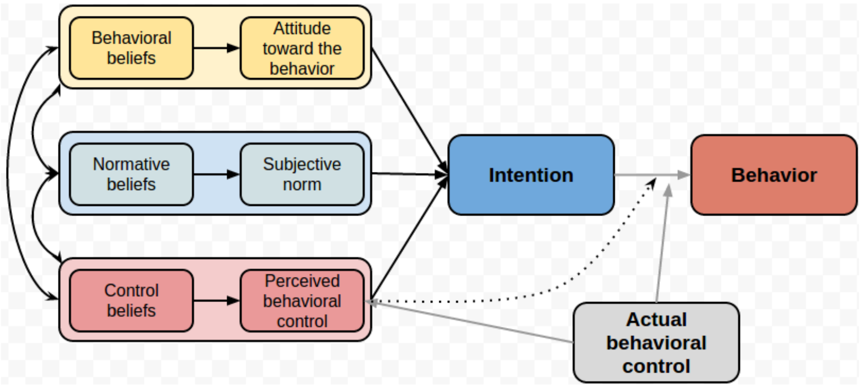

Figure 2.5: Theory of Planned Behavior

2.3.3 Transtheoretical Model

The Transtheoretical Model (TTM), also known as the Stages of Change Model, was developed by Prochaska and DiClemente (Boston University School of Public Health, 2013c), (James O. Prochaska, 1994) who examined why some smokers were capable of quitting on their own. TTM focuses on the decision-making of the people who intentionally trying to change a behavior. TTM is not a theory but a model, which means that different behavioral theories can be applied to different stages in the model where they may be most effective (Boston University School of Public Health, 2013c). The model consists of six stages of change, namely *pre-contemplation, contemplation, preparation, action, maintenance,* and *termination* (James O. Prochaska, Colleen A. Redding, Kerry E. Evers, 2008) as shown in Figure 2.6. The last stage is less used in health-related behaviors. The idea is to use effective strategies (e.g. behavioral theories) at each step, where the most effective strategies is used at each step to move a person to the next stage.

Pre-contemplation

The pre-contemplation phase is where the user has no intention of taking any action in the near future. They might be unaware that their behavior is a problem and produces negative consequences. They underestimate the pros and thinks too much about the cons of changing the behavior. A characteristic is that the user is not considering any changes. Techniques to use with the users:

- Validate the user's lack of readiness.
- Clarify that the decision is theirs.
- Encourage the user to re-evaluate their current behavior.
- Encourage the user to self-exploration and not action
- Explain and personalize the risk

Contemplation

The user is beginning to recognize the problems with their behavior, and starts to look at the pros and cons of their continued actions. They are not considering any change yet, and the techniques to apply on the users are:

- Validate the lack of readiness
- Clarify that the decision is theirs
- Encourage the users to evaluate the pros and cons of behavior change
- Identify and promote the new, positive outcome expectations

Preparation

The preparation stage is where the people do have an intention to take action within the near future, and they realize that their behavior can be a problem. They might take small steps toward behavior change. Techniques to apply are:

- Identify and assist in problem solving
- Help the patient identify social support
- Verify that the patient has underlying skills for the behavior change
- Encourage the user to take small initial steps

Action

This stage is where the user have recently changed their behavior, and intend to keep going with the behavior. Characteristics is that the user have been practicing the behavior for 3-6 months. Techniques:

- Focus on restructuring cues and social support
- Bolster self-efficacy for dealing with obstacles
- Combat feelings of loss and reiterate long-term benefits

Maintenance

The users have sustained their behavior change for a while, and intend to maintain the behavior change. They will now try to prevent a relapse.

- Plan for follow-up support
- Reinforce the internal rewards
- Discuss coping with relapse

Relapse

Users have no desire in return to their unhealthy behavior, and will not relapse. This stage is not often considered in health promotion programs, because people tend to stay in the maintenance stage. Techniques to use on users:

- Evaluate trigger for relapse
- Reassess motivation and barriers
- Plan stronger coping strategies

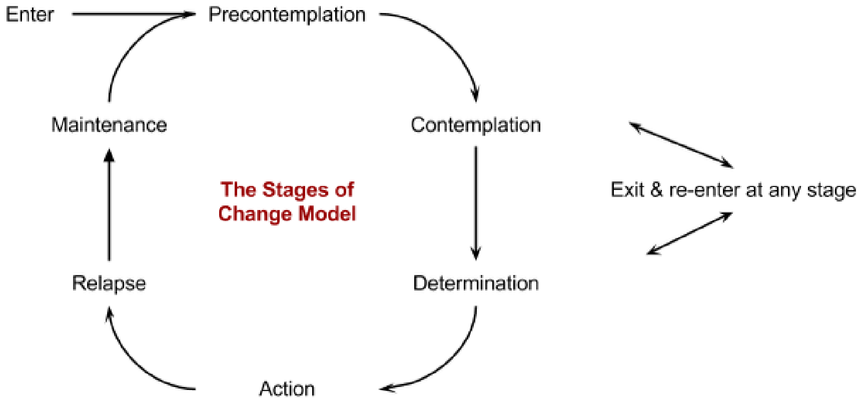

Figure 2.6: The Transtheoretical Model

The limitations of TTM that should be considered when using this model in public health, is that it ignores the social context in which change occurs. The time needed for each step is also different from people. The model also assumes that people make logical and coherent plans in their process of decision-making, which is not always true.

2.3.4 A Behavior Change Taxonomy

(Abraham and Michie, 2008) developed 26 standardized definitions of BC techniques used in interventions. (Michie et al., 2011) took the taxonomy of (Abraham and Michie, 2008) further by showing the importance of further systematic and rigorous development. They defines a CALO-RE taxonomy which is more comprehensive, with fewer conceptual problems and less overlap between items. There has also been created an extended taxonomy of 40 definition(Michie et al., 2011). This paper also recommend researchers and those translating evidence into practice, to use the CALO-RE taxonomy to specify behavior change interventions aimed at increasing physical activity and healthy eating.

(Lepri et al., 2012) focuses on inducing behavioral change via computer systems that can analyze human behavior and communicate persuasive messages accordingly. The paper (Lepri et al., 2012) provides a framework for assessing the impact of social factors on such applications and discusses the role of social mediation of behaviors and attitudes.

2.3.5 Competition

Previous work suggests that social and competitive interaction with social media can be used to motivate behavioral change (Foster et al., 2010). In the work of (Foster et al., 2010), they found that technology can be used as triggers in BC, such as reminders. They used a simple mobile device, a digital pedometer and a social application to improve physical health in the workplace environment. The reminders engaged the participants in social competitive activity. Even the readings on the pedometer could function as a trigger for social pressure from the competitive social network application.

Social comparison is an important source of competitive behavior, where people have the tendency to self-evaluate by comparing themselves to others (Garcia et al., 2014). The social comparison theory says that actors (individuals) are driven by wanting to improve their performance and minimize the deviation between the actors and the opponents (targets) (Garcia et al., 2014). This is a unidirectional push to do better and better. The social comparison model of competition have two important factors — individual and situational factors — which are capable of increasing competitiveness. The individual factors are those who distinguish between personal differences, and relational differences like similarity and closeness that refer to the actor's perception of their relationship to the target (individual). The *dimension* can be sports, income or academics, and is the thing we compete at. Literature says that there are three variables that increase comparison concerns *Festinger, 1954; Goethals and Darley, 1977; J. Suls and Wheeler, 2000; Tesser, 1999.* Those are *relevance* which is the relevance of the performance dimension, *similarity* which is the degree of the actor's similarity to the target, and the *closeness* which is the degree of the actor's relationship closeness to the target. So in other words, competitive behavior occurs when actors recognizes similarities and the possibility of winning over a target.

The situational factors concern the actors' perception of the environment around them, that can exert a more universal effect on comparably situated actors (Garcia et al., 2014). They are the *incentive structures, proximity to a standard, number of competitors* and *social category fault lines.* "Incentive Structures" are the things that motivate us; "Proximity to a Standard" is a standard for comparison such as the number one ranking or other thresholds. The "Number of Competitors" are the number of competitors to compare against. The "Social Category Fault Lines" are the social categories such as "Americans vs the French".

2.3.6 Behavioral Intervention Technologies

Behavioral intervention technologies (BITs) are web-based and mobile interventions intended to support users in changing behaviors related to health, mental health, and well-being (Schueller et al., 2013). To make BITs useful, they require thoughtful design and consideration of the trade-offs that is associated with the technology used. Unlike the traditional face-to-face therapy where one hour session with one patient is "used up" as it no longer can help another person, and a nicotine patch that is discarded after one time use, BITs can potentially be non-consumable.

BITs can be made to support multiple languages and use different psychological theories based on the different cultures supported (Schueller et al., 2013). Other benefits of BITs is the potential use of crowd-source *cognitive reappraisals* (Morris and Picard, 2012).

Schueller et al. (2013) describes the challenges of successfully using BIT. An important challenge is to ensure that BITs accurately collects and provide relevant data, because people may be discouraged if their efforts at BC are not captured and acknowledged (Consolvo et al., 2009).

Skeuomorphism is an ornamental version of something that in a previous product, was a necessity. An example of this is the fake shutter sound in a digital camera, the "save" button that looks like a floppy disk, or a "folder" that looks like a paper folder. This principle can be used in terms of psychology as well, where you for example have "sessions" for weekly use.

Chapter 3

Related Work

This chapter briefly describes related work in this thesis.

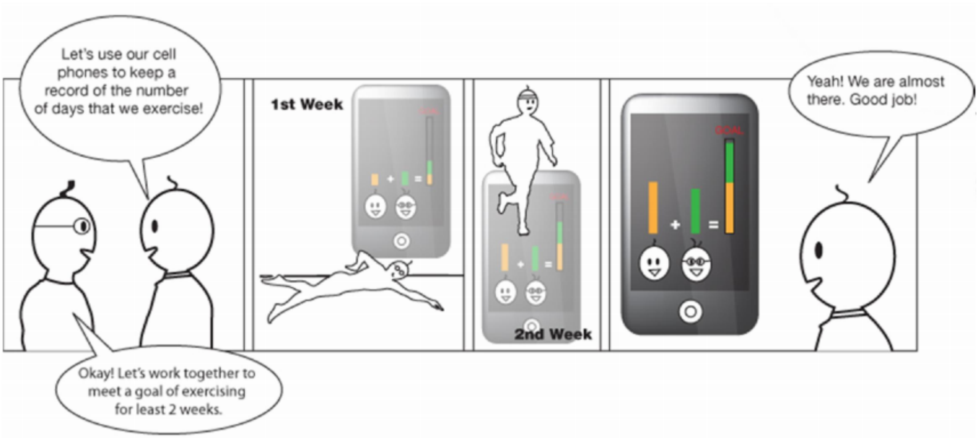
Let's use our cell phones to keep a record of the number of days that we exercise!
Okay! Let's work together to meet a goal of exercising for least 2 weeks.
1st Week
2nd Week
GOAL
Yeah! We are almost there. Good job!

Figure 3.1: Persuasive Computing - Trial Lecture by Muhammad Asif - IDI (2014)

3.1 State-of-the-Art

Gamification can be used in healthcare-related contexts, and this section will list some state-of-the-art applications which use Gamification strategies.

3.1.1 In Context of Physical Activity

Zamzee [1] is a game for children and teenagers, which uses a tri-axis accelerometer to measure the duration and intensity of the physical activity, and can be put on their clothes or put in their pockets. It is supported by a monitored computer, mobile application and a motivational website. It gives rewards for moving and allows progression and challenges.

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[1] Zamzee: urlwww.zamzee.com

Nike+ [2] is a system for youth and adults which consists of a running application for mobile phones, a sport watch and a fuel band bracelet which support GPS, calorie count, time elapsed, pace, distance and records counter. It provides feedback as the user runs and moves. See Figure 3.2

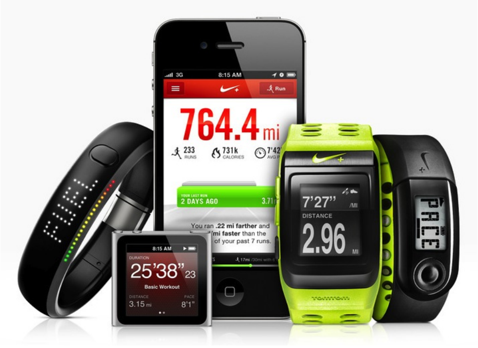

Figure 3.2: Nike+ multi-platform system

Xbox Fitness [3] A gamified health system for Xbox 360 which allows you to exercise at home with the help of Kinect, a sensor technology that tracks your movements. It tracks every move the user does and supply the user with a real-time coaching mechanic. You can connect with friends across Nike+ and the Xbox community, to increase the motivation to reach new goals.

RunKeeper [4] is an application for Android and iPhone that track your pace, measure workout distance, chart weight loss, crash training goals and let you see your friends workout. They use Gamification mechanics like progress, interactive story, goals, achievements and competition between friends for a spot on the monthly activity leader-boards. Runkeeper also has a calorie counting system with a reward system, which keeps the user informed. See Figure 3.3

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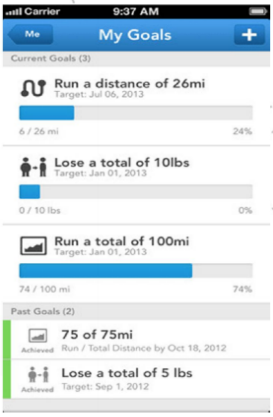
[2] Nike+ `www.nikeplus.nike.com/`

[3] Xbox Fitness: `www.xbox.com/xboxfitness`

[4] RunKeeper: `www.runkeeper.com`



Current Goals (3)

Run a distance of 26mi
Target: Jul 06, 2013
6 / 26 mi 24%

Lose a total of 10lbs
Target: Jan 01, 2013
0 / 10 lbs 0%

Run a total of 100mi
Target: Jan 01, 2013
74 / 100 mi 74%

Past Goals (2)

Achieved 75 of 75mi
Run / Total Distance by Oct 18, 2012

Achieved Lose a total of 5 lbs
Target: Sep 1, 2012

Figure 3.3: RunKeeper - Android application

Google Fit [5] is a health application created by Google, which supports the users by using the smart phone as a pedometer and GPS tracker. It tracks the users daily activity and automatically creates a goal for the users, and give the users an award if they meet their personal daily goal. You can add personal information on hundreds of activities like climbing, cycling, diving, tennis and so on. See Figure 3.4

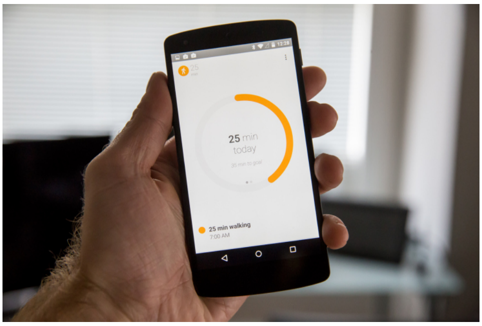


Figure 3.4: Google Fit for Google and Android users

3.1.2 In Context of Diet and Weight Loss

Slimkicker [6] is an application for phones and computers that turns diet and fitness goals into a game. Users can gather points as they track healthy calories, does exercise and completes challenges.

---

[5] Google Fit: `https://fit.google.com/`

[6] Slimkicker: `www.slimkicker.com`

Slutta [7] is a mobile application for users that want to quit nicotine intake. It support the user by daily motivational posts, keeps track of money saved and how long the user have been nicotine free. Slutta has a website and has a call-center if you want to talk to someone to get guidance. See Figure 3.5

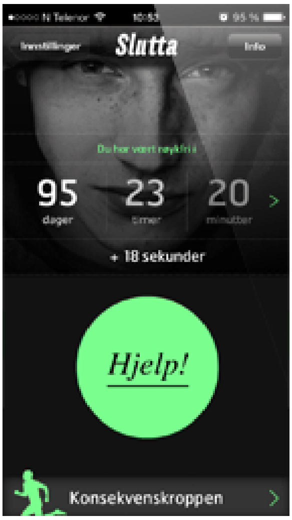

N Telenor
10:53
95 %
Innstillinger
Slutta
Info
Du har vært røykfri i
95
dager
23
timer
20
minutter
+ 18 sekunder
Hjelp!
Konsekvenskroppen

Figure 3.5: Slutta.no

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[7] Slutta: `www.slutta.no`

Chapter 4

Method

In this chapter the research method used will be explained, and information about the data collection methods will be described, as well as the system implemented for the case study.

The case study took its place between March 2015 and May 2015 and is described in Section 4.2. The design and implementation of the application used in the case study are presented in Section 4.3.

4.1 Conceptual Framework

A conceptual framework was used to group concepts and broadly define and systematically organize them to provide a focus, a rationale and a tool for the integration and interpretation of information (Mobys, 2009).

Miles and Huberman (1994) notes that conceptual framework serves as purposes for (a) identifying who will and will not be included in the study (a) describing what relationships may be present based on logic, theory and/or experience; and (c) providing the researcher with the opportunity to gather general constructs into intellectual "bins".

The conceptual framework is used as data interpretation and is the anchor of the study. As the conceptual framework starts with an initial design, based on the literature and personal experiences, it evolves during the study when new findings will reshape the framework.

In this thesis, we will use the **Blue Span** behavior, as this is a simple approach, and it will get easier and clearer to gather information relevant for the research questions. Fogg says in a TEDx talk (Fogg, B. J., 2012a) that the habits are in the *Blue Path* behaviors, which is also very intuitive: "Do familiar behavior from now on". One way to achieve this, is to take natural baby-steps towards the goal; Begin with a new behavior one time *Green Dot*, when this have been done, you do the behavior again (blue dot). You would like to repeat this behavior many times, but its not a habit yet, so you schedule a duration, such as 40 days (blue span). The goal is to repeat this behavior until it naturally becomes a habit (blue path). But because this will take more time than this research has time for, BlueSpan is in focus, which is the stage before a habit is created.

To achieve this, an iterative approach have to be conducted on a user group to learn about their experiences and thoughts on improvement. The conceptual framework is a core conceptualization of the problem situation and is designed to provide a structured overview of the bigger problem, and to give some understanding of particular problems within the big picture.

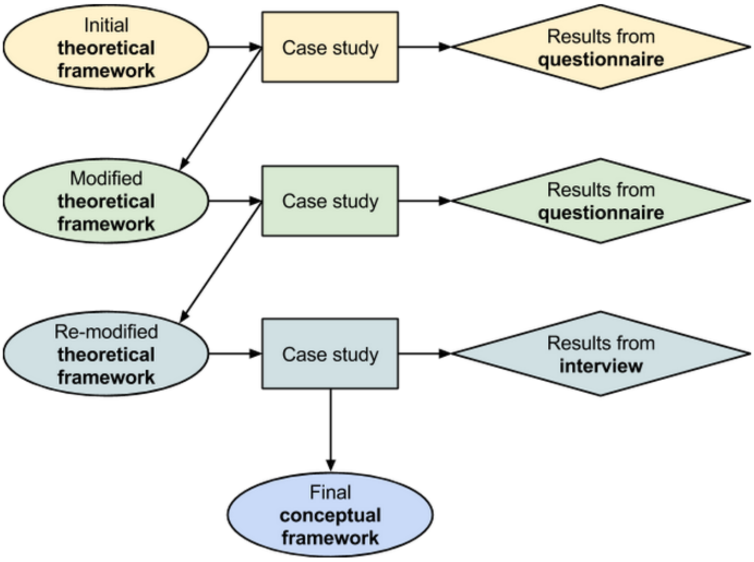
Initial **theoretical framework**
Case study
Results from **questionnaire**
Modified **theoretical framework**
Case study
Results from **questionnaire**
Re-modified **theoretical framework**
Case study
Results from **interview**
Final **conceptual framework**

Figure 4.1: Development of the conceptual framework

As we see in Figure 1.1, there was three iterations of the case study which began with an initial theoretical framework consisting of a set of theories and functionality that was implemented in an Android application. After two weeks of testing, a questionnaire was conducted on the informants who gave new feedback on how to improve the application, which led to the modified theoretical framework iteration. The application got its upgrades and was conducted on the users for another two weeks of testing, and the same procedure with the questionnaire was conducted on the informants. The re-modified theoretical framework was the last iteration where the user spent the last period of two months using the application, which ended with a final questionnaire of all the participants, and an interview of a selection of the informants. The results from the final questionnaire and the interviews were used to create design guide, which is a concept of theories used to persuade youths on performing behaviors for a period. The design guide is described in Chapter 6

4.2 Design of Case Study

Two groups was used in the case study to find answers for the research questions. One group (*group A*) which is a group of youth who is physically active, and a user *(*group I) which is little or physical inactive.

It was used a qualitative case study because this type of study is designed for health interventions, among others, to promote good health behaviors or to prevent bad health behaviors (Baxter and Jack, 2008a). This suits the research goal of this thesis. It allows the researcher to describe a phenomenon in the context of using different data sources. With an iterative approach, each case study gave a review of the data collection methods that led to new ideas and improving the connection between ICT and BC.

To discover whether ICT can be used to persuade youth to change one behavior, the qualitative case study was conducted on two groups of youth, to take daily push-ups. The groups were divided in physically active and non-active because we could then get insight from two perspectives of the youth.

The users can choose the amount of push-ups themselves, but the application will suggest a low amount of push-ups because Fogg suggests that tiny baby-steps are the most efficient way to achieve a behavior change. If you only have to take one push-up, there is harder to make an excuse to avoid the behavior. This also relies on theories from (Fogg, 2009b), that states you should choose a simple behavior to target because it can be too overwhelming and unmotivating to chose a big goal.

The informants will be using an Android application that will try to help them towards getting a new behavior. The application is described in Section 4.3 and is designed to use signal as triggers to make the informants taking push-ups. The signal is a trigger that happens on a predictable schedule, like a scheduled notification.

The case study was conducted on 30 youth, with age ranging from 18 to 26. There were both males and females, and both physically active and inactive youth. As described in Section 4.1 the case study was conducted in an iterative approach, where questionnaires were given to the informants in every iteration. How the questionnaires were designed is described in Section 4.4. At the end of the case study, qualitative data was collected by performing an interview on some of the informants, as described in Section 4.5.

4.3 Implementation

This section describes the technology used and the features of the implemented system used in the case study. The persuasive application was an Android application named *Push*.

— The application is a small part of the thesis, where it was meant for getting data to the case study. After some research on existing solution nothing suitable was found. The design of the application is minimalistic and simple with just the necessary functionality. Because of this, the user could focus on one thing only — taking push-ups and keeping track of the progress. The researcher used as many libraries and framework as possible to minimize the time consumption on designing and implementing the application. The application is based on Fogg's method 2.1.5.

4.3.1 Technology used

This section describes the language and libraries used to create the system used in the case study.

Android SDK

Android software development kit (SDK) [1] is the development tools used to create Android applications.

AndroidCircleButton

A Circle button widget [2] for Android that was used as the button to register push-ups.

CircularProgressButton

Circular Progress Button [3] is a library for Android, which offers a good looking button with animation. This was used to replace standard boring looking Android buttons.

MPAndroidChart

MPAndroidChart [4] is a simple charting library for Android, which provides a good looking representation of the statistics (the push-ups registred).

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[1] http://developer.android.com/sdk/index.html

[2] https://github.com/markushi/android-circlebutton

[3] https://github.com/dmytrodanylyk/circular-progress-button

[4] https://github.com/PhilJay/MPAndroidChart

Android Sliding Up Panel

Android Sliding Up Panel [5] is a library for Android that provides a simple way to add a draggable sliding-up panel. The daily statistics was put on this sliding panel. This was used to make the user interface minimalistic for the user.

---

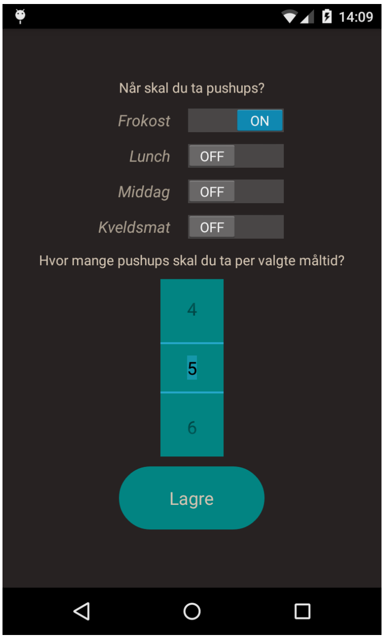
[5] https://github.com/umano/AndroidSlidingUpPanel

4.3.2 Features

This section describes the features of the system used in the case study.

Setup Screen

The setup screen shows up the first time that the application run. The user can select basic preferences like what meal to take push-ups with, and how many push-ups they want to take. According to the motivation wave (Fogg, 2012) it is suggested to create small goals, so five push-ups is selected as a default for the user. We can then assume that the users have low motivation, but the user can change this if desirable. Figure 4.2 shows what the initial screen looks like.



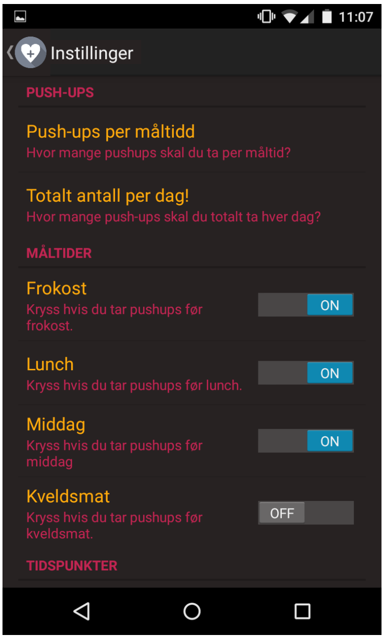
Når skal du ta pushups?

Frokost ON
Lunch OFF
Middag OFF
Kveldsmat OFF

Hvor mange pushups skal du ta per valgte måltid?

4
5
6

Figure 4.2: This is the first screen, where the user can choose some startup basic settings.



PUSH-UPS

Push-ups per måltidd
Hvor mange pushups skal du ta per måltid?

Totalt antall per dag!
Hvor mange push-ups skal du totalt ta hver dag?

MÅLTIDER

Frokost
Kryss hvis du tar pushups før frokost. ON

Lunch
Kryss hvis du tar pushups før lunch. ON

Middag
Kryss hvis du tar pushups før middag ON

Kveldsmat
Kryss hvis du tar pushups før kveldsmat. OFF

TIDSPUNKTER

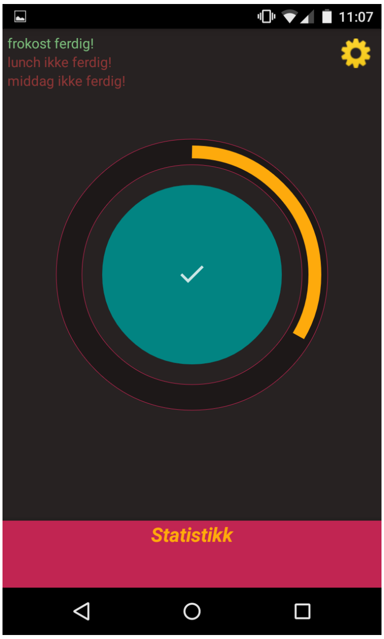
Figure 4.3: This is the preferences, where you can change the behavior to the application.

Settings Screen

The settings screen is a standard Android preference screen 4.3 where the user can change the amount of push-ups, daily-goal, and the time when each meal is eaten for that user. Default times on meals are breakfast (08:00), lunch (11:30), dinner (17:30), and evening meal (21:30).

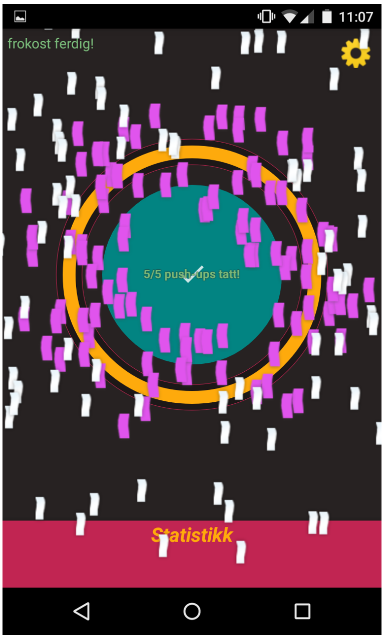
Register Screen

The register screen is the main screen that the user see every time they open the application after the initial run. Here the user can register a push-up session by clicking the circle button as seen in Figure 4.4. The user can see which meal is completed for today, and which was skipped and not taken yet. If the daily goal is met, a celebrating confeti animation will appear to give some small motivation to the user, as seen in Figure 4.5.



frokost ferdig!
lunch ikke ferdig!
middag ikke ferdig!

Figure 4.4: The daily progress is the yellow circle, and the register button is the blue circle.



frokost ferdig!
5/5 push-ups tatt!

Figure 4.5: When the daily goal is met, an animated confetti explosion appears.

Statistic Panel

Everyday the amont of push-ups taken are registred, and the user can see the statistics in a sliding panel, as shown in Figure 4.6.

Notification

For every meal the user have registred to take push-ups, the system will notify the user to remind about taking push-ups. If the user for some reason will not take push-ups, he/she can dismiss the session by clicking the *ORKER IKKE* button. The system will register this and update the statistics and the meal as "skipped", as seen in Figure 4.7.

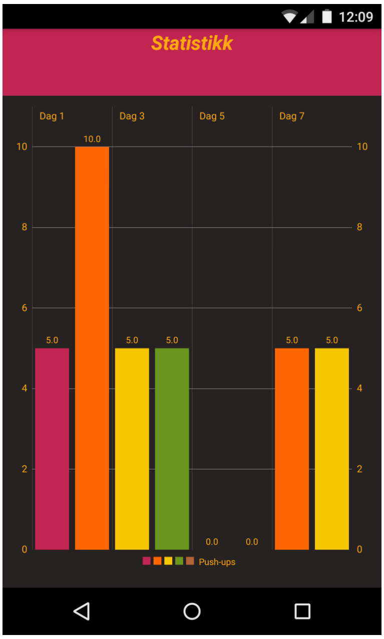
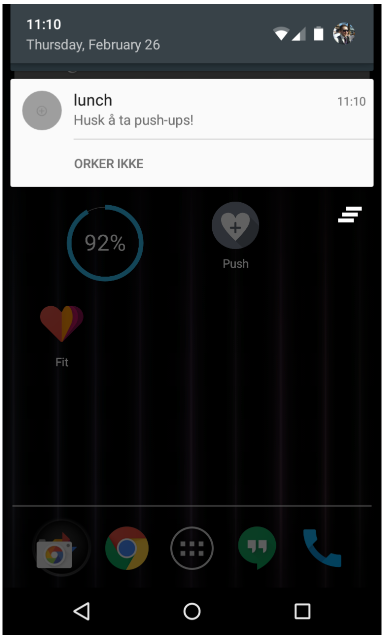

12:09
Statistikk
Dag 1
Dag 3
Dag 5
Dag 7
10
8
6
4
2
0
10.0
5.0
5.0
5.0
0.0
0.0
5.0
5.0
Push-ups

Figure 4.6: Statistical overview of the progress. Y-axis represents push-ups, X-axis represents days since day 1.


11:10
Thursday, February 26

lunch
Husk å ta push-ups!
11:10

ORKER IKKE
92%
Push
Fit

Figure 4.7: The application uses NotificationManager on Android to notify the users about missing push-up sessions

4.4 Questionnaire

This section describes the online questionnaires designed for the case study, which was structured to fit the conceptual framework iterations, as described in Section 4.1.

The questionnaire was used for **data collection**, and was designed to measure separate variables like preferences, behaviors and facts. The preferences are for answering questions like if they eat a meal at home, or if something was hindering them to perform the push-ups like not enough space or unpleasant situations.The behavior part is created to answer if they participated and performed the push-ups and how many times a week they did it, and if they have had progression or regression. The last — facts — describe their age, gender, and other facts about the participants.

4.4.1 Questionnaire Layout

We have to inf out how many of the users that uses the system daily, and whether they are maintaining the case or not, and the reason for that. Do the informants manage to continuing using the system, or has it become excess. The online questionnaire contained the following segments of questions: general personalities, personal health and computer skills.

General Personal Background

A segment containing general information about the informants like age and gender.

Personal Health

This segment of questions was mapping the health status of the informants. It is interesting to know if they are physically active, if they exercise sometimes, or if they are little or non-physically active.

Computer Skills

When we search for answers regarding the use of technology, it is important to map their computer skills, there will always be a conflict of advanced and inexperienced users. We want to know what design and functionality that scopes around most people.

4.4.2 Sampling Frame

The students who volunteered to be a part of the case study.

4.4.3 Recruitment of Participants

Everyone who volunteered agreed to take an interview at the end of the case. This way we will get people who are initially motivated to use the application, so we can focus on the behavior and not the motivational part. The collection of volunteers happened on Facebook-pages for students of NTNU and NTNUI (NTNU's sports club).

4.4.4 Sampling Size

27 students volunteered to take a part of the case study, where 19 claimed to be physically active, and 8 claimed to be non-physically active beside the case study.

4.5 Interview

The interview was conducted on four informants from the case study. Two of the informants were active, and two were inactive. This was due to gathering data from two perspectives, where one perspective is from the physically active view, and the other is from a physically inactive view. The interview was designed to take one hour per informant and contained both closed and open-ended questions. This is because we want to get some facts to distinguish between the informants, and open answers that can give new ideas to the research. These ideas come from the experiences from the informants, their thoughts and what they learned during the case study.

4.6 Research Process

This section briefly describes the research process, from the preparation phase to the conclusion and discussion phase.

The preparation began with the **literature review**, for when the selection of databases for articles and literature search was determined. These databases were Scopus, ACM Digital Library, and Google Scholar. This covers most of the papers on the web that is related to persuasion-related research and were chosen on this background. The search terms “Persuasive Technology”, “Gamification”, “Captology”, “Behavior Change” and “Physical Activity” were searched for in titles, abstracts, keywords, and content. Example on search string is *(”Persuasive Technology” OR ”Captology” OR ”Gamification”) AND (”Behavior change”) AND (”physical activity” OR ”physical” OR ”exercise” OR ”workout”)*, which gave 142 results on ACM and 30 results on Scopus. On Google Scholar, which also searches in ACM and Scopus, gave 1820 results with its sophisticated search method. The following **inclusion criteria** was applied:

1. The paper need more than just abstract.
2. The paper is newer than 2008.

3. The paper contains study on persuasive technology, captology, Gamification or behavior change.
4. The paper focus on health like food, sedentary, exercise and such like.

The papers **exclusion criteria** were the following categories:

1. Description of a system without evaluation.
2. Studies which did not focus on health.
3. Studies that mention persuasive technology but not studied a topic connected to it.

The first four months was used to literature review on PT, Gamification, and BC. Because the field is including multiple studies, a lot of time was used to prepare the background literature. After the literature review and the creation of Chapter 2, the research questions and research goal could be formulated, and the research method was chosen.

After the literature review, the **research strategies** could be established, and the **case study** was designed, along with the interview guide for the case study. After some weeks of coding and implementation with beta-testers, the conduction of the case study took place.

In May 2015, the case study was complete, and the beginning of data collection in the form of interviews took place. The data collection was done concurrently with the data analysis as this is a common approach in qualitative studies (Baxter and Jack, 2008b). The data collection is described in details in Chapter 5.

Qualitative data analysis was used. The findings were systematized and grouped and coupled with theories and strategies from persuasive technology, Gamification, and BC. The new findings were described and discussed before the conclusion and contribution were written.

Chapter 5

Result

This chapter describes the data sources, the strategies for collecting data, and the results. Section 5.1 state the results from the online questionnaire that was iteratively conducted on the informants of the case study. Section 5.2 states the results and findings from the interviews.

5.1 Questionnaire

This section states the results gathered from the questionnaires. The result should not be considered as quantitative data, because of its low amount of 30 participants, but as a guide to how a persuasive application on youth should be designed.

5.1.1 Age and Gender Distribution

The Table 5.1 shows the age distribution of the informants, where they are organized by gender, and whether they are physically active or inactive.

Table 5.1: This table show all the informants, distributed by age and whether they are physically active or not

Age	**Active**		**Inactive**	
	Male	**Female**	**Male**	**Female**
19	-	1	-	-
20	-	1	1	-
21	1	-	1	-
22	4	2	1	1
23	3	4	1	-
24	1	4	-	1
25	1	1	-	-
26	1	-	-	-

5.1.2 Push-ups and Notification

The participants were asked if they take push-ups every day or if they skip some days. They were also asked for a reason for why they skipped a session. Figure 5.1 shows the results on how often they took push-ups.

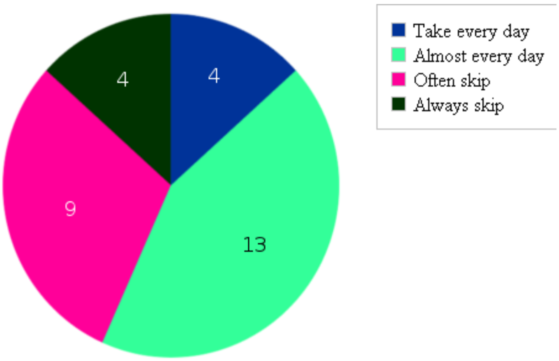


Figure 5.1: Pie chart of how often the participants were taking push-ups during the case study.

The most common reason for skipping push-ups, were during the weekends, when the participants were sleeping longer than usual, had a hangover or wanted to take a day off. Some participants said they were not motivated every day, which can be related to Fogg Motivation Wave (Section 2.1.2). Other states they got bored by the application, which resulted in not using it, and hence not taking push-ups.

The participants were asked if the notification worked; the result is shown in Figure 5.2. The feedback on their experiences with the use of notification was mostly negative. The participants had the impression that the notification was annoying and that it occurred too often. Only a handful of the participants had no problem with the notification.

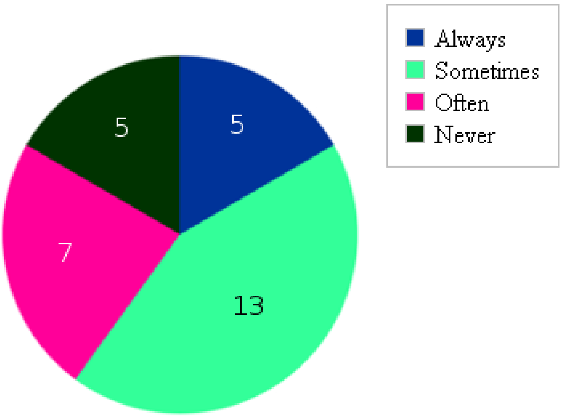


Figure 5.2: Pie chart of how often the participants took push-ups when they got notified.

5.1.3 Results from Active vs. Inactive Participants

Six (20%) of the participants registered that they are physically inactive, and four of out them completed the study. 24 of the participants (80%) were physically active, and 20 of them completed the study. These numbers tell us that there was a higher success rate within the physical active participants, but it also tells us that the application worked on the inactive ones. Three of the active persons increased the amount of push-ups while one of the inactive increased.

A third of the participants said that they felt that taking push-ups had become a daily routine in the last iteration of the conceptual framework (See Section 4.1). Only one of them were not physical active. 7 out of the 30 participants also said that the application was helping them to take push-ups, and one of them were not physically active.

5.2 Interview

This section describes the qualitative data gathered from the interviews. The section is divided into subsections, where each subsection is a segment of answers from the interviewees.

One physically active female and male participated, as well as one physically inactive female and male. The interview guide can be seen in Appendix C. The age of the participants was 19, 22, 22 and 23.

The interviewees will hereby be named *Person A1* and *Person A2* as an alias for the physically active informants, and *Person I1* and *Person I2* are the aliases for the physically inactive informants. Table 5.2 shows some information about the informants.

Table 5.2: Information about the informants

Informant	**Gender**	**Age**	**Physical Active**
Person A1	Male	19	Yes
Person A2	Female	22	Yes
Person I1	Male	22	No
Person I2	Female	23	No

5.2.1 Experiences with the Application

The informants were asked about their experiences with the application, if they registered their push-ups and if they missed any functionality in the application.

All informants had the first impression that the application had a good and simple design and that it was easy to use. However, they all said that the application became boring to use after some weeks, because of lack of functionality, social interaction, and Gamification mechanics. Some of the informants experienced that the application sometimes stopped giving them notification after they restarted their application, which turned out to be a bug in the implementation.

When asked if they registered their push-ups in the application, *Person A1* said he registered the push-ups to impress others, and because he wanted to show that this was a challenge he was capable of handling. One interesting fact is that he admitted he had registered push-ups without taking them, just to make the statistics look better.

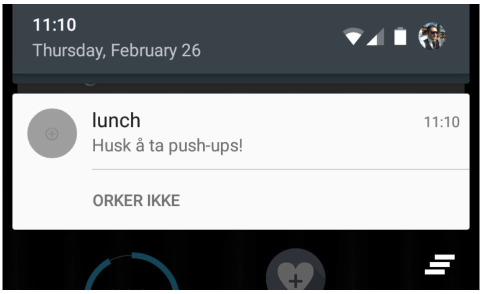
Person A2 registered the push-ups daily in the first weeks but stopped after a while because the application was annoying to use. She still continued taking push-ups without the application.

Person I1 registered his push-ups regularly, but sometimes forgot it and stated that it should be possible to add push-ups to previous days if you had forgotten to register them.

When the informants were asked if they missed any functionality, *Person A1* said he wish there were some motivational posters, like “it only takes 10 seconds to take 5 push-ups”, or something like “you burn a chocolate bar by taking 50 push-ups for a day”. *Person A2* wanted to add displaying of weight and calories burnt, because it is motivating to see changes, and that it helps to take push-ups. *Person I1* had the same idea, and that it should be social interactions as well, so you could like others activities or give them motivational posts.

5.2.2 Perceived Usefulness of Signal as Trigger

The informants were asked about their experiences with the signal (Android notification) as a trigger (5.3).



lunch

Husk å ta push-ups!

Figure 5.3: This is what the signal looked like when a user got notified to take push-ups before lunch.

All the informants had the experience that the notification got annoying after two weeks. When asked why it was annoying, *Person A1* said that he was unmotivated some days, and that the notification was annoying on the days he was unmotivated, and that the notification was OK on his motivated days. *Person A2* took push-ups twice a day and, therefore, received two notifications a day. She started to associate the notification with something bad, like an alarm clock. She said that the notification should rather happen if a person forgot to take push-ups than as a reminder. *Person A1* had a similar idea but said the notification should start as a reminder in the first week, and then evolve into only notifying if the behavior were forgotten after time. In other words, rely more and more on the human memory. *Person I1* said that he did not get annoyed by the notification because he did not take push-ups for more than two weeks and did not get the time to get annoyed by it. But he stated that he probably would get irritated by the notification if he had continued using the application. *Person I2* said that the notification did not always have an effect on her, only if she was motivated enough. She said the notification worked more and more because she got used to the routine. When the notification started working regularly, it also started to get annoying and irritating, she said.

5.2.3 Experiences with Taking Push-ups

The informants were asked to tell about their experiences with taking push-ups.

Person A1 put himself a small goal with five push-ups a day because then it would be easy to do, and no time-consuming as he could avoid taking a shower afterward. He said he only took push-ups the days he was not exercising at the gym because then he was active every day. When asked about the incident where he registered fake push-ups he did not take, he said that it did not last for long. He had realized that he had been cheating, and took it up with himself and agreed to himself that he was going to catch up with the cheated push-ups by taking push-ups more often. This, he said, took off, and he took push-ups beyond the maximum of four times day, as the application was designed to. He said he took push-ups whenever he could, five here and five there until it reached 100 a day. This continued for some weeks until he hit 200, and the self-study for exams started, and he did not have time for it. He wants back to 20 push-ups every morning because he wanted to complete the case study. *Person A1* said he was going to continue with taking push-ups after the case study, as well as sit-ups as he had started with. He said it was good for him because he had long days sitting still studying for the exams, and the push-ups and sit-ups helped to keep himself calm.

Person A2 admitted that she did not enjoy taking push-ups very much, but she put herself a goal of taking five push-ups daily. She took push-ups every day except for Sundays and other special occasions. She stopped taking push-ups after one month when her motivation was lost. She had tried to increase the number of push-ups to see if it helped on the motivation, but she then had to take a shower after the session, which made the behavior into an exercise and got more time-consuming. This is related to the components of ability in FBM, where time is one ability that can be the cause of not performing a behavior.

Person I1 said it was hard to take push-ups in the beginning because the motivation was very low. He said that because he was an inactive person, it was hard for him to take push-ups every day. He joined the case study because he thought this would be an opportunity to make him more active. It turned out to not work on him because he could not find a goal and purpose big enough to overcome his lack motivation.

Person I2 was motivated from the beginning and took push-ups every day. She said that the motivation dropped after some days, but that she still managed to take push-ups. She also said that she sometimes skipped push-ups on purpose because she was too lazy. After she decreased the number of push-ups from eight to five to make the behavior easier, and the number of sessions from two to one, she managed to continue taking push-ups.

5.2.4 Persuasive Technology as a Blue Span Behavior

The informants were asked if the application had helped them towards the goal of daily push-ups. The responses were positive in the light of the blue span behavior.

Person A1 said the application had an effect in the beginning, and that he even started to fake the push-ups just to increase the statistics in the application. He said that the application helped him in the beginning, but that it shortly after got boring and annoying to use.

Person A2 also had positive feedback on the persuasion of the application. The application worked in the beginning until the application stopped notifying her (which was an application bug). She managed to continue taking push-ups without the application, which is the goal of a blue span behavior.

Person I1 said that the application worked the two first weeks, but got so annoying after this time, that he uninstalled the application. He also quit the program after those two weeks, but the application kept him for two weeks, which is a short time-period.

Person I2 had the experience that the application was helpful in the beginning with the notifications, because it reminded her to take push-ups, and it was easier to take push-ups when she was following a program (the case study).

5.2.5 The Application in Light of Counterproductivity

The informants were asked if the application at some point was counterproductive by providing spam, lack of motivational aspects, bad design or missing the functionality.

Person A1 had the experience that the application got annoying after several weeks, because the notification fired off every day. He uninstalled the application as a result but managed to continue with taking daily push-ups.

Person A2 said that the application had a lack of features, because it was too simple and boring to use. When you are supposed to use the application daily, it needs more functionality and interesting things like calorie counting and weight monitor, she said.

Person I1 and *Person I2* did not have anything to add but said that the notification should be fired less and less over time, and rely on the human memory more and more over time.

5.2.6 Gamification and Persuasive Technology

The informants were asked about their experiences with other application which uses Gamification and persuasive technology, and which techniques they think should be integrated into this application.

Person A1 had tried a motivation application for studying, which game him daily motivational posts and suggested that this should be implemented in the application. He had also tried an exercise application that counted calories based on different exercises (bench, biceps, abs, etc.). He said this was pretty persuasive because you could count calories easily and keep a track of your fitness. He suggested that calories burned could be turned into experience points, which he thought was a great idea that would make the application fun to use.

Person A2 had experiences with Google Fit [1] and Nike+ [2]. Google Fit was great because it counts your step and distance walked/jogged/ran/biked based on the smartphones sensors and GPS. Google Fit automatically creates a goal for you based on how long you walk. If you reach your daily goal, you will get a notification that have a celebration animation. The best thing about the application, she said, was that you don't have to do anything or register anything, it does this automatically for you. Nike+ was another application she found persuasive with features like calories burnt, weight loss, and length walked/ran.

Person I1 had tried an application called Untappd [3]. It is a beer application that let you check-in beers you have tasted and rate them. The application has a badge system that gives you achievements based on what, where, when and how many beers of different types you have drank. It also has a newsfeed with friends' activities, and you can "toast" them, which is similar to the Facebook like button. This, he said, is good game mechanics that should be integrated in our application (See Figure 5.4).

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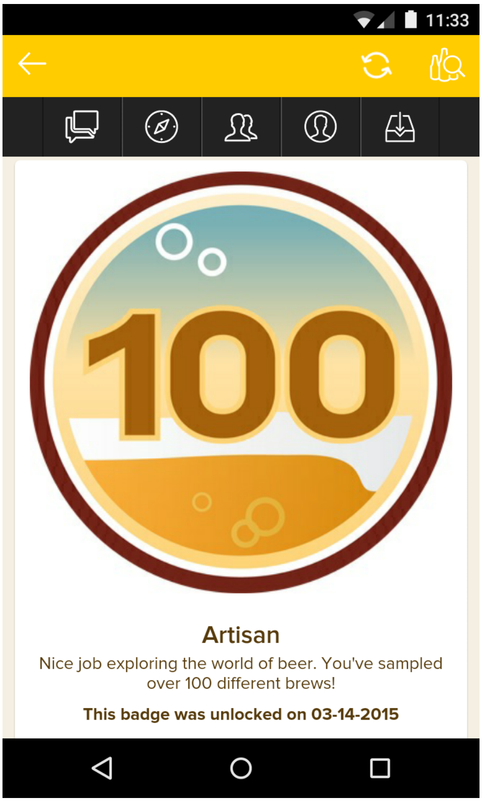
[1] Google Fit: `https://fit.google.com/`

[2] Nike+ `https://secure-nikeplus.nike.com/plus/`

[3] Untappd: `www.untappd.com`



Artisan

Nice job exploring the world of beer. You've sampled over 100 different brews!

This badge was unlocked on 03-14-2015

Figure 5.4: A badge on Unntapd

Person I2 had only tried Slutta [4] and said it was persuasive in the way that it showed you how much money you have saved and the days, hours and minutes since your last smoke. The visual progress was motivating, and something similar should be implemented into our application, she said.

The informants were asked about which game mechanics they think should be included into the application and got explained what each game mechanic means. Overall the most popular game mechanics were *Achievements*, *Appointments*, *Combos*, and *Progression*. Other game mechanics were suggested, but these were the most popular ones.

Person A1 said that *Achievements* are important because they can motivate by giving them goals and some benefits of taking push-ups, and you achieve something. *Person A2* said achievements are good because you can use them to reach new heights, like increase push-ups because you want the next badge, or get an achievement for taking fifteen push-ups every day for seven days, etc.

---

[4] Slutta: `slutta.no`

Person A2 said *Appointments* could be ideal because you can make appointments with friends to meet somewhere to take push-ups, or to take push-ups at the same time. She said it is more motivating when you are not doing a task alone, but gets backup from friends, and backing them up. It is harder to avoid doing a behavior when you make an appointment, she said. Which is the same statement Fogg says (Fogg, B. J., 2012b). *Person I2* said that you can make an appointment with your friends, and this will make you take push-ups, because you don't want to let your friends down.

Person A1 said *Combos* was a good idea to integrate with achievements because you could get a reward for taking push-ups every day for a week, and get rewarded for doing such a combo. *Person I1* had the similar idea and added that you could increase the number of push-ups by one every day for a week to unlock new features.

Progression was the last popular game mechanics, which was the only technique common with all the informants. *Person A1* said it is necessary to see the progression, and that he was used to looking for progression in his workout routines. It is motivating to see an actual difference with your work and that you don't do it for nothing. *Person A2* said that progression and achievements are the most important mechanics and that it is necessary to see progress of what you are doing. *Person I1* and *Person I2* agreed to this and said that it is necessary to see the progress like weight loss, calories burnt, or total push-ups taken.

Chapter 6

Design Guide

This chapter describes a design guide made from the results and the background literature. The design guide has not been fully used and tested on the participants, as this design guide is a result of the last iteration of the case study. However, some parts have been tested and given us results, and the qualitative data have given us better understanding of how to create a conceptual model for persuasive technology for youths. By design, we don't mean graphical design, but what functionality and in what order information is presented to the target group to achieve persuasion.

The design guide is parted into sections of design matters and has a graphical suggestion to give an example of what we mean by the different approaches. Section 6.1 gives a brief introduction to the model. Section 6.2 describes how to inform youths about different health-beneficial behaviors to make them aware of their situation and suggest better behaviors as a replacement in their favor. Section 6.3 describe how we prepare the youths for behavior change by introducing them to social collaboration, like creating appointments with friends. Section 6.4 describe what functionality and techniques to implement in an application used for persuading youths to keep them using the application for a time-period. Section 6.5 describe how we maintain the behavior of youths with a reward system. The last Section 6.5.2 describe how artificial intelligence can be used to find out how to encounter situations when the youths are skipping the behavior, by asking the users for simple input and using suggested methods from previous research (Fogg, 2009a).

6.1 Introduction

To make persuasive technology persuade toward changing an unhealthy habit/behavior or create a new one is very difficult. This is because people are different, have different cultures, knowledge, experiences and lives in different environments. These are all factors which have to be considered on how we are going to persuade an individual. When you go to psychological therapy, you have to explain about your experiences, thoughts, perception and so forth, which by the psychologist is mapped in different tests and theories developed by different psychologists and researchers in the past. The persuasive technologies researched so far have a simple usage of psychology and makes the persuasive technology work on a targeted audience.

Another problem to note is how to make the audience interested in using the persuasive application. Is it a recommendation from your doctor or a friend, is it through marketing or is it the individuals who seek it. The design guide assumes that the user already knows about the application and intends to try it.

A conceptual model have been created to show how the different theories, concepts and results are connected to achieve our goal. The model is shown in Figure 6.1 and is explained in the next sections, which are *Stage of Informing*, *Preparation*, *Action*, and *Maintenance.*

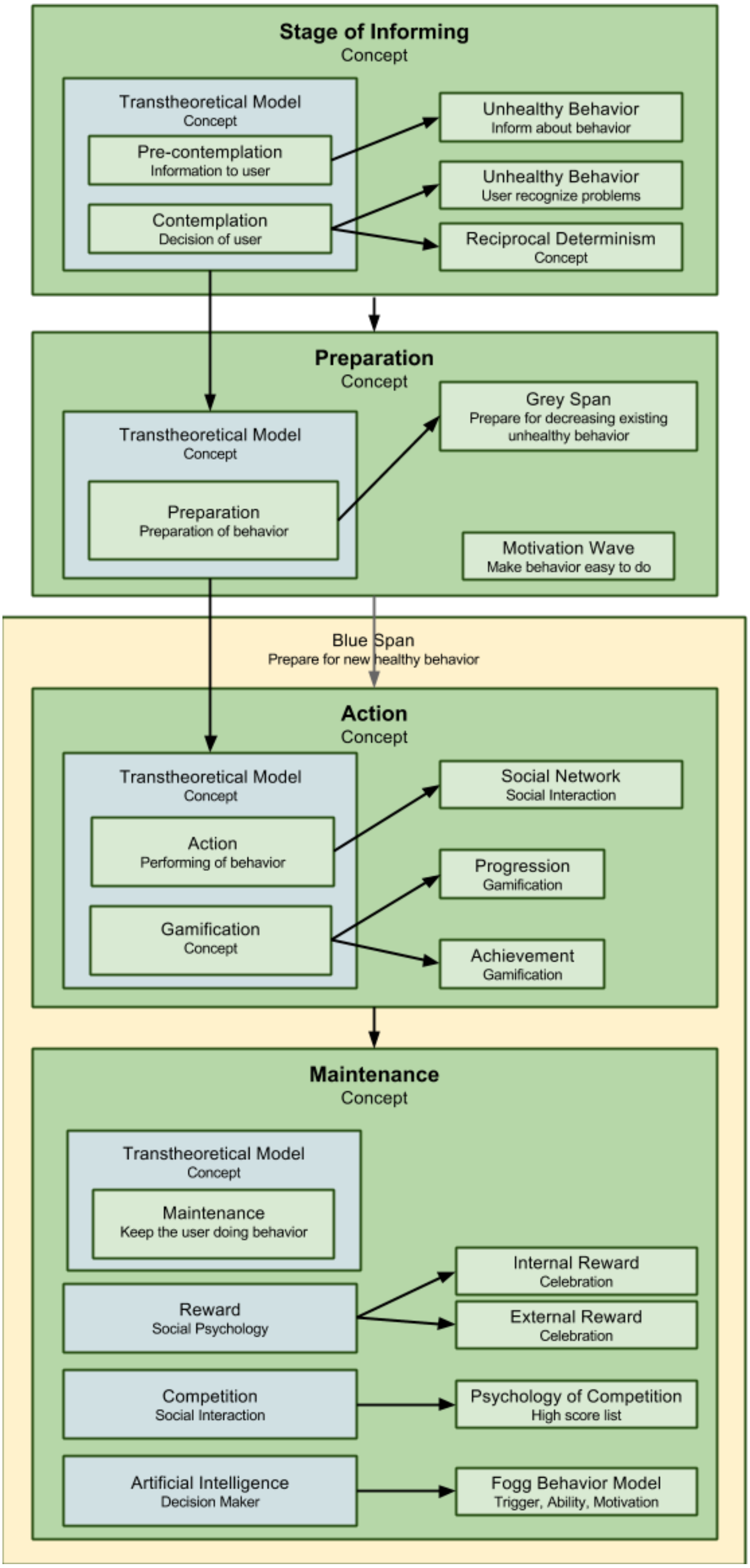

Stage of Informing
Concept
Transtheoretical Model
Concept
Pre-contemplation
Information to user
Contemplation
Decision of user
Unhealthy Behavior
Inform about behavior
Unhealthy Behavior
User recognize problems
Reciprocal Determinism
Concept
Preparation
Concept
Transtheoretical Model
Concept
Preparation
Preparation of behavior
Grey Span
Prepare for decreasing existing unhealthy behavior
Motivation Wave
Make behavior easy to do
Blue Span
Prepare for new healthy behavior
Action
Concept
Transtheoretical Model
Concept
Action
Performing of behavior
Gamification
Concept
Social Network
Social Interaction
Progression
Gamification
Achievement
Gamification
Maintenance
Concept
Transtheoretical Model
Concept
Maintenance
Keep the user doing behavior
Reward
Social Psychology
Competition
Social Interaction
Artificial Intelligence
Decision Maker
Internal Reward
Celebration
External Reward
Celebration
Psychology of Competition
High score list
Fogg Behavior Model
Trigger, Ability, Motivation

Figure 6.1: The conceptual model of the design guide.

6.2 Stage of Informing

First the user has no intention to take any action in the near future, in psychology — according to the TTM (James O. Prochaska, 1994) — this is the pre-contemplation stage. What we have to do here, is to make the users aware of their current behavior, and encourage them to re-evaluate it and clarify that it is their decision to make. It is important to explain the situation to the user and personalize the risk.

This can be done by creating a collection of typical unhealthy behaviors, which the user can select and read about. Information about the consequences and disadvantages of the behavior must be given, like what effect this behavior have on their health. A new healthy behavior can be suggested to replace the bad one, and advantages of the change are given. It is important that the information given is short and does not require a lot of reading. Sources of the information can be added, so the users have the opportunity to dig deeper into their situation if necessary.

It is important to think about what a healthy behavior is, as this can be very dependent on what the researcher or designer thinks (Atkinson, 2006). But activities like jogging, quit smoking, healthy eating and brushing teeth are some activities we safely can say are healthy.

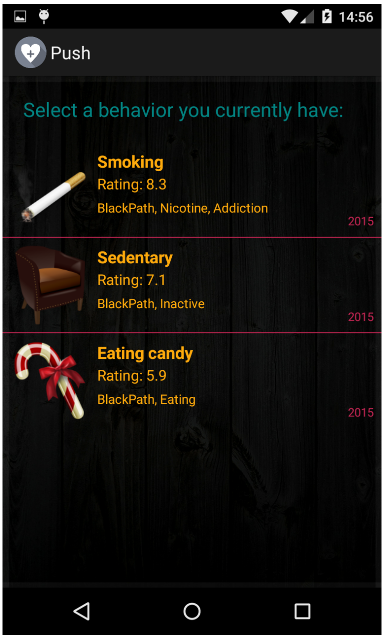
The next step in TTM is the contemplation stage, which is when the users start to recognize the problems with their behavior. We assume here that the users have some ideas of pros and cons with their current behavior, so it is natural to include this stage at this point. They are not considering change as of yet, so it is important to encourage them with positive feedback like sentences as “we believe you can do it”, and “you are not the only one”.

Persuasive Technology has different ways of persuading people, from scaring people towards a desired behavior, to motivate them through positive thinking. It is more ethical to persuade the users to their will. The technology is there to guide people and help them to change unhealthy behavior at their will. If they don’t have the knowledge about unhealthy behaviors, we can inform them with relevant and correct information about the behavior. The chosen behaviors have to be carefully reviewed, and all necessary information about such behavior have to be reviewed.

If the user doesn’t know what behavior to change, an overview of suggested behaviors can be listed, with a realistic goal and baby steps towards it. As Fogg states, it is easier to achieve tiny habits with baby steps on the way to the goal, rather than to have a huge goal with big steps. The characteristics of small habits are that they don’t require much motivation, and they are easy to do (2.1.2)). Every behavior in this suggestion list can have a rating system based on the user-experience, and behaviors below a certain rating can be automatically deleted. This way there will most likely be more good behavioral tasks than bad ones.

It is logical to connect the concept of reciprocal determinism from the social cognitive theory at this stage. This is because of the two types of persons according to (Bandura, 1989), the people who rely on the decision of others, and the people who like to take the decision in their own hands. This can be achieved by suggesting behaviors with pros and cons to the first type of people, and inform the other type of people so they can make their own decision.

Figure 6.2 shows an example of how a list of unhealthy behavior could look like while Figure 6.3 illustrates and example of information about consequences of smoking, and benefits of quitting the behavior.



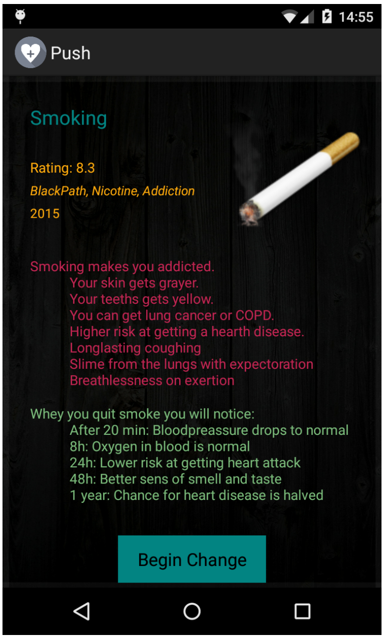
Select a behavior you currently have:

Smoking
Rating: 8.3
BlackPath, Nicotine, Addiction
2015

Sedentary
Rating: 7.1
BlackPath, Inactive
2015

Eating candy
Rating: 5.9
BlackPath, Eating
2015

Figure 6.2: Example of unhealthy behaviors where user can select a familiar one.



Smoking
Rating: 8.3
BlackPath, Nicotine, Addiction
2015

Smoking makes you addicted.
Your skin gets grayer.
Your teeths gets yellow.
You can get lung cancer or COPD.
Higher risk at getting a hearth disease.
Longlasting coughing
Slime from the lungs with expectoration
Breathlessness on exertion

Whey you quit smoke you will notice:
After 20 min: Bloodpreassure drops to normal
8h: Oxygen in blood is normal
24h: Lower risk at getting heart attack
48h: Better sens of smell and taste
1 year: Chance for heart disease is halved

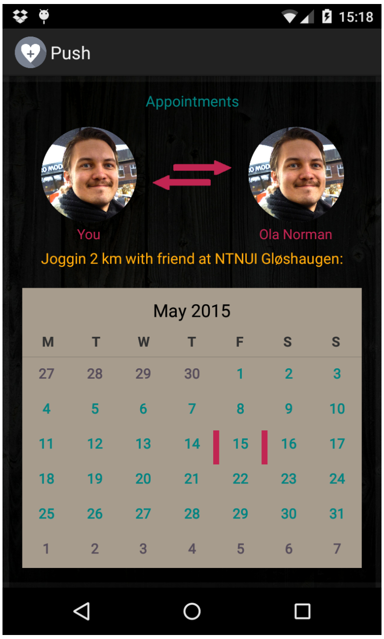
Figure 6.3: Example of information about a particular unhealthy behavior.

6.3 Preparation

In the preparation stage of the TTM, the user is aware of their unhealthy behavior and want to take small steps toward behavior change. According to Fogg, this is a gray type of behavior (Fogg and Hreha, 2010), where the user want to decrease their unhealthy behavior intensity (Section 2.1.4). Fogg also states that it is difficult to stop a behavior and that it is easier to replace it with a new or familiar one. This is how we get the *Blue* type of behavior connected with this stage, and we can use the findings from our case study.

If we take the example above with quit smoking, this should start with a *Gray Span* behavior, where the user is required to reduce their smoking, along with a *Blue Span* behavior, which is to e.g. begin with a jogging routine.

One problem to counter here is the motivation wave (Section 2.1.2). We can not predict when the user will have high or low motivation, but what we can do, is to prepare the behavior by doing it easier to do. In this example, it would be to remind the user to take with running shoes and outfit to school/work. When the user is finished studying/working, it is easier to hit the gym because you already have the equipment with you. What we learned in the results (5.2.6), is that youth like to have some social interaction, and one way to use this to a behavior change benefit, is to give the application the functionality to make a meeting schedule for exercise partners. If the user makes an appointment with another friend to hit the gym together (see Figure 6.4), it is harder to avoid the behavior because the social interaction have a big persuasive effect when it comes to not letting your friends down. If you do not have any training partners, the application could book a meeting with your personal trainer, which will have a similar effect. Another way to connect the user with other friends is to have a news-feed where the users can see each others activity, and get the feeling they are not alone, as shown in Figure 6.5.

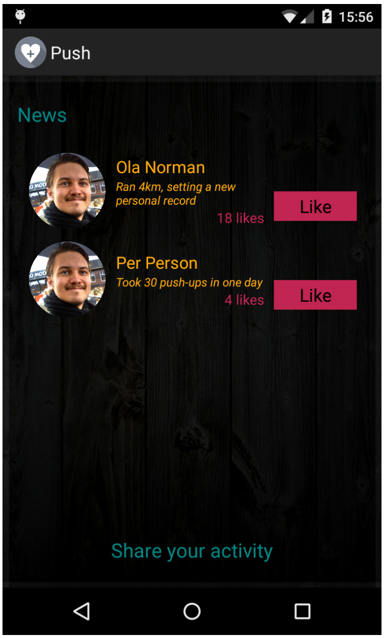


Joggin 2 km with friend at NTNUI Gløshaugen:

May 2015

M	T	W	T	F	S	S
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

Figure 6.4: This example show how two friends can connect with each other by creating an appointment between them.



Ola Norman
Ran 4km, setting a new personal record
18 likes

Per Person
Took 30 push-ups in one day
4 likes

Figure 6.5: Example of news feed implementation to get better social interaction with other users of the application.

We have now created a stage of how to prepare for behavior change, and the next stage is to keep the users using the application.

6.4 Action

The action stage is where the behavior change is currently happening. The problem we have to solve at this stage is how we keep the users using the application, and how we keep the users performing the behavior. The results on RQ1 are helping to answer the first problem, and RQ2 is helping to answer the second problem. The Gamification elements that the youth preferred is described in Section 5.2.6, and the suggested techniques from the Action stage in the TTM is also relevant. The techniques focus on restructuring cues and social support, bolster self- efficacy[1] for dealing with obstacles, and helps to combat the feelings of loss and reiterate long-term benefits.

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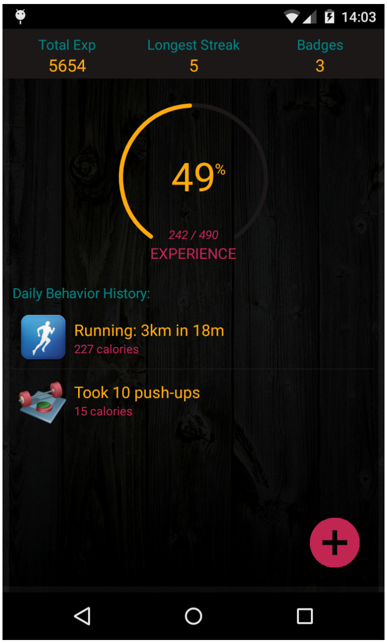
[1] Self-efficacy: A psychological term used to describe the strength of a person's belief in the ability to complete a task and reach goals.

It is important to not give the user too big goals, but rather small steps towards the BC. The increasing of behavior intensity comes over time, with the help of social interaction and Gamification.

As social interaction is an important aspect of keeping users and to better persuade them, the application must be either connected to an existing social network, or have its own network of social connections, communication possibilities and appointments as previously suggested.

Gamification is the key to keeping youth using an application for a time-period. The results say that *Progression* and *Achievements* are the most important and interesting game elements to implement, both for physical active and inactive youth.



Total Exp 5654
Longest Streak 5
Badges 3

242 / 490

Daily Behavior History:

Running: 3km in 18m
227 calories

Took 10 push-ups
15 calories

Figure 6.6: This is an example of how calories can be used as experience points. Each activity registers the estimated amount of calories burnt, and the percent shows the daily goal based on recommended daily calorie intake and the recommended amount of exercise.

The first game element *Progression* is a way of showing progression to the user. One interesting approach is to use experience points, where one experience point is equivalent to one calorie burnt (see Figure 6.6.) Let's say the user was jogging 3km for a week, has a body weight of 73kg and a heart rate of 70 beats per minute. He will then burn 225 calories during this exercise. When we think about ethics, it is important to foresee that some users might take this very serious and start to burn as many calories as possible. To prevent this, we will use a daily calorie requirement calculator, to calculate how many calories the users are required to eat every day. If the user burn more calories than the daily recommended limit, the application will stop counting the experience points, and give a warning to the user that the maximum daily activity is met. How to calculate the daily calorie requirement is described in Section 6.4.1.

The other Gamification element to include is the *Achievements*. The user can collect badges by completing tasks, goals, and challenges. An example of achievements in the context of the jogging behavior is to run 1km during a week, 5km, 10km, 25km, and 50km. Another achievement can be to run ten different routes, or jog in five different cities and so forth. Figure 6.7 shows an example of such an achievement system, and Figure 6.8 shows an example of the achievement details.

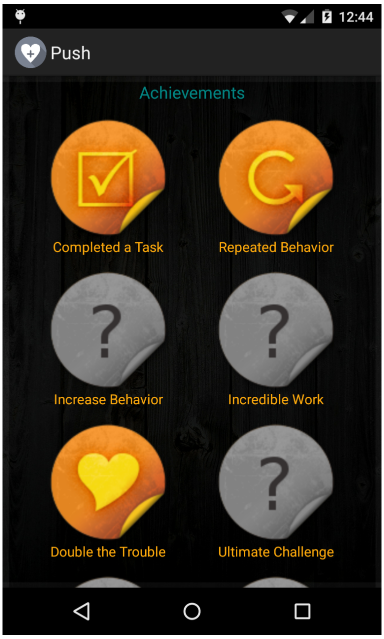
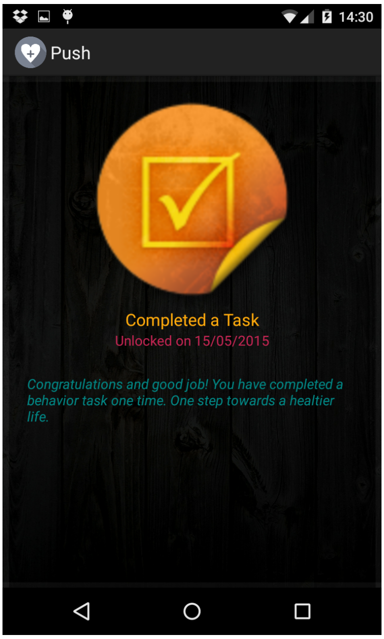

12:44
Push
Achievements
Completed a Task
Repeated Behavior
Increase Behavior
Incredible Work
Double the Trouble
Ultimate Challenge

Figure 6.7: Example view of list of badges, both unlocked and locked


14:30
Push
Completed a Task
Unlocked on 15/05/2015

Congratulations and good job! You have completed a behavior task one time. One step towards a healtier life.

Figure 6.8: Every achievement have its own view with a detailed description

6.4.1 Daily Calorie Requirement

It can be persuading to provide motivational facts to the users, like how many calories they burn, what they gain by doing a particular physical activity.

BMR (Basal Metabolic Rate) is the minimal rate of energy expenditure per unit time by endothermic animals at rest. In other words, how many calories you burn by not doing any physical activity.

Based on your gender, we have to calculate the LBM (Lean Body Mass) before we can find the BMR. Equation 6.1 and Equation 6.2 show how to calculate the LBM based on your gender, where W is a person's weight in kg, H is the height of a person in cm. The Equation 6.3 shows how to calculate the BMR.

Estimation of LBM for males: [2]

$$LBM = (0.32810 * W) + (0.33929 * H) - 29.5336 \tag{6.1}$$

Estimation of LBM for females: [2]

$$LBM = (0.29569 * W) + (0.41813 * H) - 43.2933 \tag{6.2}$$

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[2] `http://en.wikipedia.org/wiki/Lean_body_mass` (29.04.2015)

BMR estimation formula (The Katch-McArdle Formula): [3]

$$BMR = 370 + (21.6 * LBM) \tag{6.3}$$

Further, a person's daily calorie requirement is based on how physically active they are. A person will be in one of the following categories:

- Sedentary lifestyle - The person do little or no exercise at all. The daily calorie requirement is BMR x 1.2
- Slightly active lifestyle - The person does light exercise, which is between one and three times per week. The daily calorie requirement is BMR x 1.375
- Moderately active lifestyle - The person does moderate amount of exercise, which is between three to five days per week. The daily calorie requirement is BMR x 1.55
- Active lifestyle - The person does intense/heavy exercise six to seven times per week. The daily calorie requirement is BMR x 1.725
- Very active lifestyle - The person does very heavy/intensive exercise twice a day (extra heavy workouts). The daily calorie requirement is BMR x 1.9

Based on these calculations we can ask the users about age, weight in kg, height in cm and how often they exercise. The answer will be how many calories they need every day, and the amount of push-ups, jogging, or whatever will calculate how much they will burn, and roughly calculate how many kg they will loose during a week/month/year if they perform the behavior.

6.5 Maintenance

This is the maintenance stage of design, where we have to focus on maintaining the behavior. As the TTM states, it is important to reinforce the internal rewards, which is how people give rewards to themselves after completing a task. In psychology, a rewarding stimulus is a part of the reward system, which is the stimuli that the brain interprets as intrinsically positive or as something to be approached. This is closely related to the reinforcing stimuli, which is the stimuli that increase the probability of repeating behavior paired with them. When it comes to BC, this seems to be an important thing to do, to increase the maintenance of the behavior.

Dr. Alan Watkins, an honored lecturer in neuroscience, gives a tip on how to achieve an internal reward. One way is to do a little celebration jump, a little dance or a punch in the air while yelling “I'm awesome”. This will affect your emotion, he says, which will affect what you are feeling, which will then affect your thinking, which will affect your behavior, and at last, affect your reinforce stimuli. This chain of reaction is what naturally happens in the body from the progress of doing a little celebration dance, to the neurons that work on your reinforce stimuli. The application must, therefore, learn the user to perform such a celebration after completing their behavior (jogging/taking push-ups or what behavior they are performing). External rewards can also be included, which will be in the form of a like-button.

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[3] `http://en.wikipedia.org/wiki/Basal_metabolic_rate` (29.04.2015)

6.5.1 Competition

As described in Section 2.3.5, social comparison is important when it comes to competitive behaviors. People tend to self-evaluate by comparing themselves to others. As this is an unidirectional push between the actor and the target to be better and better, it is beneficial for them both. In other words, it is important with social interaction and a way competing against the users connections. The three variables that increase comparison are *relevance*, *similarity*, and *closeness*. This means that the users have to compete with the same dimension (a behavior both parties are interested in). If the application supports several behaviors as in our examples, the users must know with of their connections has the same interests. The similarity is the actors similarity to the target. If we use running, for example, the friend or competitive partner need the same goals as e.g. running five km for a week. The closeness tells us in what degree the relationship between the actor and the target is. It is difficult to measure this, but if the user can select their targets (competitive partners) this should not be of concern in the design.

As stated in (Garcia et al., 2014), there are four factors that are important when we talk about the psychology of competition. The *incentive structures* that is the things that motivate us, the *proximity to a standard* that can be a threshold like the number one ranking among friends. The *number of competitors* is self-explained, and *social category fault lines* that are the social categories like "Americans vs. the French", or "girls vs. boys". This can be achieved by introducing a list of high scores, like the top ten users. When we don't show every user ranking, people can't know if they are the worst "player" and lose motivation. When their ranking is hidden, unless you are one of the ten best, the users will keep their motivation. The high scores can be ordered by different factors like gender, country and type of activity, and show the total number of participants as an indicator of how difficult it is to become one of the top ten.

6.5.2 Artificial Intelligence

It sounds a bit dull to call it Artificial Intelligence (AI), but the application should be calculating the state of the user based on as few user inputs as possible.

The AI will work as the engine of the application, which uses statistics and logic programming to find out how to approach the users with their needs. People act differently based on their knowledge, social environment, IQ, genes, life experiences and so forth. If the user is not performing their behavior, we can use the AI to find out what persuasive technique or psychological theory to apply to the user. The variables from Fogg behavior model, Section 2.1.1, can be used to find out why the user is not performing the behavior. It is either the triggers, the ability or the motivation that is the bottleneck. For example, the application can ask the user for input on which of the ability factors that causes the user to not perform a behavior.

Time Does the behavior take too long time?

Money Does the behavior require too much money?

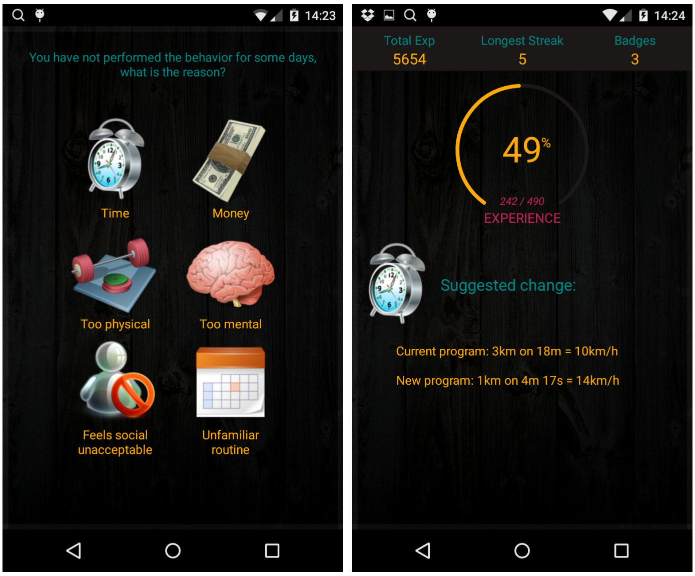
Physical Effort Does the behavior require significant physical effort?

Brain Cycles Does the behavior require significant mental effort?

Social Deviance Is the behavior strange; out of the norm?

Non-routine Is the behavior something you are not used to be doing?

Based on the user input, the AI can adjust the behavior by either making it easier to do, cheaper to do, less physical effort, and so forth. Figure 6.9 shows two examples on how we can feed user input to the AI.



You have not performed the behavior for some days, what is the reason?

Total Exp 5654
Longest Streak 5
Badges 3
242 / 490
EXPERIENCE
Suggested change:
Current program: 3km on 18m = 10km/h
New program: 1km on 4m 17s = 14km/h

(a) AI asks for user input (b) AI suggest change

Figure 6.9: Two views on how the AI asks for user input to reconstruct the user behavior to make the user perform it. In this case it is time which is a hinder and the AI suggests that the user should increase running speed, and run shorter.

Chapter 7

Discussion

This chapter summarizes what have been done, and discussion on the findings. The limitations of the research is described in Section 7.6.

7.1 Validity and Reliability of the Study

The quality of the case studies has to be of high levels of internal and external validity, as well as high levels of reliability. Yin's foundation for conducting case studies was used as guide (Yin, 2009). He states that reliability is important to secure that the same results can be replicated in an empirical study, and that this can be done by document all the steps in the research process. By developing a case study protocol that includes theoretical considerations, data collection methods and transcripts of the questionnaires. Because all the questions in the questionnaire had an open-ended answer box, many of the participants answered with own thoughts and ideas, which can give different results if the case is replicated, but the closed questions might give the same results.

Internal validity is used to minimize biased design, and is retained by an online questionnaire which stores the answers immediately.

To increase external validity, a strategy suggested by (Yin, 2009) is to view the case as an experiment, and look for analytical generalization by matching the cases against a theory. This way we can map results from the case study with external theories to strengthen the validity.

Confirmability is the comparable concern for objectivity. One difficulty is that it is inevitable to design a questionnaire that is not biased by the researcher. Therefore we must show that the findings are the results of the experiences and ideas of the informants and not the characteristics and preferences from the researcher (Shenton, 2004). The questionnaires was designed to collect both closed and open-ended questions, this way the researcher could collect facts and experiences and ideas from the informants.

The law in Norway prevents personal information to be used in research without the permission from the Norsk Samfunnsvitenskapelig Datatjeneste (NSD), which is the data protection official for research. An application has to be made to NSD to be allowed to use personal data in research, such as IP-addresses, gender, age and where they study. The application requires to send in the interview guide, the questionnaire and the information letter which is given to the informants which takes part in the case study. The application was approved, and the research got permission from NSD to conduct a case study. This allows the researcher to keep a track of the IP addresses, to verify that duplicates of answers from the questionnaire will not occur, and that the answers comes from unique people, making the results stronger.

7.2 Discussion on Research Question 1

How can we use Gamification and persuasive technology to persuade youths to be physical active for a period?

The qualitative results, as stated in Section 5.2.3, we found that one informant did very well with the process of taking push-ups, two took push-ups with minimal effort, and one quit the program. The four selected informants from the case study were carefully selected as they should represent the rest of the group. One male and female was physically active, and one male and female were inactive. The results makes sense when we compare them to the questionnaire conducted on all 30 participants. 13.5% of the participants did very well, 73% took push-ups with minimal effort, and 13.5% quit the program. These are not outstanding results, but the majority of the participants completed the case study with taking 5 push-ups almost every day for three months. Because the behavior is a *Blue Span* there is no requirement that the participants to increase or decrease the behavior, and the majority completed the case of three months, but according to the qualitative results as described in Section 5.2.4, the participants had individual experiences after the first two weeks.

The qualitative results on Gamification and persuasive technology in context of the participants experiences during the case study are stated in Section 5.2.6. These results shows that there is a large necessity of the game elements *achievements* and *progression* to keep youth persuaded to do physical activity. A new hypothesis can be created by these findings, which says that the amount of Gamification required in a persuasive application depends on the duration of the span. When the span is short, like two weeks, there should be enough with a notification as a signal, but if the duration is three months, you need achievements and progression. As we see in the results, one informant said that goals are important to keep the interest and motivation in place, and this thought of always seeking a goal and purpose can be enhanced by introducing achievements.

7.3 Discussion on Research Question 2

How can Gamification and persuasive technology be used to keep youths using an application for a period?

From the results in Section 5.2.1 we learned that the design only was good for two weeks, and that we need more motivational aspects, Gamification and social interaction to create an application that keeps the users interest for a longer time. To begin with the negative aspect of this result, we have to mention that the *Blue Span* behavior have an arbitrary length which is determined before the behavior change period begins. For example, the participants were supposed to have a span of three months, and the application should, therefore, be designed in such way that makes them keep the interest for three months. The positive aspects are that the application did persuade the participants for a period, but only for two weeks. The findings can be used in persuasive design where it is beneficial to keep the users for two weeks. It is important to note that this was conducted on Norwegian students, aged between 19 and 26 and that the results might differ in other ages, cultures, and environments.

When we look at the results from Section 5.2.2, we can conclude that the signal as a trigger (notification) only works when the users have a certain amount of motivation. This makes the design very complicated, because the motivation of people are constantly going up and down, and it is difficult to time a notification when the motivation within a person is high enough. A different way to look at this result is to suggest that a notification might not be a suitable digital approach for the signal as a trigger. Perhaps a social reminder is a stronger trigger, where the users get triggered by interaction with another person.

7.4 Discussion on the Case Study

The case study, as described in Chapter 4 was conducted on 30 participants over a period of three months. To gather good qualitative data for research, the amount of participants could have been higher. As the literature says a behavior change takes at least 18 days, the length of the study is considered acceptable. However, the number of participants could have been increased to get more reliable data and quantitative data. The participants are all native Norwegian and are students of a large university, which is not representative for the common youth in Norway. The average age could have preferably been lower than 22.7 as we are studying youth. We got 50% females and 50% males, which is a good distribution of gender. 80% of the participants are active, and 20% of them are inactive, which also is an uneven distribution.

7.5 Discussion on the Design Guide

The design guide is a persuasive technology design for youths and students, both active and inactive, aged between 19 and 25. The graphical design was not usability tested and might not be good, but was created to exemplify how an application can be designed by using the design guide.

An issue with the design guide is that we assume the user knows about the application and have the intention to install it. This means that they have some motivation and some intention from the beginning to change behavior. It can be discussed if this is outside the scope of this research, but it is an important aspect of persuasive technology.

The rating system suggested is just an idea that have not been tested, and could have been tested in a new iteration of the case study, if the researcher have had more time.

Because it is both time consuming, costly and more difficult to train people to use a new technology channel or a new design, it is easier to use something they are already familiar with. Therefore the use of smartphones and the use of design guidelines from Android (and Apple and Windows) is a smart choice. This is a product most people have and is familiar with.

The choice of taking daily push-ups was selected because it is a behavior that require some amount of discipline and motivation and is not easy for everyone to complete. Therefore, other types of behaviors can be used with the design guide to achieving a health-beneficial habit. The limits on selecting behaviors are how much motivation they require and that they are blue span behaviors. The ethical concerns with selecting behaviors will also need to be taken and carefully reviewed.

7.6 Limitations

Because the research studies persuasive technology, and how to persuade youth towards a new healthy behavior, there is a broad scope of psychology that can be included. As a computer scientist, this type of study should be closely cooperated with a psychologist, and because it has not been so, the project is limited to the understanding of the researcher. Because the amount of reading to understand this field is huge and difficult to grasp, it can be difficult to find and answer new questions within this field. The scope gets easily very broad, and, as a result, this led to a limited scope of psychology,

and a broader scope of technology.

It was difficult to find valuable information about youth in the literature; as a result, much of the theory is based on people, in general, which often applies to adults.

Other limitations are people that are different from the average man, like people with bad self-esteem, out-burnt, depressed, have an illness or a syndrome. However, these people tend to appreciate being normally treated, but on a psychological point of view, it might be different. These are special cases which requires more research, and can be interesting for further work.

Chapter 8

Conclusion

This chapter will state what is contributed in this research, and describe the conclusion. At last the recommendation for future work is disclosed.

8.1 Contribution

Behavior change is complex and requires a tailored solution to work on a targeted group. This research have contributed with how to achieve a *Blue Span* behavior among youth. We now know in what degree the signal as a trigger, in the form of notification, works to trigger youths to perform a certain behavior. We have also learned how to persuade both physical active and inactive youth for a two weeks, and which Gamification mechanics they require to keep using a persuasive application. We have also created a design guide with a conceptual model of how to achieve our research goal.

8.2 Conclusion

The research aimed at creating a design guide on how to create persuasive technology for persuading youth to perform a behavior for a period of time. This was done by conducting a case study on youth (19 - 25 years old) for a two months period. An Android application was created for this purpose, with a poorly designed progress game element and a signal as a trigger, which according to Fogg (see 2.1.1) is one of three types of how to trigger a behavior. The case study had 30 participants both male and females, and both physically active and physically inactive. This was because the behavior was physical task — to take push-ups every day — and it was interesting to see how and why this had an effect on the different youths.

The research questions was the following:

RQ1 *How can we use Gamification and persuasive technology to persuade youths to be physical active for a period?*

RQ2 *How can Gamification and persuasive technology be used to keep youths using an application for a period?*

The first research question can be answered with the findings from both the questionnaires and the interviews conducted with the informants that participated the case study. When we asked the participants if they took push-ups every day the answers were either *almost every day* or *often skip*. When we looked closer at the results, we see that the signal as a trigger (the Android notification) only was effective for a short period of two weeks, and not two month. The participants said that the notification should stop after two weeks because this is when it started to become annoying and counterproductive. It was important for the participants to have social interaction and progression to keep them persuaded to be physically active. The social context is where the users can communicate with each others and make appointments with another to not feel alone in the behavior task. The progression element in Gamification is important for the users to see changes in what they are doing. It is more motivating to notice a change and to set new goals when they have reach one.

The second research question is answered by the findings from the interview, and by background literature on Gamification and persuasive technology. First, there is much information on what game elements that is persuasive and which persuasive approach that is recommended to achieve goals, and this were included in the design guide. Second, it is the most important part, which is the results of the case study. Youth which often have a different perspective of what is persuasive contra an adult, says according to the results, that achievements and the social aspect are the main drives when it comes to keeping youths using persuasive technology for a period of time. The achievements give the user a constant goal and challenges to keep them occupied and always something to achieve, and it keeps them using the application.

Have we achieved the research goal? Partly. The average age of the youths in the case study was 22.7 and should preferably be younger. The case study could have been run for more iterations with all of the components from the design guide included. We could then achieve deeper understanding of the case and accept or discard the design guide, which at this point is mostly hypothetical. Youths have many interests, and they often change rapidly, so the *Blue Span* behavior is still a valid problem to solve to keep youth persuaded for shorter periods. 66% of the physically inactive participants completed the case of taking daily push-ups for two month (with exceptions like weekends and exam periods), while 83% of the physically active participants completed the case study (with similar exceptions). 30% of the participants said that taking push-ups had become a daily routine, which is the step before adapting a habit.

8.3 Future Work

The first and most important future work that is related to this research is to conduct a case study on younger youth and design an application based on the design guide created in this thesis.

A similar research with a target group of youth with bad self-esteem, out-burnt, depressed, have an illness or a syndrome or other special cases which is outside the norm is also interesting to look at.

It could be interesting with an longitudinal research, because it is registered that it takes up to 8 months to change a behavior, and it could be interesting to know why some people use longer time than others, which can use as little as 18 days.

Another suggestion for future work is how we can get youth/people to install a persuasive application that aims at persuade people to change a bad behavior or adopt good healthy behaviors.

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Appendix A

Information Letter

This appendix includes the information letter given to the informants for the case study.

Forespørsel om deltakelse i forskningsprosjektet

Dette er et informasjonsbrev om hva studien omhandler og hvilke konsekvenser deltakerne får ved samtykke.

”A behavior change intervention – can digital triggers be used to change a youth’s behavior”

Bakgrunn og formål
Dette studiet er en masteroppgave ved NTNU, institusjon for datateknikk og informasjonsvitenskap (IDI). Formålet er å finne ut om teknologi kan bli brukt som en trigger for å hjelpe personer til å endre vaner.

Du har blitt valgt fordi du er en student mellom 18 og 25 år gammel, og du har meldt at du frivillig vil delta i undersøkelsen.

Hva innebærer deltakelse i studien?
Studien innebærer at deltakeren skal ta push-ups daglig dersom det er mulig. Det er opp til deltakeren å ta push-ups eller ikke. Deltakeren vil få tilsendt spørreundersøkelser flere ganger i løpet av studien som tar 5 minutter å svare på. På slutten av studien vil deltakeren delta på et intervju som varer en drøy time. Dette skal undersøkes ved at deltakeren skal ta push-ups daglig, hvor antall push-ups er frivillig. Spørsmålene vil omhandle hvorvidt deltakeren har tatt push-ups daglig eller stoppet, og hvor mange push-ups som er planlagt eller endret underveis. Spørsmålene omhandler alder og hvor ofte personen trener fysisk ved siden av studien. Det vil kun være lagret notater på datamaskin.

Hva skjer med informasjonen om deg?
Alle personopplysninger vil bli behandlet konfidensielt. Informasjonen vil bli brukt til å sammenlignes mot andre sin informasjon for å finne likheter eller ulikheter som kan bli diskutert i rapporten. Personen vil bli referet til som Person XXX, hvor XXX vil bli erstattet med et unikt nummer.Det er kun studenten og veileder som har tilgang til personopplysninger.

Deltakeren vil ikke kunne gjenkjennes i en publikasjon.

Prosjektet skal etter planenavsluttes 1. Juli 2015. Personopplysninger vil bli slettet, og datamaterialet vil bli anonymisert ved prosjektslutt.

Frivillig deltakelse
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert.

Dersom du ønsker å delta eller har spørsmål til studien, ta kontakt med
Student: Robin Tordly, 94184919, robin.tordly@gmail.com
Veileder: Babak Farshchian, 73594451 baf@idi.ntnu.no

Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS.

Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

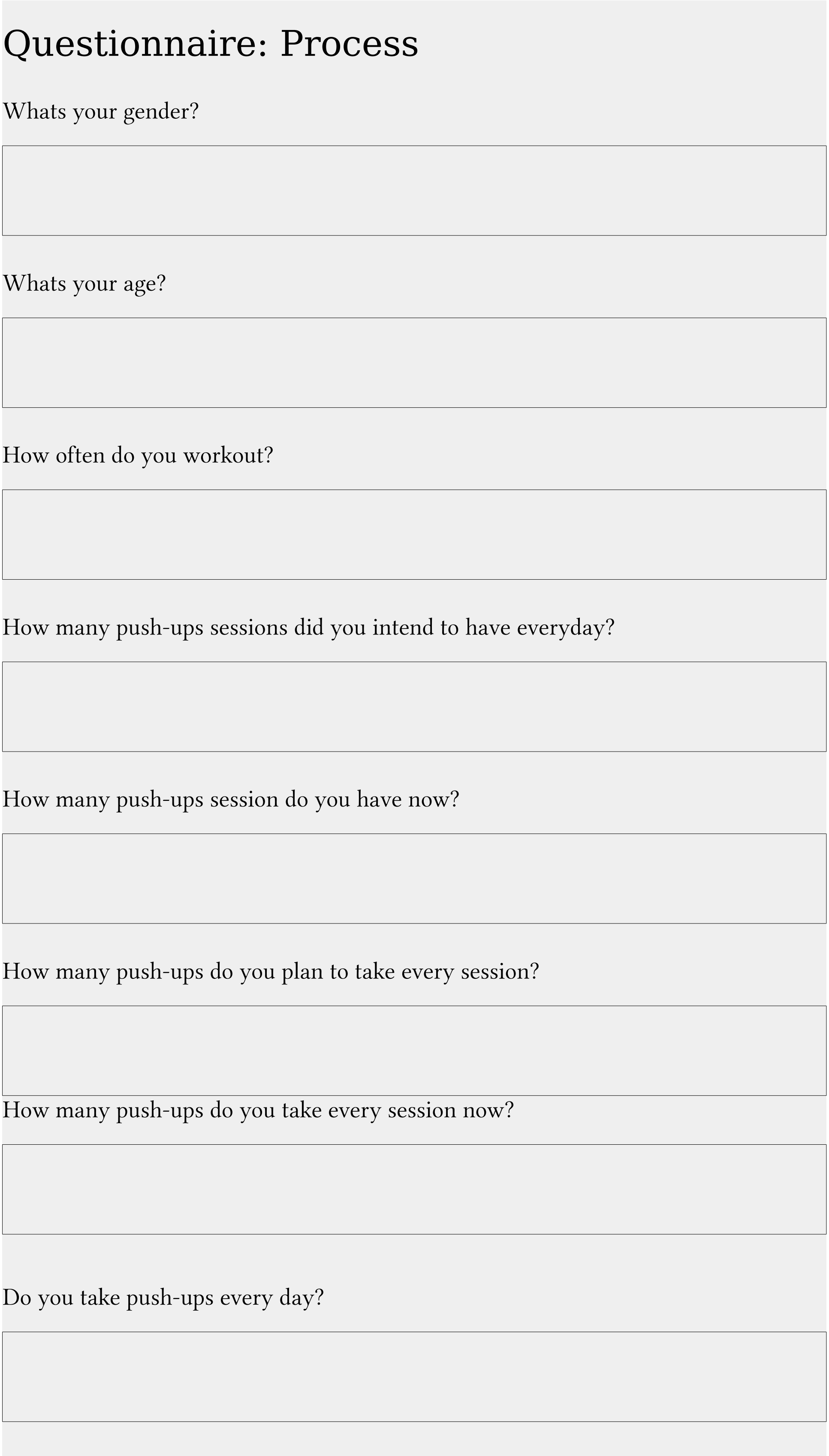
----
(Signert av prosjektdeltaker, dato)

☐ ***Jeg samtykker til å delta i intervju***
☐ ***Jeg samtykker til å delta på spørreundersøkelse***
☐ ***Jeg samtykker til at personopplysninger kan publiseres etter prosjektslutt***

Appendix B

Questionnaire

This appendix includes the online questionnaire conducted on the informants during the case study.



Questionnaire: Process

Whats your gender?

Whats your age?

How often do you workout?

How many push-ups sessions did you intend to have everyday?

How many push-ups session do you have now?

How many push-ups do you plan to take every session?

How many push-ups do you take every session now?

Do you take push-ups every day?

If you ever skipped some push-ups, what was the reason?

Do the notification work? Do you take push-ups when you get notified?

Is the notification intrusive or annoying in some way?

Do you feel that the application is helping you to take push-ups daily?

Will you continue using the application?

What do you think should be different with the application?

Do you feel that taking push-ups is a part of your daily routine?

Is taking push-ups become an habit, or do you still have to be notified?

Appendix C

Interview Guide

This appendix includes the interview guide used for planning the interviews of the informants.

Intervjuguide: Masteroppgave

Fase 1: Rammesetting	**1. Løs prat** (5 min) • Uformell prat
	2. Informasjonsprat (5-10 min) • Fortelle om temaet for samtalen (at det er en mastergrad og at det skal samles inn informasjon til studien. • Fortelle om taushetsplikt og anynomitet. • Spørre om noe er uklart og om respondenten har noen spørsmål
Fase 2: Erfaringer	**3. Overgangsspørsmål** (15 min) • Hva slags erfaringer respondentene har hatt med Android applikasjonen og hvordan det har vært å ta push-ups.
Fase 3: Fokusering	**4. Nøkkelspørsmål** (45 min) • 3-5 nøkkelspørsmål • Oppfølgingsspørsmål
Fase 4: Tilbakeblikk	**5. Oppsummering** (15 min) • Oppsumere funn • Har jeg forstått deg riktig? • Er det noe du vil legge til?

C.1 Interview Questions

These are the questions that were asked during the interviews of the informants.

Personals
Whats your age?

Whats your gender?

Are you physically active?

Experiences
What experiences have you had with the use of the Android application? Did the notification have any impact on you, like a signal to remind you to take push-ups? Did you you miss any form of functionality, or was did the application have everything you needed? Was it too much with notification every day?

What is your experiences with taking push-ups every day? Was it hard, was it easy? Was it motivating or unmotivating? Was it fun, or boring?

Key Questions
Have the application in some way helped you towards the goal of daily push-ups?

Have the application in some way been counterproductive, in the light of motivation, spam, design, lack of functionality, boring to use, crashed, not enough users/friends, etc?

What can you say about the process of taking push-ups? Have you increased/decreased the amount of push-ups? Have you increased/decreased the amount of sessions? Have you had any breaks from the program, or have you quit the program?

(Explain to the informer what gamification and persuasive technology are)
The focus are on gamification and persuasive technology. Have you had any experiences from other applications that you think might be using this? If so, did any of them have any impact on you, and do you have any ideas of why it had an effect on you?

Follow-up Questions
If you were in charge of the design and creation of the application, what would you have changed/included/excluded from the application, and why?

Do you want to continue using the application? If so, why do you think you would continue using it. If no, why do you think you don't want to continue using it?

Appendix D

Attached File

This thesis comes with an attatched zip file that contains the Android project source code, developed for the case study, and for the graphical Figures in the design guide. The file is named Push.zip.