How to encourage stretching and breaks at work

Understanding long term usage of a behaviour change support system

Magnus Brändström
Albert Dueso
Abstract

We are spending more and more time seated at work, which increases the risk for health problems. Behaviour change support systems that encourage breaks and stretching at work have been used as interventions to try to reduce these problems. No previous studies had looked at how these systems were used for long periods of time. In this qualitative study based on ten interviews, we aimed for expanding our understanding of long-term usage of such systems by studying one called ‘Efons’. The results indicate that the main factors influencing long-term usage are timely reminders, the impact that the stretching exercises has on the users’ health and the education of the user about health recommendations. We also found elements we argue have the ability to influence long-term usage and currently do not exist in the system studied or its context of use, such as adapt the system to the needs of the user or provide education about why these systems are useful.

Keywords: Persuasive technology, BCSS, workplace interventions

1. Introduction

In Sweden, 76 % of the working population is using computers in their work, and 40% spend at least half of their workday at a computer. Of them, 16%, or about 670 000 people have problems with working too much at the computer (Statistics Sweden, 2012). Sitting for long periods is associated with health problems (Healy, Matthews, Dunstan, Winkler and Owen, 2011; Thorp, Owen, Neuhaus and Dunstan, 2011; Tremblay, Colley, Saunders, Healy and Owen, 2010). There is a growing understanding that this increasing sedentary time, together with low levels of light intensity physical activity, results in poor health independently of the time spent in moderate or vigorous activity, such as going to the gym or running (Hamilton, Hamilton and Zderic, 2007; Healey et al., 2008a; Healy et al., 2008b; Peterson, Sarma and Gordon, 2012; Public Health Agency of Sweden, 2012; Tremblay et al., 2010). For a lot of adults with full-time employment, the bulk of their sedentary time occurs at work (Brown, Miller and Miller, 2003). Increased sedentary time at work is being recognized as a risk factor for health problems, among them obesity (Chau, van der Ploeg, Merom, Chey and Bauman, 2012; Graff-Iversen, Selmer, Sørensen and Skurtveit, 2007; Mummery, Schofield, Steele, Eakin and Brown, 2005). Prolonged sitting and computer usage is also associated with cumulative trauma disorders (CTD) - a collection of chronic musculoskeletal disorders caused by frequent, sustained and repetitive movements (Trujillo and Zeng, 2006), which have been associated with large number of reported work-related injuries (Bohr, 2000). Repetitive activities in a relatively static position can lead to strain injuries (Foye, Cianca and Prather, 2002), which are diseases or trouble in the extremities that have been caused by longer physical and/or psychological strain at work. They can occur in hands, wrists, shoulders, neck, back, hips and knees (Yassi, 1997), and are common in many professions, but it can be assumed that an increase in usage of computers at work and at home is directly related to the increase of strain injuries (Trujillo and Zeng, 2006).
Recent studies show that taking frequent breaks from sitting is associated with a healthier metabolism, independently of the total sitting time (Healy et al., 2008a) and can together with walking, lower glucose and insulin levels in overweight adults (Dunstan et al., 2012). Mclean, Tingley, Scott and Rickards (2001) investigated the advantages of microbreaks. They did not find any negative effects on productivity, however they found positive effects in a decreased discomfort in the muscles often associated with computer-related strain injuries. Henning, Jaques, Kissel, Sullivan and Alteras-Webb (1997) found that by taking short breaks from computer work for 30-60 seconds in 15-minute intervals during the whole day increased workers capacity and well-being. They also found that short pauses combined with exercise (unspecified which kind) were more effective than passive pauses. It has been shown that by taking short breaks from work and doing stretching exercises, strain injuries can be prevented. To be effective, these pauses and exercises must be done regularly (Trujillo and Zeng, 2006). Numerous interventions have been tried to reduce the problems associated with prolonged sedentary time and repetitive movements, such as educating staff about the problems with sedentary time, introducing adjustable desks at work or promoting incidental office activity (Alkhajah et al., 2012; Healy et al., 2013; Parry, Straker, Gilson and Smith, 2013).

Information technologies always have an influence on people’s attitudes and behaviours (Oinas-Kukkonen, 2013). This influence can be intended or unintended. The interactive information technology which is intentionally designed for changing the user’s attitude or behaviour is known as persuasive technology. There has been promising usage of persuasive technology to reduce sedentary behaviour and promote breaks at work (Dantzig, Geleijnse and Halteren, 2013; Hedge and Evans, 2001; Morris, Brush and Meyers, 2008; Jafarinaimi, Forlizzi, Hurst and Zimmerman, 2005) as well as in related areas, i.e. encouraging physical activity at work (Fortmann, Stratmann, Boll, Poppinga and Heuten, 2013; Foster, Linehan, Kirman, Lawson and James, 2010).

A relevant contribution to this field was done by Oinas-Kukkonen (2010), which introduced the concept of behaviour change support system (BCSS) as the core of research on information systems that are designed to change, alter or reinforce behaviours, attitudes or compliance, and provided a foundation for designing and evaluating this kind of systems.

To the best of our knowledge, previous research studies of BCSS that encourages physical activity and/or breaks in sedentary time at work have only been conducted with users that have been using the system for a limited period of time. We claim that one of the challenges in designing and developing a successful BCSS for breaking up sedentary behavior is to get people to use it for a long period of time, even when the positive effects of these behaviors are not obvious to the users. Currently, there seems to be no studies addressing long-term usage in this setting. Another challenge, as stated in Oinas-Kukkonen (2013), in the BCSS open research agenda, is to “know which software features or combinations of software features have the greatest impact in different settings” (Oinas-Kukkonen, 2013, p.1232). There are few studies that address what software features have the greatest impacts on stretching and taking breaks at work.

In this study, a BCSS used to break up sedentary time and promote stretching at the workplace was investigated. This system was used as a tool to better understand this kind of
BCSS. It was not the system itself that was the main interest, but what this system and its users could tell us about the design of similar systems.

1.1. Research questions
While using this kind of system and other BCSS that encourage behaviours whose effects might not become apparent for a long time, users might not see or appreciate the value of upholding certain behaviours if they are not experiencing the negative effects that might result from e.g. an inactive lifestyle. The research questions that we have set out to answer in this thesis are:

- How can we more successfully design BCSSs that encourage breaks and stretching at work that can engage users over long periods of time?
- What software features or combination of software features have the greatest impact in encouraging breaks and stretching at work?

1.2. Purpose
The purpose of the study is to expand the understanding of what makes people use BCSSs that encourage breaks and stretching at work for long periods of time. By doing so, we should be able to say something about the design of systems like these.

1.3. Outline
Firstly, related research to the area of interest is presented in section two. Section three contains the research approach, a description of the system used by our informants, techniques for data gathering, analysis and sampling, including a presentation of our informants. The section is ended with subsections on ethical concerns and the rigour and relevance of the study. In section four, the results and the outcome of our analysis is presented, followed by a discussion in section five, as well as perspectives on the study and directions for future research. In section six, the conclusions of the study are revealed.

2. Related research

2.1. Persuasive technology
Fogg (2002) first brought the connection between persuasion and computers into the field of HCI, with the concepts of persuasive technology and “captology”.

Persuasive technology is broadly defined as any interactive computing system designed to change people’s attitudes or behaviour (Fogg, 2002: p.1). In his seminal book, Fogg (2002) introduced the term called captology to describe technology that is designed to be persuasive, that focuses on behaviour change and that is the result of human-computer interaction. Captology describes the area where computing technology and persuasion overlap. The conceptual framework of the functional triad was introduced, which illustrated different roles computing technology can play as tools, media and social actors. More recently, the concept of behaviour change support systems, whether web-based, mobile, ubiquitous or more

---

1 Human-computer interaction
traditional information systems, have been proposed to be treated as “the core of research into persuasion, influence, nudge and coercion” (Oinas-Kukkonen, 2013: p.1223) although persuasion is in focus. A BCSS can be defined as “a socio-technical information system with psychological and behavioural outcomes designed to form, alter or reinforce attitudes, behaviours or an act of complying without using coercion or deception” (Oinas-Kukkonen, 2013: p.1225). We claim that this definition encompasses the ICT systems that have previously been used as interventions at workplaces, in particular to reduce or break up sedentary time, and the systems used to encourage physical activity through technology that are presented in the related research below. Even though those articles are not using the concept of BCSSs, the systems descriptions fit into the definition, and hence, they will be categorised as such in this thesis.

In Oinas-Kukkonen (2013) a foundation upon which BCSSs can be studied is presented, the archetypes of BCSSs and the design process is described. Two main tools to better frame research and design activities are provided: the outcome/change matrix (O/C Matrix) and the persuasive system design model (PSD). The O/C Matrix consists of what is presented as the archetypes of behaviour change: a change in complying, behaviour change and attitude change, combined with a breakdown of the type of change itself into a forming, altering and reinforcing outcome. The model is used to specify what kind of change and outcome a system is designed to support. The PSD model is a vehicle for designing and evaluating BCSSs and presents key issues behind persuasive systems, the persuasion context and design principles for design of persuasive systems (Oinas-Kukkonen and Harjumaa, 2009). For an overview of the model, see Appendix 5.

The PSD model defines seven persuasion postulates which are based upon the author’s empirical work, conceptual analysis and other research. The postulates were first published in Oinas-Kukkonen and Harjumaa (2009) and later modified in Oinas-Kukkonen (2013) and they have to be taken into account in order to understand the key issues behind persuasive systems. The first postulate state that IT is never neutral, it always influence the user one way or another, intended or not. Building BCSSs requires insight from both software and information systems design, and also from psychology; in the second postulate, it is stated that people want their world-view to be organized and consistent. Other lessons learned from psychology are that persuasion is seen as often incremental and that the direct and indirect routes are key persuasion strategies. In terms of Software design requirements it is important that BCSSs should be both useful and easy to use, that they need to be unobtrusive to the users primary tasks, and that BCSSs always should be transparent (Oinas-Kukkonen, 2013: pp.1227-1228). If a system is difficult to use or does not support the user’s most important interests and needs, it is unlikely to be persuasive or used for a long period of time. Many of the aspects in developing BCSSs are not specific to this kind of systems, but concern general software design and content creation issues; e.g. lack of errors, ease of use, high information quality, attractiveness and high overall usability (Oinas-Kukkonen, 2013: pp.1228-1229).

---

2 Information- and communication technology
3 The direct and indirect route to persuasion emphasise facts and emotions respectively. For further information, see for example Myers (2012).
Other than the seven postulates, the next important step when developing a BCSS is to analyse the persuasion context – the intent, event and strategy for persuasion. This is done to identify when a message is to be delivered. The O/C matrix can be used here to analyze the intended outcome/change. Similarly, the message, its route, the user and use situation, and technological issues should be solved. The PSD model also includes categories for persuasive system design principles: primary task support, dialogue support, perceived system credibility and social support (see Appendix 5 for a summary of these design principles).

The primary task category includes system qualities supporting the most important tasks of the user. In any interactive system, some degree of feedback is provided to the user and thus the principles in the dialogue support category are related to implementing computer-human dialogue support in a way that helps the user to move towards their goal or target behaviour. The design principles included in the system credibility category concerns how to design a system that is perceived as more credible. Design principles that are in the social support category describe how to design a system that leverages social influence to motivate its users (Oinas-Kukkonen and Harjuuma, 2009: pp.491-496). The PSD model does not claim that all possible software features presented should always be implemented in a BCSS (Oinas-Kukkonen, 2013: p.1228). The model has been used in several qualitative studies and evaluations, including a three-month-long qualitative field trial, exploring how a training program in a new prototype heart rate monitor promotes proper exercising (Harjuuma, Segarståhl and Oinas-Kukkonen, 2009).

### 2.2. Previous studies of BCSSs

The new opportunities afforded by cloud computing infrastructure, which enables large amounts of data to be collected and processed unobtrusively, have triggered a growing interest in systems that record personal life events (Calvo and Peters, 2006: p.1). There has also been a growing interest in using these opportunities and commercial products to record data on personal activity, such as sleep, eating habits, spending and physical exercise, to improve one’s life (Wolf, 2010). This growing movement is called the quantified self, and is concerned with using wearable sensing and wearable computing to improve everyday functioning, not in the least with commercial systems such as FitBit⁴, Fitocracy⁵ and Nike Fuelband⁶. These systems provide feedback on users’ activities, so that they can ultimately improve their performance and everyday functioning by making connections between behaviour and feedback, and by viewing their progress. BCSSs are another type of systems that are used by people with the goal of improving the user’s lives. There are a plethora of BCSSs available, not in the least in the health domain, where positive results have been reported in a variety of areas: managing smoking cessation, hazardous drinking, stress, anxiety, depression, complicated grief, insomnia, obesity diabetes and asthma (Stretcher, 2007: p. 58).

---

⁴ [https://www.fitbit.com/](https://www.fitbit.com/)
⁵ [https://www.fitocracy.com/](https://www.fitocracy.com/)
2.2.1. BCSSs promoting physical activity

The following is a description of studies and key findings that have been done on BCSSs that encourage physical activity.

In Bort-Roig, Nilson, Puib-Ribera, Contreras and Trost (2014), a systematic review of smartphone technology and their viability for measuring and influencing physical activity was performed. They included 26 articles in the review, and found that smartphone strategies to influence physical activity tended to be ad-hoc rather than theory based. The most useful strategies identified as useful to encourage physical activity were:

- Physical activity profiles
- Goal-setting
- Real-time feedback
- Social support networking
- Online expert consultation

The authors see the range of novel engaging intervention strategies which are used by smartphones, as potentially useful for physical activity promotion. The users’ perceptions on using these kinds of interventions were found to be positive as well. However, the intervention effects reported in the literature are modest at best.

A meta study by Van Sluijs, Van Poppel, Twisk, Brug and Van Mechelen (2005) found that computer-tailored interventions have the potential to improve health. In Moualed, Jones and Hermens (2011) a Feedback Agent was developed to motivate physical activity. The system gave its users tailored feedback through an algorithm based upon information supplied by the user. The authors found and highlighted three important aspects of user feedback: the timing, content and representation of feedback. Timing and content can be understood and configured using algorithms. Consolvo, Klasnja, McDonald and Landay (2009a) studied another system, UbiFit, which was developed and tested with 28 users in a three month field study. The paper explores individuals’ reactions to goal-setting, specifically goal sources (who should set the goal) and timeframes (over what time period should an individual have to achieve a goal). They conclude that most participants prefer to set their goals themselves, and that the preferred timeframe is from Monday to Sunday. Another interesting finding was that the target audience (for a BCSS encouraging physical activity) should be individuals for whom physical activity is something important. An implication from goal-setting theory is that having individuals making their goals public could also be effective in increasing goal commitment.

The self-setting of goals for physical activity and the effect of this on perceived difficulty, importance and competence was explored in Saini and Lacroix (2009). In the study, 48 people were using a system with unobtrusive wearable sensors that measured their physical activity for ten days, and were provided with daily graphs with their physical activity by email. The authors claim that many individuals have intentions to change, and goal setting support is needed to comprise goals that accurately reflect these intentions. It was found that feedback is important for achieving goals, since that can be used to monitor progress towards goals, and that the self-regulatory mechanisms that justify the investment of effort towards
goal achievement are affected by goal commitment (i.e. which is a manifestation of the level of importance or attractiveness of the goal). It also highlights that one of the most consistent findings in goal-setting research is that specific and difficult goals lead to higher levels of performance than vague and easy goals.

Crone, Smith and Gough (2005) claimed that sharing information and collaborating in the context of exercising has an influence on people’s level of activity. In Munson and Consolvo (2012), two BCSSs with the intent of promoting physical activity were developed to better understand how goal-setting, rewards, self-monitoring and sharing can encourage physical activity. The study was conducted with 23 people during 4 weeks. Key findings were that participants prefer to have both primary and secondary goals and that trophies and ribbons used as rewards were not very motivating. Another finding was that sharing (posting to particular friends) was used to some extent, but it was problematic since the participants had concerns about how often and to whom they should share the results. They also advice using the principle of *kairos* when using reminders: it should be combined with contextual awareness so that reminders can be delivered at the right time.

### 2.2.2. BCSSs that promote physical activity at work

Studies investigating the usage of BCSS that encourages physical activity at work have been conducted. In Hirano, Farrell, Danis and Kellogg (2013) the usage of the mobile application *Walkminder* is studied. It has a glanceable display that shows individual level of physical activity and uses vibrations to interrupt extended periods of inactivity. The system was unobtrusive and was able to heighten the user’s awareness of physical activity, but did not increase physical activity. Another paper explored the use of the “MoveLamp”, an ambient light display that used the battery metaphor to display the information of activity, in order to help users to keep track of their activity and encourage them to integrate a little physical activity into the day (Fortman et al., 2013). The authors pursued three main design goals that were inspired by the proposed design strategies to support behaviour change presented in Consolvo, McDonald and Landay (2009b):

- Support user’s awareness of his or her continuous sitting duration
- Give feedback on the amount of activity the user has done recently
- Present the information in a motivational and unobtrusive way

Results showed an increase in the number of steps taken by the ten persons who participated.

Another study that examined physical activity at work conducted by Foster et al. (2010), evaluated a Facebook application where users logged data gathered by a pedometer in either a social or a solitary condition. Findings show that the social condition; which included sharing, comparing and commenting upon others results, were more motivating to users, since it made them engage in more activity.

Barkhuus (2006) also argue that self-monitoring and social comparison might motivate users to increase physical activity. Research conducted by Lin, Mamykina, Lindtner, Delajoux

---

7 Introduced by Fogg (2002, p.43)
8 Graphics understandable at a glance, requiring little attention
and Strub (2006) studies the game called “Fish’n’Steps”, which linked a player’s daily step count to the growth and activity of an animated virtual character (a fish in a tank) in order to increase the physical activity of the player. The study used a transtheoretical model of change, that “systematically integrates the stages with processes of change from diverse theories of psychotherapy” (Prochaska, DiClemente and Norcross, 1993 p.1) to measure the advances of players, before, during and after the study and checked if physical activity was increased. Lessons learned from the study places emphasis on the value of games such as Fish’N’Steps to encourage rather than provide negative reinforcement when individuals are not meeting their own expectations, to promote long-term behavioural change.

In Consolvo et al. (2008), a system using glanceable mobile displays is studied, “Ubifit” (where particular elements are examined in Consolvo et al. 2009a) which builds upon findings on using positive reinforcement, found in Gasser et al. (2006), Lin et al. (2006) and Consolvo et al. (2006). Results showed that participants who used the system were able to maintain their physical activity level over time during the three-month study, compared to participants who did not use the system.

The study by Cercos and Mueller (2013) presented a design of a semi public display that showed the step count of a group of players in near real-time, using a wearable self-monitoring device: “Fitbits”. The authors claim that there is an opportunity for these kinds of displays to support groups in increasing their physical activity, by enabling social support and creating new ways of interaction between members of a community based on the number of steps. Their findings show that the system motivated the players to use a self-monitoring device daily, and enabled new conversations among players without producing privacy issues.

2.2.3. BCSSs promoting breaks in sedentary behaviour at work

There are a multitude of commercial software systems that encourages stretching and breaks in sedentary behaviour at work, e.g. Efons (used by our informants), Ergopop9, Pausit10 and Stretch Break11. Nilsson (2007) studied the usability of Efons and concluded that it was easy to use. There is also research which has more specifically looked at how BCSSs can encourage breaks in sedentary behaviour at work.

The system “Superbreak” presented in Morris, Brush and Meyers (2008) encouraged users to take interactive breaks, in comparison to just see a timer. Users preferred Superbreak to more traditional break-reminder software. The study shows that participants chose not to skip interactive breaks despite the relatively high demands on screen space and consequent intrusiveness on workflow, which supports the notion that interactivity is a strong motivator for taking breaks. Jafarinaimi, Forlizzi, Hurst and Zimmerman (2005) presented another system, “Breakaway” which was designed to reminder users to take breaks. It used a stick-figure that changes pose depending on how the users were sitting by using sensors placed in their chair. An initial evaluation showed a correlation between the movement of the sculpture and when participants took breaks, which indicates that using an ambient displays, that makes use of an aesthetic and lifelike form might be promising for

9 http://www.ergopop.com/
10 http://www.pausit.se/Home.html
11 http://www.paratec.com/
making positive changes in human behaviour. The person who tested this system for two weeks found it nice, aesthetically pleasing and stated that it was unobtrusive. In Trujillo and Zeng (2006), the break software “Stop & stretch” was developed and installed to prevent CTDs caused by computer usage at work. Nineteen users’ opinions to the program were investigated. The results indicated that the users were satisfied with the system, and it had sufficient usability and acceptance within a workplace setting, and the authors claim that it might be applied to other similar work settings. The program was not measured against any other program or condition, and its features were not described, only that it had a limited time interval for suggesting breaks.

Monsey et al. (2003) focused on a BCSS that supported breaks in sedentary time. They collected data from a convenience sample of 26 participants who were instructed in a stretching program to prevent repetitive strain injuries, and assigned to either a treatment group with the computer reminder software or a control group without the software. To measure compliance, all participants recorded the number of times per day they stretched. They were instructed to record data for eight business days. A statistically significant difference between the groups was not found, but the study shows that there is great potential for increasing compliance with programs such as the Stretch Break PRO versus stretching programs without computer reminder software.

Dantzig, Geleijnse and Halteren (2013) present results on how to create an effective persuasive mobile application aimed at reducing sedentary behaviour. The “SitCoach” application was developed to nudge office workers from their seats. The program monitored physical activity and sedentary behaviour and provided timely persuasive messages that suggested active breaks. A test showed that users have little awareness of their prolonged sitting behaviour, and they considered their ability to take active breaks to be highly dependent on external factors. The authors claim that solutions therefore should support people on controlling sedentary behaviour. In the second part of the study, a six-week experiment, workers received messages on their mobile phone advising them to take breaks whenever they were sitting for too long at their computer. Based upon the results, the authors recommend timely reminders as an effective mean to reduce sitting breaks. They argue that providing persuasive content might not be necessary; that simple reminders on a smartphone are sufficient to trigger short breaks. They recommend that these reminders should be discreet and unobtrusive, and that these reminders should be able to be disabled in certain situations. They further recommend that people’s autonomy should be respected and give them control over their behaviour; break reminder applications are often considered to be annoying because they undermine autonomy and disturb people at untimely moments.

2.3 Summary and shortcomings of related research
In this section, we have introduced persuasive systems and a model for studying BCSSs. We have presented research of BCSSs that encourage physical activity, as well as stretching and taking breaks at work, which have broadened our knowledge into this particular area. Firstly, we introduced the PSD model, which has guided us by providing a foundation for evaluating and understanding these kinds of systems. This model has facilitated the discussion of system features by providing us with a language to talk about them (see section 5). Secondly,
interesting findings from previous research about BCSSs that encourages physical activity and stretching and pauses at work were presented. Below is a summary of them:

- Users should be made self-aware of activity levels
- Feedback provided to users should use only positive reinforcement
- Supporting social influence in system encouraging physical activity could be motivating for user
- The system should be unobtrusive and provide timely reminders
- Goal-setting may be beneficial for increasing activity and motivation in systems promoting physical activity

To best of our knowledge, previous studies of BCSSs which encourage physical activity and/or breaks in sedentary time at work have not addressed long time usage. Related research presented in this section was conducted with users that used the system for a limited period of time and it is lacking an understanding of how long-term usage of systems in this setting is supported. The systems are also often described briefly or not at all. A few studies of BCSSs conducted in this setting have provided some insight into what software features that successfully impacts behaviour change, but findings are limited.

2. Method

In this section, the research approach and data gathering techniques are presented. A description of the system used by our informants and its functions is provided. Data gathering, sampling and a presentation of the informants is provided, as well as a description of our data analysis. The section ends with a discussion on ethical concerns and the rigour and relevance of our study.

3.1. Research approach

Given the application under evaluation and the setting in which it was used; we decided to not conduct observational studies to gather data such as ethnography or contextual inquiry mainly due to time constraints. Moreover, observational studies might provide biased results due to the observer effect (Schensul, Schensul and LeCompte, 1999). Efons, the system evaluated in this study, acts as a reminder for taking breaks and stretch every certain amount of time and it was considered that the fact of being present with the informants might induce them to take more breaks or at least increase their willingness to comply with the software demands. Therefore, it was opted for obtaining the information from the user itself rather than from the observation of his/her behaviour. A qualitative research study was conducted, based on interviews with the informants in order to gather data about their experience using the application. Ten semi-structured interviews were conducted, focusing on how the users have been using the system, what features they use and appreciate, how they perceive certain suggested features, and what improvements could be made in the system. This was done in order to gain in-depth knowledge about the informants’ behaviours and decision making, and the reasons for these behaviours when using Efons, thus gaining insight into what makes them use similar systems for long periods of time.
Bryman’s description of qualitative interviews (2008: pp.412-446) was used as a foundation for constructing and conducting the interviews. Secondly, along with each interview, the “bipolar laddering” method (BLA) described below was used to explore the user experience and to further our knowledge about how the software features were experienced by the users, what seemed to be the most important features, and what improvements could be made. In this way, the second research question was examined; what software features seem to have the most impact in this setting.

3.1.1 Semi-structure interviews
Open, structured and semi-structured interviews were considered and it was decided that the semi-structure interview was the most suitable option, since it enables a flexible interview process, as Bryman (2008) points out. This approach provided opportunities that a structured interview would not have done. There was a possibility to ask the questions in a more natural order depending on what the informant said. This enabled a wider flexibility in the usage of questions, and in the preparations that were made before the interviews, some possible follow-up questions were developed depending on which answers were expected. There was also an opportunity to ask follow up questions that were not previously conceived, depending on what was said. Further, we could ask questions to clarify ambiguous or vague answers. An unstructured interview could have been used in this case as well, but since the study already had a specific focus for the interviews, the research questions, using an unstructured interview was perceived as too unfocused, and comparisons between the users would probably have been harder to make.

3.1.2 Bipolar laddering
Bipolar laddering is defined as “a psychological exploration technique, which points out key factors of the user experience with a concrete product or service” (Pifarré, Sorribas, Villegas, Fonseca, García, 2008: p.3). This method was applied to Youtube and the authors stated that the resulting data allowed them to discover a large amount of information about relevant elements of the product and how and why these elements affected users (Pifarré et al., 2008).

According to the authors (Pifarré and Tomico, 2007), the method works on both positive and negative poles in order to define the strengths and weaknesses of the product or service. The laddering is applied to understand why an element is perceived as a strength or a weakness. The authors also stated that it is important to establish an expert-to-expert relationship between user (expert in using the product) and interviewer (expert in UX) in order to make sure that the user feels comfortable and confident talking about things that he likes and dislikes about the product.

In order to perform the test, the interviewer does not have to prepare any questions, but follow the following methodological steps (Pifarré et al., 2008):

1. Elicitation of the elements
First of all the interviewer asks users to mention what elements they like the most or were more helpful in order to achieve their goals and common tasks. Then the interviewer asks for

12 User Experience
the elements that users like the least. In this step, the element does not need to be explained in detail, a word or short sentence is enough.

2. Elements definition
Users are asked to justify each element and the answers have to provide concrete explanation of why the mentioned element is a strength or a weakness. Here the laddering takes place.

3. Marking of elements
Once all of the elements are well defined, users are asked to score each element from 0 to 10, taking into account that 0 is the lowest level of satisfaction and 10 the highest.

4. Asking for a solution
Finally, users are asked to provide suggestions for improvements or solutions. Once the test is done, all of the elements are gathered and organized in positive common elements, positive particular elements, negative common elements and negative particular elements. Common elements are the ones mentioned by at least two users and particular elements are the ones mentioned by only one user. In this method, the researchers have no hypothesis about how the elements of the system are perceived by the users; all information obtained during the BLA comes from the users, the interviewers will never suggest any element to the user. In this way some elements totally unexpected from the interviewer can arise.

To complement the semi-structured interviews and examine our second research question, the BLA method was considered appropriate because it would provide insights about how and why the features of the system affected the users and how they were perceived.

3.2 System description
Efons, the system investigated in this thesis, is a system encouraging breaks and stretching at the workplace. The system is developed by Uptoit AB to be used preventively to reduce risks for work-related strain injuries, but also as rehabilitation for strain injuries. It is mainly developed for companies that want to offer a tool for active health maintenance and/or rehabilitation for their employees. These companies buy the licenses and so the employees do not have to pay for the program. It is mainly targeted to people who have sedentary or static work - office employees. It is meant to be used several times per day to achieve its purpose.

3.2.1 System functions
Screen captures of all the functions described below can be found in Appendix 6. The interaction between the users and the program is mainly focused on the reminder functionality. The program is set to remind the user at different times to take a break and perform stretching exercises that are presented as videos on the screen and the user is supposed to follow them. The reminder appears at set intervals or fixed times as a small box at the lower right corner of the user’s screen, and the user can choose to take the break, snooze it, or cancel it. If the user chooses to take the break, the whole screen will be covered by the program, and in the middle of the screen, a pre-set amount of exercises will be shown, that are randomized from a selection of 21 exercises. The exercises are demonstrated by a female presenter. The user can pause the exercises (and doing so enables the option to minimize it), choose a different randomized exercise and stop the sequence. The name of the exercises is displayed at the top left, and a progress bar shows how much of the session
remains and how many exercises, which is displayed by sections of the progress bar. It is also possible to adjust the volume of pre-set music that plays during the break (at bottom right corner). After the exercise is completed or stopped, a new screen will be showed with a “daily tip” that will be displayed along with a link to Uptoit’s homepage where the user can send their opinions.

In the main screen of the program, the user can choose between four functions; start the program (which starts a session with the current settings), settings, a link to the user pages on Uptoit’s webpage, and information about the program.

In the settings, the user can choose to see statistics about their usage displayed in a graph, and decide to display it weekly, monthly or for the total time of usage. The statistics can also be set to be displayed in the main screen. The other settings that can be made are: when the reminders will be displayed, how many exercises should be performed per session, if the tips should be displayed after the sessions, sound settings, license verification, and advanced settings. The reminder can be set either at regular intervals, fixed times, or both. Additionally, the user can set the length of the snooze, and settings concerning how long the program should wait to be active or inactive depending on the activity on the computer. It is also possible to use default values. In the sound settings, the user can choose her own sound files to be played during the break, and also one default sound to be played when it is time for a break, and between the exercises. In the advanced settings, the user can enable the following options:

- Set the program to start when the operating system starts
- Display when the next reminder will be shown, which is displayed as a small box above the time in the lower right corner of the screen
- Meeting setting, enabling the user to turn off the program for certain pre-set periods, so that no reminders will pop up during that time.

3.3 Data gathering

Prior to the pilot interview, an interview guide was constructed based upon the research questions and previous research. In the pilot interview, questions were first asked, then the BLA was conducted, and then questions were asked about features that were not part of the system (for this interview guide, see Appendix 1.) After the pilot interview, it was decided to change the order in which the BLA appeared, placing it at the end of the interview. It was considered easier for the informants to remember their experience using the program and impressions of the program if they would have answered questions related to their usage before doing the BLA. Sometimes, this lead to repetitions from the informants since issues that they had previously brought up were again examined during the BLA. However, this was not a disadvantage since it provided a reason to ask the informants to elaborate more on some feature or experience of a feature, and gave us further insight into their experience of the system. Some changes were done about the phrasing of questions about feedback, and the order of some questions was changed in a way that would be more natural. These changes were implemented in hope of getting a better flow and more natural transition between the questions during the interview.
After the second interview, questions about personalization were added, concerning why the users did not personalize it. It was also decided to show non-users pictures of the program to trigger their memory of it (the final version of the interview guide can be found in Appendix 2). The interview guides were written in both Swedish and English, since one of the authors did not speak Swedish. Three interviews were conducted in English and seven in Swedish. All interviews were recorded and transcribed. The interviews that were conducted in Swedish were translated into English from the recordings in order to make coding and analysis available to both authors. Some terms and phrases that were hard to directly translate were elaborated upon in the transcriptions and marked by notes that further explained the meaning of these terms. The length of the interviews combined with the BLA was between 30 and 90 minutes. Most of them took around 45 minutes.

3.4. Sampling
The method for sampling the users was goal directed; the intention was to speak with experienced, long-term users of the system as well as non-users; informants who had previously used the system for at least 18 months. Since the sample is small, and non-randomized, it's not possible to generalize the results to a larger population. Bryman’s definition of “goal-oriented sampling” was used (2008: p.434), which means that the informants have been interviewed because they have been perceived as relevant for reaching a deeper understanding about the subject we are investigating. The informants were selected thoroughly in cooperation with the CEO of Uptoit. The requirements were presented to the CEO, who provided initial contact with the informants. The idea was to get in contact with users who met the following requirements:

- Desk-bound office work environment
- Had been using Efons for at least one year
- Either current users or non-users of Efons

As stated above, apart from speaking to current long-term users of the system, there was also an interest in speaking to users who were currently not using the system. It has been stated that the study of non-users is relevant for “those who wish to understand the social realities of the ‘information age’” (Selwyn, 2003). Satchell and Dourish (2009) present some implications for HCI by the study of non-users, claiming that much can be learned about technology by studying it in the context of non-use. In this study, it was assumed that the inclusion of non-users would provide relevant findings about what is supporting long-term use. In this study, the term “non-user” is defined as an informant that had used the system for at least 18 months, but had stopped using the system prior to the interview.

3.4.1. Presentation of the informants
Below there is a brief summary of the informants that were part of this study. All informants had access to adjustable tables. The names of the users have been changed to protect their anonymity.
3.5. Data analysis

A grounded approach was used for data analysis. Instead of using a theoretical framework for data analysis, an inductive analysis has been used to discover patterns, categories and themes in the collected data (Patton, 2002: p.453). Grounded theory emphasizes being grounded, to be immersed in the data, so that embedded meanings and relationships can emerge (Glaser and Strauss, 1967). Using grounded theory, categories and themes have been derived from the data, and relationships between these have been analysed. In this process, the affinity diagram technique (Baxter and Courage, 2005) served as an inspirational source.

First of all, all of the transcriptions were read and relevant segments were highlighted. The next step was to introduce all of these highlighted segments into QDA Miner, a qualitative data analysis software package. These segments were entered as codes and placed in preliminary groups or themes that emerged along the process. Once all of the codes were entered, new groups and sub-groups were created for easier management and analysis. The structure derived from these groups and subgroups was used to present the results. The coding and analysis were done continuously. The categories created were not however, perceived to be saturated. Even though the more general patterns were similar, some new things were still found in the last interviews, but due to time constraints and availability, it was decided to not proceed with any further interviews.

3.6. Ethics

The four main ethical requirements used in this study; information, approval, confidentiality and utility were presented by the Swedish Research Council (n.d.) regarding research ethics in humanistic-social research. All informants were informed about the purpose of the study before conducting the interviews. All informants were volunteering, and were told before the interview that they did not have to answer the questions given, and could abort the interview at any time. They were also informed them that all notes and recording would be stored in a

<table>
<thead>
<tr>
<th>Informant</th>
<th>Gender</th>
<th>Age</th>
<th>Occupation</th>
<th>Hours in static position/day</th>
<th>Computer competence</th>
<th>Weekly physical activity</th>
<th>Time using Efons</th>
<th>Current User</th>
<th>Type of Office</th>
<th>Use of social media</th>
<th>Time standing per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per</td>
<td>M</td>
<td>65</td>
<td>Economy administrator</td>
<td>6h standing</td>
<td>3</td>
<td>Running, Gymniz</td>
<td>2 years</td>
<td>Yes</td>
<td>Open</td>
<td>None</td>
<td>-6h</td>
</tr>
<tr>
<td>Sara</td>
<td>F</td>
<td>40</td>
<td>Educational developer</td>
<td>6h sitting</td>
<td>4</td>
<td>Running weekly</td>
<td>2 years</td>
<td>No</td>
<td>Shared</td>
<td>Yes</td>
<td>0-1</td>
</tr>
<tr>
<td>Jeanette</td>
<td>F</td>
<td>35</td>
<td>Library assistant</td>
<td>4h sitting</td>
<td>3</td>
<td>Gymniz, bike or walk to work</td>
<td>2 years</td>
<td>No</td>
<td>Closed</td>
<td>Yes</td>
<td>-4</td>
</tr>
<tr>
<td>Anton</td>
<td>M</td>
<td>60</td>
<td>Branchhead at University</td>
<td>6h sitting, stands about 30min.</td>
<td>3</td>
<td>RidingX2-4</td>
<td>2 years</td>
<td>Yes</td>
<td>Closed</td>
<td>Yes</td>
<td>0-15h</td>
</tr>
<tr>
<td>Vibeke</td>
<td>F</td>
<td>50</td>
<td>Examinations application officer</td>
<td>3-7h sitting</td>
<td>3</td>
<td>Gymniz, walks to work</td>
<td>-28 months</td>
<td>Yes</td>
<td>Closed</td>
<td>Yes</td>
<td>-2</td>
</tr>
<tr>
<td>Adam</td>
<td>M</td>
<td>45</td>
<td>System administrator</td>
<td>3h sitting, 2-3 standing</td>
<td>4</td>
<td>Gymniz, runningX2-3</td>
<td>2 years</td>
<td>No</td>
<td>Closed</td>
<td>Yes</td>
<td>-2-3</td>
</tr>
<tr>
<td>Camilla</td>
<td>F</td>
<td>50</td>
<td>Degree evaluation officer</td>
<td>Min. 6h sitting</td>
<td>3</td>
<td>Running or walking 5-10 hours/week</td>
<td>3 or 4 years</td>
<td>Yes</td>
<td>Closed</td>
<td>Yes</td>
<td>-1</td>
</tr>
<tr>
<td>Viktoria</td>
<td>F</td>
<td>45</td>
<td>Economy administrator</td>
<td>2h sitting, then standing</td>
<td>4 or 5</td>
<td>Take walks</td>
<td>4-5 years</td>
<td>Yes</td>
<td>Closed</td>
<td>None</td>
<td>-8h</td>
</tr>
<tr>
<td>Olger</td>
<td>M</td>
<td>40</td>
<td>Programmer</td>
<td>6h sitting</td>
<td>5</td>
<td>RunningX2-3, Gymniz</td>
<td>6 years</td>
<td>Yes</td>
<td>Open</td>
<td>Yes</td>
<td>0-12h</td>
</tr>
<tr>
<td>Anders</td>
<td>M</td>
<td>60</td>
<td>Tester</td>
<td>Min. 6h sitting</td>
<td>5</td>
<td>RunningX2, Running X2-2</td>
<td>5 or 6 years</td>
<td>Yes</td>
<td>Open</td>
<td>Seldom</td>
<td>1-2h</td>
</tr>
</tbody>
</table>

Table 1. Presentation of the informants
safe place and that only the authors would have access to them. Permission to record the interviews was asked and obtained from all the informants. None wanted to exclude anything that came up during the interviews. The informants were informed that they would be anonymous in the report, and we have tried to exclude information that could lead to the identifying of the informants or their workplaces. The utility requirement is about that the gathered information should only be used for research. However, we argue that the results from our research can be used by designers as well.

3.7. Rigour and relevance
In social science, the three most important criteria for evaluations of research are the constructs reliability, validity and reproducibility (Bryman 2008, p.49). In qualitative research, one does not relate to the same constructs regarding the rigour of the research, as in quantitative research. In Bryman (2008), some alternative constructs are proposed to evaluate the quality of research. Instead of reproducibility, the construct of “dependability” is used (Bryman, 2008: pp.352-356), which concerns clearness in all the parts of the research process; careful reviews of the choice of informants, problem statement, etc. To assure the quality, colleagues can be used as reviewers. During this study, we have received guidance by our supervisor at the department of informatics at Umeå University. Two counterparts to internal and external validity in qualitative research are called trustworthiness and transferability. To assure a higher trustworthiness, follow-up questions were made to make sure that the responses from the informants were perceived correctly, making sure that the interpretation of the answer was what the informants meant. This was done to enable corrections when necessary, and happened especially frequently during the application of the BLA method. To achieve a greater transferability in qualitative research, dense descriptions of the culture that is studied can be used, to enable other researchers to decide the transferability of the results to other environments (Bryman, 2008: pp.354-355). Due to the fact that the informants are coming from four different workplaces, a limited time spent at each workplace, the anonymity of the workplaces and limited space in the thesis, it has been difficult to provide a dense description of the context. However, the parts found to be most relevant about the contexts are presented in section 4 and short descriptions about the contexts can be found in Appendix 4. We claim that having two researchers collaborating has been beneficial for this study. During the whole study, especially while conducting the analysis and discussion, it has been valuable to have more than one perspective, letting us reflect upon our own biases.

4. Results and analysis
Below, empirical data found in the study is presented in the themes that emerged during our grounded analysis. For a complete overview of the results from the BLA with justifications of the elements and improvements, see Appendix 3.

4.1. Usage of the system
Different aspects concerning system usage in general are presented below.
4.1.1. Reasons to start using the program
The reason to start using Efons was more or less the same for all informants; they had been offered to use it at their workplace. Since all informants had jobs where they sat still for long periods of time, it was common for many to get stiff and get some pain in neck and shoulders. These problems were a reason for many to try it. “I got some aches on my shoulders and neck, and then I heard from a colleague: oh there is a program for this and then I installed the program.” (Sara). After trying Efons, most of them noticed a positive difference, and hence continued to use it. “Yes, we used it and discovered that, this is good. It’s good to move, you get less stiff. We thought it was good.” (Anders). For Justina, Efons was already available at her workplace, and it was brought up during the job interview as a benefit, since the recruiter knew she was interested in health issues.

4.1.2. Typical usage of the program
A typical use situation would be to have the program set to remind the user every hour, press “Start” when the reminder came up, and then perform the exercises that were shown on the screen by following the movements presented in the video. Two informants, Justina and Anton complemented the use of Efons with other exercises, or switched exercises during the breaks to some exercise that they knew before. “I do some other exercise, Efons, or some exercise that I know of, outside the program, during that time” (Justina). Victoria, who was not doing any of the exercises due to an injury, used Efons as a reminder to do rehab-exercises provided by her physiotherapist.

4.1.3. Reasons to not take a break
There was mainly two obstacles that hindered the informants to take breaks: meetings and work tasks.

All but Sara and Victoria said that they would never use the program at a meeting or if they had a visitor at their office. Sara had urged others to participate in the breaks at meetings, and Victoria had used it at meetings as a reason to urge participants to take a “regular” break from the meeting. All of the informants had at some point chosen to not take breaks due to the situation at the time.

One common reason was that they were concentrating on something and did not want to take a break and loose that concentration.

“If I’m very concentrated when I’m doing it, and maybe write something, I don’t immediately get up and to the movements suggested by the program. Instead, I wait until my concentration on the task at hand lowers, and then I seize the opportunity so to say.” (Anton)

Another common reason to not take a break was that they did not want to be interrupted when they felt that they were busy. “Simply, I didn’t want to interrupt work” (Adam). Another important factor was that at one of the workplaces, workload differed across the year, and at certain intensive periods, some informants did not feel that they had the time to take breaks. “When it was as most stressful, you usually cancelled, unfortunately, when you really needed it” (Victoria).
4.1.4 Usage over time

Concerning our informants’ usage of the program over time, four different ways of usage were identified. Several informants had used the program similarly over time for long periods, with the same settings and amount of breaks taken. “I think it’s probably similar over time. I think so at least. You don’t get bored. Even though the movements are quite simple, they don’t take very long, and that’s fine. I think, I don’t really remember, I don’t think that there is any great difference in the intensity. Not for myself at least” (Per).

Another trend was that several users were using it more actively in the beginning, and then used it less with time “In the beginning, I probably did all of them, and maybe, what is it in a week, 4 per day, 20.. Maybe I did 17. At the end, I might have done 3” (Adam). Justina explained this phenomenon by stating that she started to take Efons for granted after a while. “I used it more. Back then, I was so happy that we had the opportunity. Later, you take it for granted” (Justina). Jeanette was using it more frequently during the first year. “At least the first year probably. Then it became less and less frequent. Probably. But the first year I think that I tried to use it pretty frequent” (Jeanette).

One factor that several users talked about concerning usage over time was the relation between the pain they experienced and how much they used it. Oskar said that when he experienced more pain, he used it more, and vice versa. As stated above, at one workplace there are periods of increased workload when the program is not used as much, and then consequently, some users experience more pain. Justina had another strategy during that period and made sure to use it to prevent stress related pain, even though she did not feel like having the time.

“At the peaks, when we have had the highest workload, when you are the most tempted to just close the reminders, I have usually decided that I should use it at least five times per day, when the workload is the highest, because it’s at those times I need it the most, even if, you want to close it.” (Justina).

4.1.5 Reasons to use the program less

Apart from the reasons stated above concerning usage over time, one reasons to use the program less on the organizational level concerns availability. “If we are going to offer it, we should be able to offer it to everyone at the university, something similar, and since it’s not working for the Mac users, that’s a problem” (Victoria). Adam started using it less since he did not notice any physical improvements by using the program.

“I would say that I might not have experienced a big difference.. I did all the exercises, during the first 6 months, maybe I skipped some of them, a whole week maybe, but I never really noticed that I got any better, in my neck, back, shoulders (...) I do not know, but maybe just that, that there was no obvious improvement” (Adam)

One concern about the program and a reason to use it less in the future was that Justina, Victoria and Anders, considered it old and outdated. “Now, it’s obsolete. It’s so bad in comparison to; everything has moved forward - graphics, options; new software rebuilt
from the foundation is needed for it to work” (Victoria). Anders meant that you expect more frequent updates from software today. “I mean today it’s like that. you expect something to happen. That the design is updated, now and then, or that there is something new, something is changed or.. More exercises. You are used to that, a bit picky” (Anders). Sara thought that if she was more active outside work, she would not need to use Efons to the same extent. “If I become a really competition runner, which I won’t be but... Because then I think that my overall condition would be so much better that I might not have the use for Efons as much” (Sara).

4.1.6. Reasons to use the program more
When asked about what would make the informants use the program more, Justina expressed: “If I would exercise less, then I think that I would, need to, use Efons more” (Justina). Apart from that, the users mainly expressed improvement suggestions. Some of these are presented in this section, and some others in the sections related to the kind of suggestions given. One user proposed continuous updates with exercises. Adam and Victoria recommended a greater number of exercises to choose from, and Victoria also suggested the ability to switch an exercise for a similar one in terms of muscle activation to make the experience less boring. Sara and Victoria suggested that it could be available on a smartphone or iPad for increased availability. Adam commented that if he had an evidence or conviction that the use of the program would prevent deterioration, he would continue using it even though of the lack of perceived health improvement. It was also proposed by Adam that the employer should take greater interest in the usage of Efons at the workplace, to do some kind of follow up on the usage of the program, and by doing so would have the opportunity to affect the usage.

4.1.7. Future use
General concerns having to do with changed habits were presented by several informants. Anders would continue to use Efons, or some other break software in the future in the same manner. Anton expressed the wish to be able to continue with the behaviour supported by Efons, even if the program was not available. “I know that I don’t have pain today because of my use of Efons. so I will continue to use it, or continue to do the movements I’ll have to try to remind myself, to put something in my phone to remind me” (Anton). Victoria said that she would probably continue to use it in the same way if she was not injured.

4.1.8. Contextual effects
Apart from the effect of the workplace’s imposed workload on the usage, another contextual effect that surfaced in the interviews was how the office space affected the way Efons was used. In two of the workplaces that were open offices, people participated in the breaks together. Per and Anders, who had been using the software for a long time, directed other people that participated in the breaks. In Anders case, the whole team participated. They had adopted the habit from another team. “I had them on the computer and directed the others, and everyone in the team followed. It was from one of the other teams that, we took the idea from” (Anders). In Per’s case, it was people in the vicinity of him who participated. “Now it’s like, I stand at the screen, and the guy opposite me, he don’t have it so he stands beside me,
and then people in the whole corridor see, so then they can follow, what we do that is” (Per). The open office space had an opposite effect on Oskar, since he was the only one in that office doing the movements. “I feel too much people around; I don't feel like starting the movements” (Oskar). In another case, Sara and a colleague had shared an office, and had set the program to start at different times, so that the program came up on one of their computers twice per hour. They then performed the movements together.

4.1.9. Reasons to stop using the program
Sara, Jeanette, Adam and Victoria were no longer using the program. Adam had been using it less and less mainly because he did not feel any physical improvements by using the program. When his computer was replaced, he then did not make any efforts to get the program reinstalled. Sara and Jeanette had similar experiences, their computers had been replaced and the program was not included in the pre-installed software. Sara had tried to get it re-installed, but failed, and had not gotten adequate help to re-install it. Jeanette had not engaged in trying to get it back. “It was supposed to be used, but then when the computer was reinstalled, I have not really.. (laughs) engaged in it that much.. To try to get it back” (Jeanette). Victoria had to stop using the program due to an injury that prevented her to perform the exercises.

4.2 Program features
Results regarding opinions on system features and how they were used and improvement suggestions are presented below.

4.2.1. Settings
There were several ways to configure the program, as explained in “System Description”. Several of the informants had only configured the system once, or had someone else who configured during the installation. Others had changed once either the interval of the reminders or the number of exercises shown and then kept that setting. “In the beginning of course I noticed that maybe doing five exercises is maybe too long so I thought that three is quite sufficient” (Oskar). The “meeting configuration” was not something that was known to most of the informants, and used by none. Several of the informants knew that they could get feedback about their use of the program in the form of a graph, but only consulted it a couple of times at most.

4.2.1.1. Settings of the reminder
The reminder had been configured differently by the informants. Per had it configured to appear every 90 minutes, Sara, Anton, Justina and Camilla every hour, Adam and Oskar every two hours. Victoria and Anders had configured it to appear at fixed times during the workday so that it would break up their fixed periods. Anders had configured it so that he would never sit still for more than one hour during the day “I have set it so that I take a break in the middle of these "blocks\textsuperscript{13}”, so that I'm never sitting still for more than one hour

\textsuperscript{13} His workday consisted of two-hour “blocks” between which there were “natural” breaks, like lunch or coffee breaks.
without a break” (Anders). Victoria had configured it differently depending on her circumstances, but often took the breaks in relation to coffee breaks or lunch. The settings did not however, determine how often the informants actually took the breaks. Typically, several informants took three or four breaks during a day, and the amounts of breaks taken often depended on external factors, workload or tasks (see sections 4.1.3 and 4.1.4).

4.2.1.2. Settings of the exercises
Sara, Oskar and Anders had changed the number of exercises that were displayed. The default value was three for the current version of the program. Oskar and Anders, who had previous version of the system, had lowered the number to three because they felt that the break took too much time with more exercises than three.

4.2.1.3. Suggested improvements
One suggestion by Oskar was to be able to control the length of each exercise. Another recommendation made by several informants was that the exercises should be adaptable to individual needs. One example by Victoria and Anders was to be able to categorize the exercise according to which body part they activated and then choose which body parts should be included in the presentation of exercises. One suggestion made by Camilla and Adam was the possibility to select the exercises from a list. Another recommendation made by Victoria regarding adaptations of the exercises concerned tailoring made by physiotherapists to adapt the presented exercises to individual or organizational needs, preferably in cooperation with a corporate healthcare company. A related suggestion by Anders was the ability to exclude certain exercises.

"It would have been comfortable if you could have, in some kind of list, mark some exercises to be excluded; don't ever show them.(...) Now I have not had that problem, but I could imagine that it would be a convenient thing for someone who would have problems” (Anders)

Anton made a proposition to include a function to view statistics of usage for the manager, enabling the possibility to have an overview of usage from a group of workers. Adam wanted more variety in general and in most aspects of Efons."May be also more settings, that might randomize length of the sessions” (Adam).

4.2.2. Reminders
The reminders are a core feature of the program and the one that the user interacts with the most. The reminder’s main function, which is to remind the user to take a break, was openly expressed as positive by several informants and in the BLA results was considered the strongest element in the program: 80% of the informants mentioned the reminder as a positive element and the average score was 8.75. “I think it's good, it's the best, because if there were no reminder, I think that I would forget it” (Camilla). Several other informants appreciated that you can choose to cancel the break. Victoria liked that the timer can be configured when to appear. Another positive thing expressed by several informants was its
size and placement: not too obtrusive, but at the same time highly noticeable. “Generally I would say, probably it’s good that it’s not that intrusive, yeah, I stick with that” (Oskar).

4.2.2.1 Improvement suggestions
One minor negative feature of the reminder experienced by Per, was that it sometimes got in the way of something he was working on. He suggested the possibility to minimize the reminder to solve this problem.

When the reminder appeared, there was an option in the settings to use a notify sound, which could also be exchanged for another sound file. Victoria proposed that there should be alternative sounds to choose from the one available in the program. Three improvement suggestions regarding reminders were obtained from the BLA: One made by Anders was a drop-down menu where the length of the snooze-time could be adjusted if the user did not want it to be longer or shorter than the default value. Camilla suggested that the appearance of the reminder should be customizable in order to make it more noticeable. Finally, Anton recommended that the reminder should be more and more intrusive if the user does not respond, covering the screen gradually with the reminders window.

4.2.3 Presentation of exercises
In general, the informants liked that there was a presenter. Some of them disliked the lack of emotion displayed by the presenter and thought that she should be more enthusiastic. “The only issue I have is that it does not look fun. The presenter should be a person who looks like they are enjoying it” (Anton). Others said that they had heard colleagues talking about it, but did not care themselves. Anton, Anders, Adam and Victoria could imagine being able to choose the presenter from several alternatives, or having an animated character presenting the exercises, to make it more fun and variable. Justina and Anders pointed out that what was the most important thing regarding the presenter was that the exercises should be clearly presented and the BLA results showed the same pattern: three users liked the presentation of exercises because they were easy to follow and clearly showed.

Finally, half of the informants mentioned the stretching exercises as a positive element with an average score of 9.2. The informants justified the element as positive because they caused a positive health effect on them, relieving pain, tension and stiffness.

4.2.3.1 Suggested improvements
There were many improvements suggested connected to the presentation of the exercises. As stated above, additional exercises to choose from as well as the ability to switch exercises were suggested. Victoria and Sara proposed that relaxation exercises should be added. Jeanette thought that there could be suggestions for alternative exercises during the videos. “I mean she (the instructor) did the exercises and you followed, that you could have some voice saying that, do you have pain here, or if you have some problem, so then do some other type of exercise, or do something else instead, a suggestion” (Jeanette). A recommendation made by Victoria regarding the exercises in general was that they should be shown from several angles the first time they were shown, so that the user could get a good overview of how the exercise should be performed correctly. Anders thought it would be a good idea to include a notify sound in the middle of static exercises that require the user to
look somewhere else than on the screen to remind the user to change position. He also asked for a “smarter” randomization algorithm, since he wanted to avoid performing two similar exercises in a row. One interesting improvements was mentioned in the BLA by Oskar, which recommended to include an audio explanation of how to perform the stretching exercises and which muscles the user is supposed to feel.

4.2.4 The tips
The amount of tips available (a random tip was shown every time) was quite limited, which was recognized by the informants after having used the program for some time. Since no new tips were included over time, several informants had disabled this function. “There came some health tips after each exercise. Yes I read them in the beginning but then I turned them off. When I had read them all at least once, I turned it off” (Anders). Several informants thought that the idea of the tips was good, but that the function would need to be updated to be used continually or to have any effect. Justina explicitly said that the tips put the legitimacy of the program into question since the sources of the tips were outdated.

“I feel now, one thing that is discouraging is that there are references to, when you have done your exercises, there are little wise tips, with sources from -81, which is older than me. And then I feel that you can put the legitimacy of the exercises into question – how old are they?” (Justina)

4.2.4.1 Suggested improvements
Several informants suggested the tips to be updated with newer sources, and to include a lot more tips for the function to be used. One recommendation from Anton mentioned in the BLA was to be able to adjust the content of the tips by e.g. dividing them into categories depending on what kind of physical activity the user is interested in. Another improvement suggestion obtained in the BLA from Victoria was the ability to adapt the frequency of the tips, so that they would not be displayed after every break. The tips function was disliked, and received an average score of 1.6 from the three users who scored it.

4.3. New scenarios
This section includes the informants’ opinions on functions that were presented to them. These functions were not currently in the program.

4.3.1. Goal setting
The function of goal setting was presented as an option to set goals connected to the use of the program. Most informants were uninterested in goal setting. It was commonly seen as connected to competition, in which most informants were uninterested, at least in connection to this program. Oskar explicitly stated to perceive a difference from doing sports and using Efons, and he used it as reason to not feel interested in any of the new functionalities presented: “No...I see it differently you know this pause program or whatever you call it for just feeling better or less bad, compare to go running, I see a difference there when it comes to goals, competition, that sort of...” (Oskar). However, Anton, Adam and Victoria could imagine goal-setting connected to their usage. Adam would prefer goals to be suggested by
the program, and also have the ability to set goals himself. Anton suggested that goals should be followed up on a weekly, monthly or quarterly basis, since other feedback intervals on goals would be either too short or too long. Victoria thought that the program could suggest incrementally bigger goals, so that the user would slowly be persuaded to use the program more over time. She also suggested that goal setting could be used to incrementally learn the exercises; that easier versions of the exercises could be presented, and then over time the user would progress to more advanced versions of the exercise until it could be performed as ‘intended’.

4.3.2. Feedback and sharing
By feedback, we meant feedback on goal setting when talking about this. There was already a graph that showed the informants feedback about their usage, but no one used it, and several informants did not know about it. “Yeah, perhaps I would like to see how many times I’ve used it, within a month, perhaps or, that would be interesting” (Camilla). In general, feedback was something that many informants were uninterested in, since most were also uninterested in goal setting. None were interested in sharing their statistics and a reason commented by several informants was that they use Efons only for their own sake: “I think not, this is not a main concern of the program I think, it’s not the intent of the program; it’s intended to be used from your own perspective” (Victoria).

4.3.2.1. Suggested improvements
From those who could imagine goal-setting, there were several suggestions about how feedback could be presented. Victoria proposed that all the statistics of user activity should be saved, and that the user should be able to choose how detailed they would like the feedback to be. It was suggested that the default feedback interface should only provide positive feedback. Anton proposed that a weekly graph could be displayed showing his progression towards goals. It was suggested by Adam that the feedback could be received by mail.

4.3.3. Competition
None of the informants were interested in competing with others using Efons and Anton and Victoria could not imagine competing against each other. "I don't think so. We have so different conditions (prerequisites) so I don't think that would be, I would rather compete with myself in that case...” (Anton). Several informants said that they had colleagues that might be interested in such a function, but were not interested personally. Victoria said that she thought that it might be motivating for some, but that the decision if and how to use competition should be carefully considered, since it could have a negative impact on some people’s use, and that it should be voluntary if implemented.

4.4. Education
This category concerns the knowledge and education of the informants about health recommendations and despite the fact that there was not any question about education in the interview, the informants talked about it spontaneously. Six informants provided comments about their health knowledge such as increased blood circulation when doing the stretching exercises, the importance of not being seated for a long period of time or the awareness of
injuries derived from static work. On the other hand, few of the informants were unsure about health recommendations: “some people say that you have to, move the larger muscle groups every two minutes, otherwise, you are basically screwed, and others say that it does not matter. So what are you to believe?” (Adam).

5. Discussion

Firstly, perspectives on the study are presented, with the intention of giving the reader some information about how the results should be interpreted. Secondly, the results and analysis section is discussed, structured in the same order as the themes presented in the previous section. Thirdly, suggestions for further research are presented.

5.1 Perspectives on our study

This study was conducted at a specific point in time, with a limited number of users. Since this is a qualitative study of a small sample, it is not possible to make generalizations outside the context of the study, therefore, the conclusions we present should be seen as suggestions and hypothesis. Given the small size of the sample, the informants selected might not be representative of the typical users of systems like Efons. Also, every application of this type of system has possibly different functionality and characteristics. It is not certain that the functionalities and characteristics of the system in focus of this study are representative for all kinds of systems like these. Therefore, the results might have been different if another similar system had been studied. However, a quick look at three other commercial systems promoting stretching and breaks at work showed that the functionality is rather similar.

In an interview situation, the interviewer always has an influence on the informant, and vice versa. Our presence and what the informants believed that we wanted to know might have influenced their answers. However, even though we probably had preconceived thoughts about what we thought the informants would say, we did not have any theoretical framework guiding our expectations of what answers we were going to receive. Before the interviews, we explained the purpose of our study, stating that we were interested in gaining knowledge about how these kinds of systems could be improved. We also stated that we were interested in evaluating the system and not the informant, to try to make the informant comfortable to talk about how they used the system without being judged. We also tried to reassure that we had understood the informants correctly by asking if our interpretations of their answers were understood correctly when we were unsure of what they had meant. We cannot be sure on how the software features impact their usage, since we do not have any reliable data on usage other than the informants own accounts on their usage. Since we could only gain access to reliable data about usage from a few of our informants, it was decided to not take it into account. However, the users did seem honest about their usage and freely brought up examples of when they did not use it, and how little they used it at times.

When doing interviews, it is important to be aware that what the informants are saying is their experience of things, which usually involves rationalizing and justifying their behaviours. People usually do this when they do not really know why they have acted in certain way. When we thought that this was happening, we tried to ask follow-up questions in
the hope of making the user think more deeply about something, or think about it from a different perspective. One way of overcoming some problems related to this would have been to use empirical data of the users’ activity in the program, but due to lack of access, this step was not taken. By using the BLA, we tried to get unbiased opinions on the users’ ideas on the system, making sure that all the elements presented in the interview were obtained from the users. We continuously tried to assure that we had understood the user correctly and to not give them ideas about our opinions on the elements presented.

5.2 Usage of the system
It was found that for some informants, the main reason to use the program was the short-term pain and stiffness relieving effects, while others were also much interested in the long-term prevention of strain injuries. Therefore, an important finding was that the system should be well-mapped with the needs and interests of its users (Oinas-Kukkonen, 2013: p.1228). The informants related the pain and stiffness release to the stretching exercises, which we consider essential for satisfying the primary needs. How the system should support different user needs are discussed in section 5.3.3.

One of the main impacts on usage was the workload. This often impacted use negatively. Solutions to tackle this problem have been proposed by previous research. Dantzig et al. (2013) argue that sedentary behaviour could be monitored at an organizational level, through monitoring computer activity, or through a smartphone as a proxy, to optimize the timing of a break. Munson and Consolvo (2012) argued for using reminders combined with contextual awareness, so that it could be delivered when users are in a favourable position to take a break. In the long-term use of these systems, using reminders that are “context aware” might be important to ensure that users are actively taking the breaks.

A reason to stop using the program was related to the lack of support. It was not clear if the management was interested in the usage of the system. Two users of the program stopped using it because they did not manage to re-install it. This could have been solved by providing support either from the management or the system provider.

5.2.1 Social context
For a long-term usage of a system like this, the context in which it is to be implemented in, is worth considering. In the results, two examples on how social phenomena impacted use both positively and negatively were found; two informants performed the exercises together with co-workers, and one informant felt self-conscious about using it alone in an open office environment. To encourage the use of these systems, efforts from the organization or from the system might be employed. Several examples from previous research suggest social influence as a possibly motivating factor for encouraging physical activity using software (Bort-Roig et al., 2014; Cercos and Mueller 2013; Consolvo et al., 2006; Crone, Smith, and Gough, 2005; Foster et al., 2010). In this case, the use of a system quality from the PSD model called “normative influence”, could be used to leverage normative influence or peer-pressure and increase the likelihood for a person to adopt a behaviour, although there are not clear examples of how that would work with this kind of system. One alternative could be to normalize use of the system by promoting it from the management’s side. If a manager promoted and encouraged the use the system, others might be more interested. In the
analysis, one of the factors influencing people not to use the system was if they had meetings. If meeting leaders would encourage breaks during meetings, they might not be a reason to not use the program.

5.3 System features

5.3.1 System credibility
How users perceive the system’s credibility is, according to the PSD model, one feature that affects persuasion (Oinas-Kukkonen and Harjumaa, 2009) which can be seen in this study. Different aspects that negatively impacted the systems credibility were found in the study, but had not been a reason to stop using the program. One source impacting trustworthiness negatively were the tips, which had old references and had not changed in years. Another was the lack of updates in general; users experienced the system as old and outdated, with a non modern interface. There was also old news about upcoming updates on the systems webpage from several years ago that several users mentioned as impacting the programs trustworthiness; it was experienced as a lack of interest in the program from the system’s provider. In order to avoid negative impacts on system credibility, we claim that if tips are to be used, they should be up to date and have credible sources. Updates should also appear more frequently so that the users feel that someone is responsible for the continued development of the program. To the best of our knowledge, this element is not something emphasized in previous studies of BCSSs, and we argue that this element might be important for long-term usage.

5.3.2 Reminders
For this type of system in this context, the reminder is crucial. The users highlighted that the reminder was unobtrusive but noticeable, which they experienced as something positive. The importance of providing timely reminders as well as unobtrusiveness is supported by previous research (Consolvo et al., 2009b; Dantzig et al., 2013; Fortman et al., 2013; Jafarinaimi et al., 2005; Morris et al., 2008; Munson and Consolvo 2012) and is found as a system quality in the dialogue support category of the PSD model (Oinas-Kukkonen and Harjumaa 2009: p.493). We argue that timely reminders are important in the-long term usage of systems like these, even if behaviours and attitudes are changed; several users mentioned that they would like to continue to take stretch breaks even if they did not have access to the system, but would still need a reminder of some sort to do so.

Several informants appreciated the fact that they could choose taking or not the break, supported by the cancel and snooze function. This pattern goes in accordance with the results provided by Dantzig et al. (2013) and Consolvo et al. (2009b), which highlight the importance of respecting the user’s autonomy and give them control over their behaviour.

5.3.3 Adaptability
A perhaps obvious element that should always be considered in any system concerning long-term use is the ability of the system to satisfy the primary needs of the user. One element that might support this is adaptability. Since users primary needs might differ and change over time, the system needs to be adaptable to continue to support the users’ needs or situation.
Even though the system is supporting behaviour or attitude change, the user might have some temporary constraint, injury or workplace situation that influences the way that they would like the program to be used. A lot of the suggestions presented by the users also had to do with adaptability or personalization of the system: more exercises, the ability to choose or exclude exercises, the ability to better control the reminder or what exercises that should appear etc. These suggestions are related to the “personalization” system quality in the PSD model, “System should offer personalized content and services for its users” (Oinas-Kukkonen and Harjumaa, 2009: p.492).

To the best our knowledge, we have not found any studies related to this particular setting that identifies adaptability as an important factor. One way of adapting the system to the users’ needs, as stated in section 4.2.1.3 would be to establish cooperation with a corporate health company, so that the users could get personal exercise programs. This would of course require the appropriate content and options to adapt the presentations of the exercises in the program. By adapting a system like this to the users’ needs and thus increasing the positive health effects that the system provides, which our results indicate is a central reason to use the system in our study, we argue that the users will be more likely to use the system more in both the short and long-term.

5.3.4. Presentation of exercises
The presentation of the exercises was generally something that the users liked. The most important thing seems to be that the exercises are presented clearly. The presenter’s mood was received negatively by some, and even though it did not seem to impact use negatively, an enthusiastic and positive presenter would likely have a positive impact. The clearness of the exercises is important for the positive health impact to occur, since it is very important to perform the exercises in the right way to experience their health benefits. The notion that interactive breaks is strongly motivating for taking breaks is supported by Morris et al. (2008) even though it could be argued that performing exercises is something more than an interactive break.

5.4. New scenarios
Contrary to findings in previous research arguing that goal-setting could be motivating to make users engage in physical activity (Consolvo et al., 2009a; Consolvo et al., 2009b; Munson and Consolvo, 2012; Saini and Lacroix, 2009), most of the informants were not interested in goal-setting or could not imagine how it would be to use goals in this particular setting. Previous research had suggested feedback and monitoring of one’s activities as features that have the potential to encourage physical activity (Bort-Roig et al., 2014; Consolvo et al., 2006; Consolvo et al., 2009b; Speck and Looney 2001) but in this study it was not something that seemed to have any impact. One obvious reason might be that several of the users did not know about the graph. Another reason might be the design of the graph. It has been stated that when providing feedback by systems encouraging physical activity, only positive feedback should be used (Consolvo et al., 2008; Lin et al., 2003). Some studies suggested that competition and sharing might have a positive impact on physical activity (Barkhuus, 2006; Foster et al., 2010). Several of the informants had previously engaged in pedometer challenges and found them engaging, but did not see either competition or
sharing as motivating in this setting. This might be due to the fact that some users clearly stated that used Efons only for their own sake.

Previous studies claim that goal-setting, sharing, feedback and competition could encourage physical activity in general. The activities that these systems encourage can be seen as training activities, such as biking and running. These activities have a clear unit to quantify the activity, e.g. steps taken or distance. One informant clearly stated that he perceived a difference between running, which he considered it to be a training activity, and Efons, which he used to simply ‘feel better’ in general. The informants did not seem to be interested in using these functionalities in this particular setting where the physical activity is taking breaks and stretching. Most of them did not see how this would be meaningful to them, especially competing.

5.5. Education
One element that seems to have an effect upon long-term usage or at least upon users’ thoughts and predictions about their continued use is education. Several of the users were well aware of the problems of sitting still for long, and therefore both knew that it had helped them through experience, but also that it helped to prevent problems in the future. One user that did not experience any improvements through using the program also was not convinced that the program helped to prevent future problems. Education about the problems of sedentary time or the prevention of strain injuries is something that could be provided through the system, or by some external source. In the case of Efons, there was such a system feature, but it was neither well liked nor used in its current state. The idea seemed to be appreciated, but it would need to be improved to influence users knowledge (and in turn, attitudes) about the importance of stretching and breaks. We believe that the tips in its current state have been intended to influence the users’ attitudes towards physical activity, but it does not seem to fulfil its intentions, mainly since the tips are outdated. If the improvements suggested in section 4.2.4.1 would be implemented, the tips could be a powerful tool for increasing the users’ knowledge and influencing their attitudes towards breaking up sedentary time.

Dantzig et al. (2013) mentioned the importance of being aware of harmfulness of sedentary time in order to make the persuasive strategies more effective. In our study we have found that this is important, but a wider approach to education should be taken into consideration. The user should be properly educated in relation to the whole health benefits and prevention that using the program might have in order to keep the interest and motivation for using the program. We argue that it would be beneficial if the implementation of the system was combined with lectures about the potential benefits of the system, and the dangers with prolonged sedentary time.

5.6 Suggestions for further research
This is a small study with a limited sample. To gain further insight into how systems like these can be developed for usage over time, further research is needed about how systems like these are affected by different organizational, social and technological contexts. A next step of the study would be to implement a new prototype of the system studied including the
most relevant suggestions for improvement and evaluate their impact on usage. For example, educational efforts either by the system itself or traditional education could be implemented and tested in order to know which is the most effective and how they impact the usage.

6. Conclusions

In this thesis we aimed for expanding our understanding of what makes people use BCSS promoting breaks and stretching at work for long periods of time. We also wanted to know which software features or combination of them have the greatest impact in this setting.

Our results indicate that the main factors influencing long-term usage are:

- Timely reminders, even when the behaviour and attitude is changed.
- The stretching exercises which address their primary need and have a positive impact on the users’ health.
- The education of the user, which make them attribute the health benefits to the use of Efons even though these effects might not be noticeable.

We have also found elements that we argue have the ability to influence long-term usage, which do not currently exist in the system or its context of use. These elements are the following:

- Systems should be updated from time to time to uphold credibility.
- The use of the system should be encouraged by management, on a normal basis and in meetings.
- Systems should be adaptable to the users’ needs, which might differ over time
- Systems like these should be combined with educational efforts by the system provider: either provided by the system itself or by traditional education, such as lectures, or a combination of both efforts.

The main software features that seem to have an impact on promoting breaks and stretching at work are reminders, clear and easy to follow presentation of exercises and features connected to personalization and control, such as the ability to set the reminder’s interval or the ability to cancel or snooze the reminder. We claim that systems like these should implement context-aware reminders to increase the likelihood that people are able to take breaks even when the workload is high.
References


Dantzig S, Geleijnse G and Halteren AT (2013) Toward a persuasive mobile application to reduce sedentary behavior. Personal and ubiquitous computing, 17(6), 1237-1246.


Hamilton MT, Hamilton DG and Zderic TW (2007) Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. Diabetes, 56(11), 2655-2667


Healy GN, Wijndaele K, Dunstan DW, Shaw JE, Salmon J, Zimmet PZ and Owen N (2008b) Objectively measured sedentary time, physical activity, and metabolic risk the Australian Diabetes, Obesity and Lifestyle Study (AusDiab). Diabetes care, 31(2), pp. 369-371


Oinas-Kukkonen H (2013) A foundation for the study of behavior change support systems. Personal and ubiquitous computing, 17(6), pp. 1223-1235


Appendix 1. Interview Guide

Introduction to the user
We are trying to investigate all aspects of Efons, with the goal of gaining knowledge on how to better develop programs like this, so we like to hear what you, as an expert in this program has to say, so we want you to feel free to talk about both what you think are the strengths and weaknesses of the system. Have in mind that we are evaluating the system, not you.

Rights of the person being interviewed
The respondent has the choice to stop the interview whenever he/she wants, or take a break if needed, or decline to answer any questions. There will be no questions about the reasons for this.

Anonymity:
Personal information about the respondents will not be stored together with the contents of the interviews. Personal information about the respondents will be age, gender and what kind of environment that they are working in, not detailed information about where they are working, as well as information about their usage of Efons. No one except the authors will have access to the recorded material, notes and transcriptions related to the interviews. The material will not be available to others than the authors.

Recording
Permission to record the interview will be asked to the participant, who is free to decline.

Background questions:
Gender:
Age:
Occupation:
Working in relation to the program:
- How many hours per day do you spend seated?
- Do you have anything that hinders you to take brakes?
- Do you have anything that hinders you to stretch?
- What events/people/whatever at the workplace could hinder you to use the program?
- Do you have any physical constraints that affect your use of the application?

Technology use:
- Do you use social networks? Which one?
- Are you using any kinds of applications or devices to support your physical activity?
- How would you define your level of computer competence?

Physical activity:
- Are you engaging in physical activity outside of work?
- Follow up: How much, what?
- Have your overall engagement in physical activity been affected by the usage of Efons?(do you move/exercise less/more after using it)?
- Follow up: Would you like Efons to support others kinds of physical activity?
- Would it be interesting to you to add functionality to Efons to encourage physical activity?

BLA -> we use the template for the bipolar laddering

Bipolar laddering is a method for evaluating a products’ user experience. The goal is to assess the strengths and weaknesses of the system, and solutions or improvements proposed by the users. It is used as a complement to the semi-structured interview.

Post-BLA Questions

Lifecycle Use
- Why did you start using the application?
- How often did you use it at the start?
- How often do you use it now?
- If you take into account all the time that you have been using the application, have you been using it differently in different periods?
Appendix 1: Interview Guide

- **Follow up:** What made you use the application differently? (For every difference in usage)
- What would make you use it more (in the future)?
- What would make you use it less (in the future)?

If applicable (for non-users):
- Why did you stop using the application?
- What would make you to use it again?
- Are you using something else instead (to encourage breaks or physical activity)? What? Why do you use that instead?

**Personalization:**
- Have you personalised your settings?
- What have you personalised? Have you changed them more than once?
- Is there any setting that you would like to be able to make that you can’t?
- Do you use the graph? Is it motivating to you?
- Do you use the meeting function in the program? (Is it useful to you?)
- Would it be motivating for you if the program could take physical constraints into consideration, to make a more personalised exercise program or selection of exercises?
- Would you want the program on any other device that is not on your computer? (Phone, tablet, some other device).

**Presentation of exercises**
- What do you think of the way the exercises are presented?
- **Follow up:** Would you like a different person to perform them? An animation?

**Reminders**
- What do you think about the way of reminding you to take a break?
- **Follow up:** Does it interrupt your work?

**Scenarios**
To be able to assess the feasibility of some features that are not on the program, but found in the literature to be effective in similar situations, we are asking the user about some of these features, if they have not already been brought up by the user in the BLA section.

**Information to the user:** I want to ask you what you think about some features that are not currently in the program:[Give a brief description of every concept if needed]
- **Goal-setting**
  - Would it be motivating for you to be able to set goals with the program?
  - If so, would you like these goals to be pre-set by the program, or set by you?
- **Feedback**
  - Would you prefer feedback on your Efons-activity to be displayed in some other form than the graph?
  - Would you like some other way of receiving feedback instead of the graph? Follow up: For example, an abstraction, like a garden growing flowers when you meet your goals?
- **Sharing**
  - Would you like to be able to share your statistics with co-workers, or someone else?
- **Competition/Sharing**
  - Would some kind of competition in the workplace interest you? Being able to see how many breaks you are taking in relation to others?

**Considering what we have talked about now, do you have any additional comments or anything that you would like to add?**

**Ending:** Then I have no more questions. Thanks so much that you could participate in this interview! If there is anything that came up during the interview that you don’t want me to include, just let me know now or send me an email. If you’d like, we will send you a copy of the thesis when it’s completed.
Appendix 2. Interview Guide final version.

Introduction to the user
We are trying to investigate all aspects of Efons, with the goal of gaining knowledge on how to better develop programs like this, so we like to hear what you, as an expert in this program has to say, so we want you to feel free to talk about both what you think are the strengths and weaknesses of the system. Have in mind that we are evaluating the system, not you.

Rights of the person being interviewed
The respondent has the choice to stop the interview whenever he/she wants, or take a break if needed, or decline to answer any questions. There will be no questions about the reasons for this.

Anonymity:
Personal information about the respondents will not be stored together with the contents of the interviews. Personal information about the respondents will be age, gender and what kind of environment that they are working in, not detailed information about where they are working, as well as information about their usage of Efons. No one except the authors will have access to the recorded material, notes and transcriptions related to the interviews. The material will not be available to others than the authors.

Recording
Permission to record the interview will be asked to the participant, who is free to decline.

- Show the program to non- or inexperienced users. First page, the reminder, and a video. If they normally have used settings; show these.

Background questions
Gender:
Age:
Occupation:
Working in relation to the program:
- Could you describe a typical day at work?
- Can you describe a typical use situation where you use efons? What do you do before and after? (alt. Have you used it today or recently? How did you do?)
- Can you describe a situation where you cannot use Efons?
- FU: Do you have anything that hinders you to stretch?
- FU: What events/people/whatever at the workplace could hinder you to use the program?
- Do you have any physical constraints that affect your use of the application?
- How many hours per day do you spend seated you think?

Technology use:
- Do you use social networks? Which one?
- Are you using any kinds of applications or devices to support your physical activity?
- How would you define your level of computer competence on a scale of 1-5?

Physical activity:
- Are you engaging in physical activity outside of work?
- Follow up: How much, what?
- Have your overall engagement in physical activity been affected by the usage of Efons?(do you move/exercise less/more after using it)?
- Follow up: Would you like Efons to support others kinds of physical activity?
- Would it be interesting to you to add functionality to Efons to encourage physical activity?

Lifecycle Use
- Why did you start using the application?
- How often did you use it at the start?
- How often do you use it now?
- If you take into account all the time that you have been using the application, have you been using it differently in different periods?
- Follow up: What made you use the application differently? (For every difference in usage)
- What would make you use it more (in the future)?
- What would make you use it less (in the future)?
- Do you use the program for the same reason now than when you started?

If applicable (for non-users):
- Why did you stop using the application?
- What would make you to use it again?
Appendix 2: Interview Guide Final Version

- Are you using something else instead (to encourage breaks or physical activity)? What? Why do you use that instead?

**Personalization:**
- Have you personalised your settings?
  - What have you changed?
  - Have you changed them more than once?
- Why have you NOT personalized your settings?
  - If not you, who made the settings?
  - Have you looked at the settings?
  - Is there any problems with changing the settings?
- Is there any setting that you would like to be able to make that you can’t?
- Do you use the meeting function in the program? (Is it useful to you?)
- Would it be motivating for you if the program could take physical constraints into consideration, to make a more personalised exercise program or selection of exercises?
  - How would you like that function to be?
- Would you want to interact with the program on any other device that is not on your computer? (Phone, tablet, some other device).

**Presentation of exercises**
- What do you think of the way the exercises are presented?
- **Follow up:** Would you like a different person to perform them? An animation?

**Reminders**
- What do you think about the way of reminding you to take a break?
- **Follow up:** Does it interrupt your work?

**Scenarios**
To be able to assess the feasibility of some features that are not on the program, but found in the literature to be effective in similar situations, we are asking the user about some of these features, if they have not already been brought up by the user in the BLA section.

**Information to the user:** I want to ask you what you think about some features that are not currently in the program:[Give a brief description of every concept if needed]

- **Goal-setting**
  - Would it be motivating for you to be able to set goals with the program?
  - How would you like that to be?
  - **Follow up:** If so, would you like these goals to be pre-set by the program, or set by you?

- **Feedback**
  - How, and about what would you like to have feedback about from Efons?
  - Do you think it would be a good idea to display it in another way than in the current – a graph? …and how would that be?
  - **Follow up:** For example, an abstraction, like a garden growing flowers when you meet your goals?

- **Sharing**
  - Would you like to be able to share your statistics with co-workers, or someone else?

- **Competition/Sharing**
  - Would some kind of competition in the workplace interest you? Being able to see how many breaks you are taking in relation to others?

**BLA -> we use the template for the bipolar laddering**

Bipolar laddering is a method for evaluating a products' user experience. The goal is to assess the strengths and weaknesses of the system, and solutions or improvements proposed by the users. It is used as a complement to the semi-structured interview.

- Considering what we have talked about now, do you have any additional comments or anything that you would like to add?
Ending: Then I have no more questions. Thanks so much that you could participate in this interview! If there is anything that came up during the interview that you don’t want me to include, just let me know now or send me an email. If you’d like, we will send you a copy of the thesis when it’s completed.
Appendix 3. Bipolar ladder ing results

<table>
<thead>
<tr>
<th>Description</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>U6</th>
<th>U7</th>
<th>U8</th>
<th>U9</th>
<th>U10</th>
<th>Average Score</th>
<th>Mention index</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 The reminder</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>6.75</td>
<td>80.00%</td>
<td></td>
</tr>
<tr>
<td>C2 The stretching exercises</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>9.2</td>
<td>50.00%</td>
<td></td>
</tr>
<tr>
<td>C3 The way of presenting the exercises</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>8.33</td>
<td>30.00%</td>
<td></td>
</tr>
<tr>
<td>C4 The variety of exercises</td>
<td>10</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.5</td>
<td>20.00%</td>
<td></td>
</tr>
<tr>
<td>C5 The settings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20.00%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Common positive elements

Positive element: C1 The reminder

User 1 – Score 10- Justification: It makes me train continuously

User 2 – Score 10- Justification: It makes you take a break

User 3 – Score 10 - Justification: It reminds you to do the exercises

Improvement suggested: Possibility to customize the size of the reminder and the sound that it makes.

User 4 – Score 10 - Justification: That you don’t forget to move. Enough time don’t pass for you to get pain

Improvement suggested: The reminder could get more and more obtrusive over time if you don’t respond to it like gradually cover the screen.

User 5 – Score 8- Justification: The reminders help you to not forget.

User 6 – Score 8- Justification: You don’t have to think about it yourself

User 7 – Score 7- Justification: It reminds me to take breaks

Improvement suggested: I would like to change the colour to make it more visible

User 8 – Score 7- Justification: That it made the need visible

Improvement suggested: Adaptability → I would like different notification sounds to choose from and the possibility to view it in different ways. I would like to be able to mute it for certain periods as well; connect it to your schedule or through outlook to choose when to use the "mute" function.

Positive element: C2 The Stretching exercises

User 1 – Score 10- Justification: To be more flexible in the upper body, to be less stiff.

User 3 – Score 10- Justification: The positive physical feeling of doing them

User 4 – Score 10 - Justification: The bodily sensation of decreased tensions in neck and shoulders
User 7 – Score 8- Justification: They were helpful, because she feels it
Improvement suggested: The ability select which kind of groups of movements

User 9 – Score 8- Justification: Sitting down makes you stiff, this breaks of stretching helps me with the neck.

Positive element: C3 The way of presenting the exercises

User 2 – Score 10- Justification: Makes it easy to follow
Improvement suggested: The colours are a bit dull, should be more pleasing aesthetically.

User 8 – Score 8- Justification: You see how it should be done and at what speed
Improvement suggested: Could be improved by splitting an exercise into difficulty levels; easier versions of the exercise that gradually makes it harder until the exercise is performed as intended. It could ask the user after a certain number of performances to try the next difficulty level. Another improvement could be an infobox combined with an introductory video for the exercises that presents the exercise from all angles, so that it’s easier to see how it should be performed.

User 9 – Score 7 - Justification: it is clear what you have to do and how do you have to perform.
Improvement suggested: A chance to have an audio explanation of how to stretch and which muscles you are supposed to feel. Another would be to make the environment happier.

Positive element: C4 The variety of exercises

User 2 – Score 10- Justification: That it activates your whole body.
Improvement suggested: For work, is as good as it can be; if you could use it at other places, it would be nice if there were different kinds of exercises to choose from, for example Yoga or whatever.

User 5 – Score 9- Justification: It’s good for the whole body and for blood circulation
Improvement suggested: More good exercises, better variation

Positive element: C5 The settings

User 8 – Score 6- Justification: That you can adapt the frequencies and times, or combination of this for the reminder.
Improvement suggested: a greater number of exercises, connect the program to a corporate healthcare, include relaxation exercises, and greater customization options overall, and for customization of exercise programs.

User 9 – Score 8- Justification: you can adjust the program so that you could feel comfortable using it: interval, number of exercises...
Improvement suggested: the possibility of changing the time per exercise
### Table 3. Particular positive elements

<table>
<thead>
<tr>
<th>Description</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>U6</th>
<th>U7</th>
<th>U8</th>
<th>U9</th>
<th>U10</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 The tips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>P2 The graphic interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>P3 Cancel function of the reminder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>P4 Option to set times for the reminder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>P5 Option to choose number of exercises per session</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>P6 Snooze function of the reminder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

**Positive element: P1 The tips**

**User 4 – Score 5- Justification:** It gives you short term intellectual stimulation.

**Improvement suggested:** Be more visible, clearer (don’t know how). One suggestion is to make the tips adaptable, by for example dividing them into categories depending on what the person does in terms of physical activity, e.g. for hockey; then you could get tips for training.

**Positive element: P2 The graphic interface**

**User 6 – Score 6- Justification:** the functionality is easy to use, it feels easy to use.

**Improvement suggested:** Aesthetics --> customization, you change it to make it your own, set the settings of aesthetics to make it more appealing.

**Positive element: P3 Cancel function of the reminder**

**User 7 – Score 7- Justification:** when is stressful at work it’s really useful, you just forget about the reminder.

**Positive element: P4 Option to set times for the reminder**

**User 10 – Score 10- Justification:** to be able to adapt the reminders to your own needs

**Improvement suggested** to be able to adjust if the next exercise-reminder will come for example one hour after the first reminder, or one hour after the snooze if the exercise has been snoozed for example for several times.

**Positive element: P5 Option to choose number of exercises per session**

**User 10 – Score 10- Justification:** it would be annoying if there were a fixed set number of exercises.

**Improvement suggested:** the function itself is good. The UI could be better; easier to find the settings and more clear, but it’s not really a problem.

**Positive element: P6 Snooze function of the reminder**

**User 10 – Score 7- Justification:** the possibility to postpone the exercise
**Improvement suggested:** to have the ability to decide how long it would snooze; there would be a default value that you set, but there would also be a drop-down menu where you could choose another time to snooze.

<table>
<thead>
<tr>
<th>Common negative elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>C1 The tips</td>
</tr>
<tr>
<td>C2 Lack of variation in the exercises</td>
</tr>
<tr>
<td>C3 The presenter's mood is too serious</td>
</tr>
</tbody>
</table>

Table 4. Common negative elements

**Negative element: C1 The Tips**

**User 5 – Score 1- Justification:** The tips feel outdated because the sources of the references are old.

**Solution:** Remove all sources that are older than 2009, (the "news"), the "words of wisdom" that are used should be found in newer sources, so that you get confirmation about what you are doing is not harmful. This function should be further developed - better and newer tips.

**User 6 – Score 3- Justification:** they were limited, I started to recognise the tips and they are always the same. We got the same tips the first month and then the whole two years of using the program.

**Solution:** to put more tips in the program.

**User 8 – Score 1- Justification:** experienced as nagging, same things, meaningless

**Solution:** adapt the frequency of the tips, include new tips (scientific).

**Negative element: C2 Lack of variation in the exercises**

**User 6 – Score 4- Justification:** because it doesn’t maintain my interest, I get bored, lack of curiosity

**Solution:** more variation

**User 8 – Score 5- Justification:** exercises are not adaptable to a particular user. You don’t get surprised. It becomes routine and you lose focus.

**Solution:** more exercises, more people who demonstrate, make it adaptable for individual needs

**Negative element: C3 The presenter's mood is too serious**

**User 2 – Score 7- Justification:** it’s less motivational, like she does not match the attitude of the user, not as motivating as if she would encourage happiness and match the mood of the user.

**Solution:** The girl would smile.
User 4 – Score 7- Justification: *Her solemn expression, could be more motivating if she was happy*

**Solution:** *if she look happy and/or enthusiastic*

<table>
<thead>
<tr>
<th>Description</th>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U4</th>
<th>U5</th>
<th>U6</th>
<th>U7</th>
<th>U8</th>
<th>U9</th>
<th>U10</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Colour distribution of the interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>P2 No change in the program for many years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>P3 The way of reminding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>P4 Too few options for customization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>P5 There is no signal between exercises apart from a sound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Table 5. Particular negative elements

**Negative element: P1 Colour distribution of the interface**

User 2 – Score 8- Justification: *Just a detail that is not as aesthetically pleasing*

**Solution:** *customizable colours. Different backgrounds - changeable with the seasons and with holidays. Would be nice to set backgrounds yourself.*

**Negative element: P2 No change in the program for many years**

User 9 – Score 5- Justification: *it’s a feeling, that you don’t see something fresh, you would to see that someone is doing something to improve the program.*

**Solution:** *To make visual updates, so I can see that something is happening*

**Negative element: P3 The way of reminding**

User 9 – Score 7- Justification: *I would like try different ways of being reminded*

**Negative element: P4 Too few options for customization**

User 8 – Score 3- Justification: *too few options for customization (too few exercises, hard to adapt how it should run over the course of the day, too few notification signals, no reward system - no goal-setting or positive feedback, no alternative exercises.***

**Solution:** *More options follow the "general" development - include updates, adapt a modern UI.*

**Negative element: P5 There is no signal between exercises apart from a sound**

User 4 – Score 7- Justification: *You can't always see when it’s time to change exercise because of the position of the last exercise; so you don't know how long you should go on.*

**Solution:** *If the sound is muted - to provide some other kind of signal, don't know what, if you have music on - that the music would stop when you would change exercise.*
Appendix 4. Presentation of contexts

The first workplace (1) was an administration office for a large organization. It was divided in several floors and was an open office environment. All the employees had access to adjustable tables. This workplace previously had a manager that was very interested in health, and had therefore signed up for a license for Efons, and had made it available to the employees at that office; there was a positive overall attitude towards the health of the employees; they could also buy cards at a local chain of gyms at a greatly reduced price. A lot of people took advantage of this, and they also sometimes went to the gym together. In this workplace, the usage of Efons had become a social thing, were employees often did the exercises together in the open office space at least in one part of the office.

The second workplace was office spaces connected to a university library, and an administration unit connected to the library itself. One informant worked in an office space shared by a colleague, and the other worked in a closed office by herself half the time, and the rest of the time in the administration unit of the library. They had contacts with different parts of the organization, but since they had different jobs, the workplace was a bit different for both. They both had contact with other parts of the organization, had meetings and such, but they worked in a bit different environments. Everyone had adjustable tables, workplace health was an important issue, and everyone at the workplace had been offered to use Efons. However, there seemed to be no central responsibility to make sure that everyone had easy access to the program, it was up to the employees to make sure it was working and to get it installed. This had caused problems with access to the program.

The third workplace, where we conducted most of our interviews, was an administrative unit of a university. All participants worked in closed offices placed in corridors. The decision to make Efons available at this workplace was not taken in this particular administrative unit, but had been offered to everyone at the university. However, the branch head, and several other in the staff had a personal interest in workplace health, and promoted the usage of the software. The workload of the office was unevenly distributed across the year. This meant that certain periods had very high workload, during which the workers experienced higher levels of stress, and often working additional hours. This impacted the use of Efons, since several experienced that they did not have time to take breaks because of the high workload; they wanted to get as much done and be as efficient as possible to finish their work.

The fourth workplace was a unit for IT-support and development and management for universities and the public sector. The workplace was situated at different parts of a University, and the informants that we talked to were situated in development teams in open office environments. The development teams seemed to have different cultures regarding Efons usage, since we saw two different kinds of approaches to the software. Everyone had access to the program from a software bank, but not everyone had chosen to use it; in some teams and office space, none used it, and in others, the habit of participating in the exercises spread between teams and team members.

At all of the workplaces, the follow up on the usage of the software seemed to be of little interest.
Appendix 5. The PSD Model

In this appendix, we have included figures of the PSD model and screen captions from Efons.

Figure 1. The PSD Model. (Oinas-Kukkonen 2013: p1228)

Figure 2. Persuasive system design techniques. (Oinas-Kukkonen, 2010: p.5)
Appendix 6. Screen captures of Efons

In this appendix, we have included screen captures of Efons.

Figure 3: A closeup on the reminder, and how much space it takes up on the screen.

Figure 4. The exercise video
Appendix 6: Screen captures of Efons

Figure 5. The Main Screen.

Figure 6. Settings