

**ACTIVITY TRACKERS AND FITNESS CENTRE MEMBERS –
MOTIVATION AND AWARENESS**

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ABSTRACT

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Worldwide, physical activity level of the general population is below what is recommended for achieving a healthy lifestyle. At the same time the use of fitness related products, such as fitness applications for smartphones and wearable activity monitors are increasing, particularly in fitness centre settings. This trend leads to questions about what is the influence of the activity trackers on a person's motivation to exercise, and whether these devices can contribute to improving the health of the general population.

The aim of this research was to explore if wearing an activity tracker (Polar Loop) motivates fitness centre members (SATS ELIXIA) and increases their physical activity participation and awareness regarding their own health. The study was conducted in SATS ELIXIA Seppälä (Jyväskylä, Finland) and it included 100 participants divided into two groups: a "Loop group" and a control group. Both of these groups were divided into three sub groups: OLD members (membership time > 9 months), personal trainer (PT) members (at least 6 PT sessions during the test period) and NEW members (membership time < 2 weeks). The data was collected from fitness centre visitor data and Polar Flow service. Moreover, participants completed a questionnaire at the beginning and at the end of the 10 week test period assessing their awareness regarding health and physical activity. The questionnaire included questions related to physical activity, sleeping time, sitting time and overall wellbeing.

The results were analysed using an independent sample T-test, one-way ANOVA and MANOVA. The results regarding gym visits revealed that all group comparisons were not statistically significant. Even though the group comparisons were not statistically significant, the trends of means and frequencies were similar to the hypothesis and revealed useful information. The overall frequency of gym visits and activity level decreased over the test period; however, the decrease was smaller within Loop users, particularly in PT and NEW subgroups. The Polar Loop tracker also helped in increasing participants' awareness of their own wellbeing, daily sitting time and sleep quality and that way helped them in their goal towards more physically active lifestyle. There were positive statistically significant correlation between activity level and gym visits variables.

Overall, results do not support a significant positive effect of activity trackers for fitness centre members. Nevertheless, since trends were to a positive directions, this encourages for further research within this topic area in fitness centre setting using larger sample sizes in order to improve our knowledge.

Key words: Activity tracker, motivation, goal setting, transtheoretical model, fitness centre, gym, personal trainer

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1 INTRODUCTION

The health benefits of physical activity are widely known, but still the participation rates in regular physical activity are below recommendations. Physical inactivity is the fourth leading risk factor for premature death globally (Middelweerd, Mollee, van der Wal, Brug & te Velde 2014). Physical activity is a means of achieving physical and mental wellness and therefore it is important to motivate people towards a more physically active lifestyle (Mears & Kilpatrick, 2008). Despite high levels of inactivity, electronic physical activity devices and computer programs are becoming more popular. Therefore it is worth studying if different physical activity related devices are able to encourage people towards more healthy and physically active lifestyle (Middelweerd et al. 2014).

Wearable electronic activity monitors have the potential to help people reach their fitness and health goals by constantly monitoring and giving feedback on activities and bodily responses (University of Texas Medical Branch at Galveston, 2014). Wearable devices may also be an effective tool in various industries, from medical and safety to leisure and entertainment. Since the 1990's, many studies have been focused on wearable devices, however most of those studies focused on the feasibility of individual solutions rather than human aspects, such as psychological and social variables. This can often lead to a lack of information related to acceptance levels and sustained engagement (Motti & Caine, 2014).

In today's market the most common health related electronic applications are fitness related applications (30,9%) followed by wellness applications (15.5%), medical applications (16.6%) wellness applications (15,5%) and nutrition applications 7,4%). The market is also expected to grow in the near future (Research2guidance, 2014). For companies producing wearable devices or using the devices with their clients, sustained consumer engagement has been named as one of the key challenges. To achieve sustained consumer engagement, companies must understand behavioural science and study motivation, habit formation and progress toward goals. Understanding the importance of social motivation and the need for social connections is also a crucial component of future development (Endeavour Partners, 2014).

Within consumer populations, wearable activity trackers have become more popular with individuals who are interested in tracking their activity levels throughout the day. They are frequently marketed as useful tools to inform people of how much exercise is needed in the day to stay healthy, demonstrate how simple, healthy life choices can positively affect physical well-being, and motivate users to achieve daily activity goals. Their usage, in particular, is becoming more and more common with younger people. However, physical activity is also affected by interactions with an individual's surrounding groups and therefore sharing physical activity related information within those groups can enhance the motivation even more (Maitland et. al., 2006).

Wearable devices have also found their way to fitness centre settings. This means that more and more people are combining activity trackers to their gym training. Physical activity self-monitoring is becoming common, especially with younger gym members. However, their usage level and effectiveness is still relatively unknown. It would be interesting to know what kind of effects activity trackers have on motivation and membership retention (Health Club Management, 2015). Given the claimed benefits and rising popularity of wearable activity trackers, it would be of benefit to exercisers, manufacturers, and fitness centre management to explore this effect.

2 ACTIVITY TRACKERS AND MOTIVATION

2.1 Motivation and physical activity

Motivation can be defined as the direction and intensity of one's efforts. People may have very different motives when it comes to changing lifestyle into more physically active. Motives have been considered critical in influencing exercise participation as well as individual or group performance. Motivation can be divided into intrinsic motivation and extrinsic motivation. When a person is extrinsically motivated the motivation is derived from other people through positive and negative reinforcement. Examples of extrinsic rewards could include monetary rewards or products such as T-shirts. However, if a person is intrinsically motivated, they push forward because they want to be competent and self-determined in mastering their task. Intrinsically motivated people exercise because they love doing it and are therefore more likely to keep up with their motivation. A situation where a person has neither intrinsic nor extrinsic motivation is called "amotivation" (Weinberg & Gould, 2011).

Self-determination theory has often been used when talking about intrinsic and extrinsic motivation and physical activity. Self-determination consists of three psychological needs: autonomy, competence and relatedness. The need for autonomy means the need to be self-initiating in the regulation of personal behaviour. The need for competence represents a person's need to interact effectively within their environment. In other words, it means that a person feels capable of completing the given tasks. The need for relatedness reflects the person's need to feel connected to other people. The feeling of autonomy, competence and relatedness can separately or together facilitate intrinsic motivation. Increased self-determination has a positive influence because it makes motivation to more intrinsic (Carron et al. 2003).

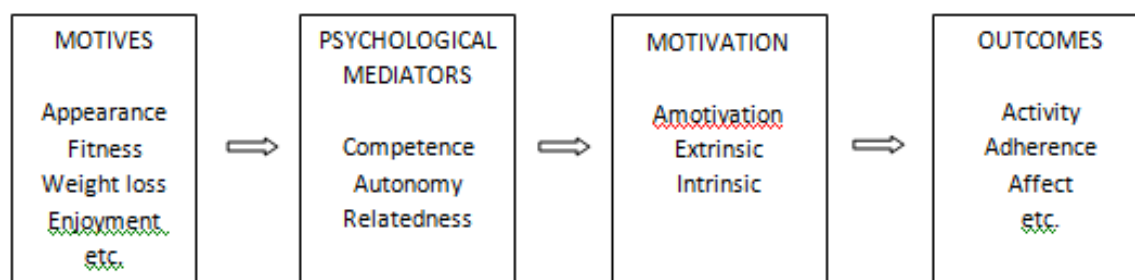


Figure 1. The relationship between motives, psychological mediators, motivation and outcomes in physical activity (Modified from Carron et al. 2003)

The most common motives for getting involved with physical activity and exercise are extrinsic factors, such as improved health, improved fitness or weight loss. However, despite the fact that extrinsic motives act as catalysts, it is assumed that the focus can often change between initial adaptation and subsequent adherence. This change also applies to the change in the amount of self-determination from non-self-determination to limited self-determination, all the way to moderate and finally full self-determination (Carron et al. 2003).

Goal setting techniques have been used extensively in order to enhance motivation and adherence and to improve performance. Studies conducted in exercise settings showed that 99% of participants set multiple personally motivating goals for their exercise participation. These goals were perceived as influencing actual exercise behaviour and helped people acknowledge what exercise behaviour is needed to meet their goals. Goal setting also helps people follow their exercise program and keep up motivation to maintain their level of activity. Goal setting can therefore be seen as a way to maximize effectiveness in reaching exercise and physical activity objectives. The most effective goals in exercise settings have been shown to be flexible goals that people have set for themselves (Berger et al. 2007).

According to Abraham & Michie (2008) there are various behaviour change techniques, all of which have different positive aspects. The point is to find the right technique to apply in the right setting and with the target group. Techniques promoting specific goal setting, self-monitoring of behaviour, review of goals and performance feedback are considered to be effective (Abraham & Michie, 2008). Health behaviour change interventions seem to be more effective if they are firmly connected with a health

behaviour change theory (Middelweerd et al. 2014).

Most health related behaviour change programs have concentrated on controlling or decreasing negative behaviours, such as reducing the use of drugs and alcohol consumption, smoking, or obesity rather than focusing on increasing positive behaviour such as physical activity and exercise. It is extremely hard to change long-term habits. Behaviour change is a process that occurs over a long time period. The transtheoretical model of change has divided this process into different stages that occur in a cyclic model. The stages are precontemplation, contemplation, preparation, action and maintenance which are illustrated in the figure below (Prochaska & Velicer, 1997) (Berger et al., 2007).

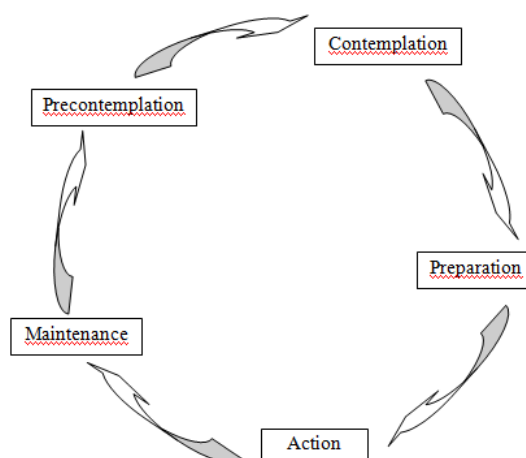


Figure 2. Cycle pattern of stages of change (Modified from Berger et al., 2007)

In the *precontemplation stage* a person has no desire or intention to change their behaviour. In an exercise setting this means, for example, that a person is not anticipating starting exercising or being more physically active within the next 6 months. These people are often called “coach potatoes”. They might dislike exercising or they might have tried to change their behaviour in the past but due to previous failures they have given up and do not believe they can make the change. They might also be against change due to social factors. Overall, people in precontemplation stage are amotivated. Most health promotion programs do not match these particular individuals even though they are usually the ones that need the lifestyle change the most (Berger et al., 2007).

The next stage is the *contemplation stage*. People in this stage have serious intentions to exercise within the following 6 months. These people are usually aware of positive and

negative issues related to the possible behaviour change. One example of a negative issue could be that spending time exercising means spending less time with one's family. Contemplation phase can last as long as two years and during this time people are not normally ready for more action oriented change programs (Berger et al., 2007).

The third stage is the *preparation stage* where people actually intend to take action toward more physically active lifestyle. Usually this initiative will be taken within a month. People in the preparation stage usually have some sort of plan and have already taken a significant action such as purchasing a gym membership, buying exercise equipment, or visited a physician (Berger et al., 2007).

The fourth stage is called *action stage*. In this stage people have taken steps and modified their lifestyle to a more physically active direction within the past 6 months. In other words, they exercise regularly but have been doing so for less than half a year. This stage takes a lot of effort and is also the least stable stage as it possesses the highest risk for a relapse (Berger et al., 2007).

The final stage is *maintenance stage*. In this stage, people have already continued their new and more physically active lifestyle for more than 6 months and are somewhat less likely to relapse and return to their old behaviour. People who have been in this stage for over 5 years are likely to continue maintaining new lifestyle throughout the rest of their life. Setbacks such as injuries and other health-related problems can lead to a relapse also later on. (Berger et al., 2007)

The transtheoretical model has been applied to many health behaviour programs and has been the most widely used program within the health promotion setting. (Spencer et al., 2006) In this study, the transtheoretical model was used as a theoretical background for designing the questionnaire.

The term proxy agency is derived from Alfred Bandura's social cognitive theory. The theory is based on the idea that people play an active role in their self-development, adaptation and self-renewal by using mechanisms of agency, where "agency" means acts which are done intentionally. There are three different types of agencies: personal, collective and proxy. In personal agency the person itself acts as an agency whereas in

collective agency a group acts as an agent. Proxy agency means a situation where a third party acts as an agent on someone's behalf (Beauchamp & Eys, 2007, Bandura, 1982). In an exercise setting a collective agent can be, for example, a fitness group or a fitness class and a proxy agent would be a personal trainer.

Bandura has outlined three reasons why people use proxy agency. Firstly, people might have lost their means to reach their desired outcome. Second, they might think that a third person is more capable of facilitating the achievement toward the desired outcome. Finally, people may want to give control over to somebody else because they want to shift the responsibility of the direct control (Bandura 1997). In an exercise and physical activity setting the use of proxy agent, often a personal trainer, helps a person to manage environment and task demands as well as gives extra help in regulating and controlling exercise behaviour, developing new skills and helping in lifestyle management (Beauchamp & Eys, 2007). Having a proxy agent also provides a person social support which increases positive outcomes. This may lead to increased positive effects which in turn can lead to greater likelihood in experiencing full involvement, focus and enjoyment (Jowett & Lavallee, 2007).

2.2 Activity trackers

Commercially available physical activity monitors are becoming more and more popular in scientific research to objectively quantify individual and group level physical activity as well as for personal use. Regarding personal use the research focus has usually been on physical activity levels related to fitness goals or weight management (Dannecker et al. 2013). Presented below are some of the most recent studies relating to activity trackers or interventions done in fitness centre settings. Also, physical activity related studies that specifically include Polar Loop have been introduced (Table 1). More information about Polar Loop can be found from the appendix 1.

A study done by Hagströmer et al. (2007) measured physical activity and inactivity. The target group consisted of 1114 randomly recruited adults who all used accelerometers for seven consecutive days. The most important finding of this study was that objectively obtained estimates of physical activity yielded different activity patterns and lower values compared to those that were obtained by self-reports (Hagströmer et al. 2007). This shows

that wearable devices often provide with more accurate data and therefore serve as a more reliable information source when planning and executing health behaviour change programs.

Together with wearable devices, smartphones also play an important role in digital health promotion. Even though smartphones are easy for interactive use they are not necessarily the most comfortable to wear and carry during an entire day and particularly when training. Because of their simplicity smartphone health devices are usually targeted for average consumers rather than experts in medical settings (Meyer & Boll, 2014). A study done by Cowan et al. (2012) also focused closely on smartphones. The study compared 127 iPhone applications which were targeted to physical activity. According to the results, applications seemed to contain only minimal theoretical content. Higher prices had a positive correlation to higher theoretical content. However, in the future there is a need for health promotion specialists to cooperate with application designers so that the products meet the requirements of different customers' needs even better (Cowan et al. 2012).

Wristband activity trackers have also been tested for monitoring and improving health outcomes for elderly populations. The study done by O'Brien et al. (2015) evaluated the utility and feasibility of activity trackers with older adults for monitoring health outcomes and physical activity and improving self-efficacy. The 12 week pilot study included 34 people out of which 95% experienced a decrease in waist circumference. Even though there were no changes in participant self-efficacy, the study suggested that activity trackers could be useful in improving older adults' health by monitoring and promoting physical activity. It is also important to note that participants found activity trackers easy to use (O'Brien et al. 2015).

A study done by Endeavour Partners (2014) concentrated on human behaviour change and long term engagement. The 18 month long study concentrated on wearable devices such as wristbands, wearable bio-monitors, smartwatches and eyewear and how they can create competitive advantage by increasing customer engagement in USA. The study revealed that 10% people over the age of 18 own an activity tracker. These devices were most popular in the age group of 25-34. However, it is worth noticing that one third of activity trackers users stopped using the device after 6 months. Approximately half of the

population who has owned an activity tracker do not use it anymore. The key in creating competitive advantage with activity trackers is to create sustained engagement. According to the study there are three important factors for doing this: habit formation, social motivation and goal reinforcement. Different wearables were compared to each other within different categories (Endeavour Partners, 2014). In the comparison study Polar Loop received highest on average marks for the combination of these three important factors that create sustained engagement. The more specific results and comparisons can be seen in figure 5 below.

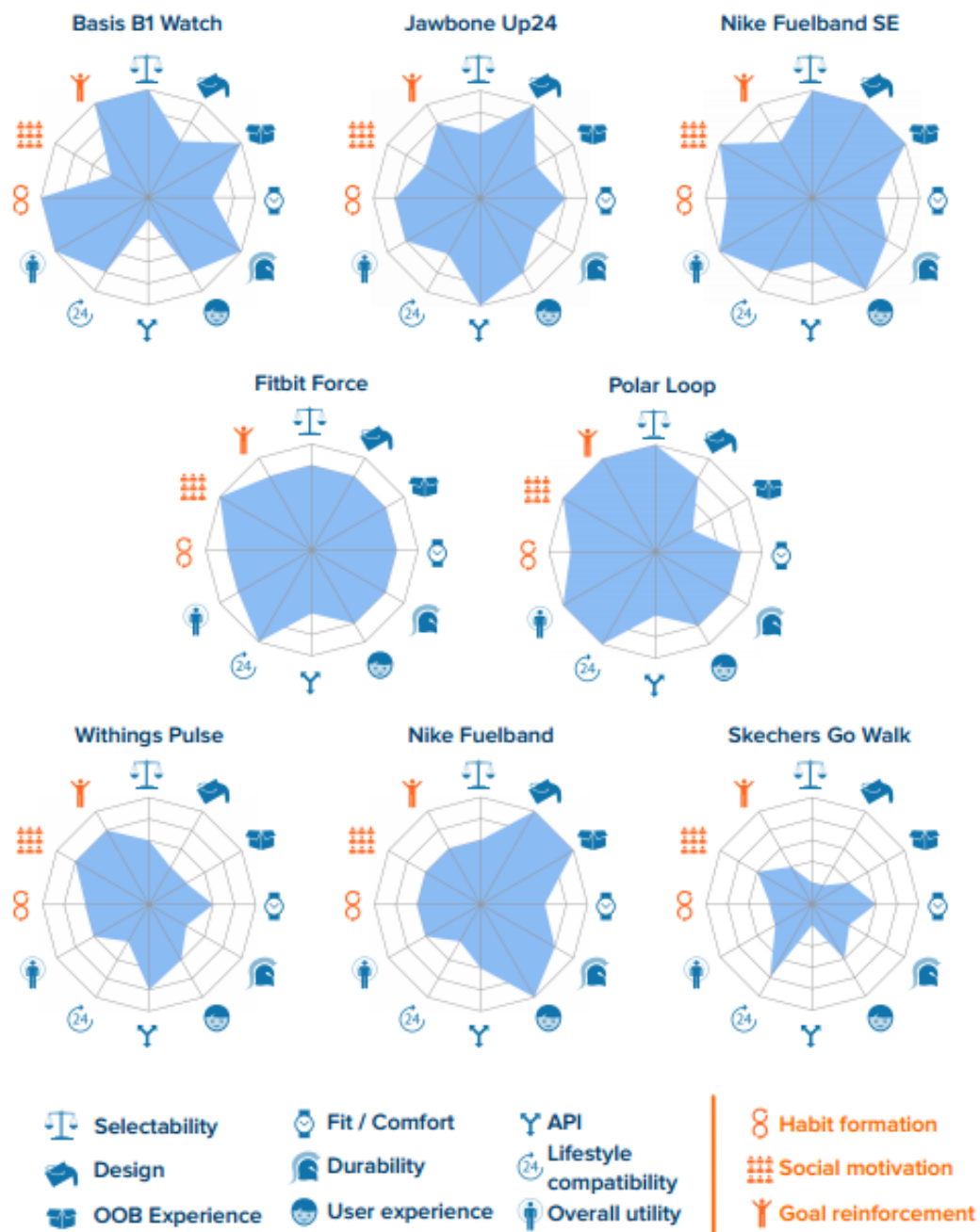


Figure 3. Comparison of different wearable devices and their different functions

At the moment there are more than 1000 exercise apps on the market. Recent research by Litman et.al. (2015) studied whether the use of these apps is actually associated with increased exercise levels and positive health outcomes. In this framework exercise apps were also used to overcome exercise barriers by increasing self-efficacy. The study included 726 participants, including people who have never used exercise apps, people who have discontinued using them and people who are still using exercise apps. All participants received a questionnaire related to their long-term levels of exercise as well as their exercise during previous week. The research showed that current app users reported to be more active compared to other two sub groups. Exercise app users had a higher total leisure time metabolic equivalent of task expenditures and their body mass index (BMI) was lower on average. The conclusion was that the association between BMI and app use is mediated by increased exercise and increased self-efficacy.

Different exercise applications can be viewed as a collection of features which have the potential to affect the cognition and behaviour of the users. These features include motivational messages, feedback based on tracking user activity, giving advice on how to exercise, setting and monitoring goals, and also the ability to share personal goals and results on social media. In the aforementioned study done by Litman et al. (2015) the focus was on two key variables that are predictors of physical activity: self-efficacy and barriers to exercise. According to the study people with higher and more barriers to exercise benefit more from using an exercise application compared to exercisers with less barriers. The study also showed that use of exercise applications was associated with increased level of self-efficacy and that application users tend to have increased level of physical activity also in their leisure time.

Since the activity tracker used in this particular study is Polar Loop the focus is now on previous studies where the activity tracker has been tested. Despite Polar Loop being a relatively new product, it has been examined in several studies. Most of them have focused on physiological features but some studies have also taking into account the human aspect. As presented above (Figure 3) in the study by Endeavour Partners (2014), Polar Loop is considered a high value product when compared to its competitors. Particularly, its features relating to goal reinforcement, habit formation and social motivation were valued. These features are an important part of the process of behaviour

change towards physical activity. The following table presents additional studies that have concentrated on Polar Loop from sociological and psychological perspectives.

Table 1. Earlier studies related to Polar Loop activity tracker and physical activity

Researcher(s), year	Name of the study	Method
Endeavour Partners (2014)	The future of activity trackers (Part 3): The secret to long-term engagement.	Comparison study
Ledger, & McCaffrey (2014)	Inside wearables. How the science of human behavior change offers the secret to long-term engagement.	White paper report
Lyons et al. (2015)	Behavior change techniques implemented in electronic lifestyle activity monitors: A systematic content analysis.	Content analysis
Roos et al. (2014)	Accuracy of energy expenditure estimated by five commercial fitness trackers.	Comparison study
Tanskanen et al. (2015)	Comparison of polar Loop and Actigraph activity monitors in detecting physical activity and sedentary time in daily living among adults.	Comparison study

The University of Jyväskylä and LIKES Research Centre for Sports and Health Sciences studied the Polar Loop activity tracker in connection with the Active Life and Work project. The study compared Loop and Actigraph monitors with a test group of 18 people over 8-10 days. The purpose was to measure sedentary time in free living conditions. As a result both monitors measured and categorized sedentary time and different levels of physical activity. The different features of Loop were monitored by the participants during the study with a following intensity: 1. steps (88%) meaning that 12% of the participants did not follow their step count 2. total active time (83%) 3. sleep (61%) and 4. sitting time (33%). Activity goals were considered realistic and 89% of participants reached their individually set goal. 83% of participants felt their level of physical activity

increased during test period. Information received from Loop was considered reliable and accurate (Tanskanen et al. 2015).

These results are similar to the study done by Lyons et al. (2014) which focused on behaviour change techniques implemented in 13 different electronic lifestyle activity monitors. The focus was on testing and comparing different activity monitors and their features by professional coders. Self-monitoring and feedback were essential elements in all devices as well as goal setting and discrepancy between current and goal behaviour. These behaviour change techniques matched recommendations from social cognitive theory. In summary, this type of technology was seen as having potential for usage in public health, clinical and rehabilitation settings (Lyons et al. 2014).

A study done by Roots et al. (2014) tested the energy expenditure accuracy of different activity trackers. The study included 20 participants whose energy expenditures were measured with various different measurements. The study revealed that Polar Loop underestimated mean energy expenditure by 16% and was on a satisfactory level in all activities excluding cycling (Roots et al. 2014).

According to a study by Ledger & McCaffrey (2014) wearable devices and services enable opportunity for personalized progress information that has never experienced before. This opportunity is based on facilitating personalized progress and development as well as providing feedback on healthy lifestyle, fitness and diet. These conclusions were made after a comparison study of different wrist monitors (Ledger & McCaffrey 2014). Similar results were received by a Polar unpublished internal survey which included over 3000 Polar Loop clients. The main reason for buying Loop was to track daily activity, though other important reasons were health and weight loss related. Loop received positive feedback on its good looks, usefulness, simplicity, ergonomics and motivational factors.

Maintaining motivation and attendance level is an issue that also interests fitness centres. It has been estimated that 50% of individuals starting a fitness program drop out within the six months. A research done by Nigg et al. (1997) focused on the attendance level of university fitness facility members. The intervention included 102 members which were randomly selected and divided into two test groups, an intervention group and a placebo

group, and both groups' gym attendance were monitored during eight week period. In the beginning of the test period the intervention group received a phone call asking them to systematically record all the expected gains and losses of exercising in fitness centre and after that share the information to the caller. The placebo group received a similar call except the topic was irrelevant to the topic such as smoking. The study showed that during the test period the intervention group maintained the attendance level while the placebo group had a significant decrease in attendance (Nigg et al. 1997).

Another intervention taking place in a fitness centre environment focused on understanding habit formation of new gym members and especially the reasons that could explain the huge drop-out of gym members. The study included 111 voluntary gym members who were asked to perform 30 minutes of moderate-to-vigorous training five times per week during their free time for the next 12 weeks. The data was collected by self-reporting. Even though affect was predicted to be the most prominent factor it was consistency that was shown to be the most important considering habit formation. Low behavioural complexity and positive environment was demonstrated to play an important role in habit changes over time (Kaushal & Rhodes, 2015).

Due to the high dropout rates of fitness centre members it is important to focus on how to maintain motivation. A study conducted at Pennsylvania State University focused on 25 inactive adults and their exercise motivation during a 30 week period. The exercise method was to start using simple, easy-to-achieve activities and keeping the training fun for the participants. The results showed that 20 participants did not miss any training during the test period and also gained health benefits and weight loss. This study showed that slow and gradual training intensity development enables customers to adapt to the new active life style and reduces their tendencies to become too discouraged to continue (Health Club Management, 2015).

A study done in 2013 focused on how many fitness centre members used some kind of products or apps to track their physical activity. 27% of members reported using a physical activity tracker. The usage level was higher with younger members and newer members. The study period lasted for seven months during which the visit frequency and motivation was measured for customers who were using and not using activity trackers. There were no differences concerning the average gym visit between the two groups.

However, members using a physical activity tracker had higher motivation relating to physical appearance and weight loss related issues. The study also showed that people who tracked their physical activity were slightly more likely to quit their membership. This phenomenon can partially be explained by the younger average age as well as the shorter average membership history of the activity tracker group. Other issues highlighted in the study were that activity trackers may lead to loss of focus of interpersonal relationships in the fitness centre environment (Health Club Management, 2015).

To sum up, motivation has an important role when it comes to changing a lifestyle into more physically active. The feeling of autonomy, competence and related are important elements of motivation. Goal setting techniques have often been used as a way of increasing motivation especially when it comes to long term behavioural changes. Nowadays the number of health technology devices has increased.

The studies have shown that activity trackers as well as different health related mobile applications seem to encourage people to become more physically active. Physical activity related technology devices offer a possibility to track exercises and set personalized goals and this way provide a monitoring tool for longer lasting behavioural change process. According to comparison studies Polar Loop has been rated to be one of the best activity trackers in the market especially regarding it's motivational functions creating sustained engagement

However, there has not been a lot of research done in the fitness centre setting that focus on activity trackers and their possible motivational effects. So, we do not know how activity trackers affect gym member's motivation or whether it can affect at all. Another research area that would be important to study in the future is the transition from extrinsic to intrinsic motivation within fitness centre customers and how could an activity tracker help in that transition.

3 AIMS

The research question of this study is the following: *“Does wearing an activity tracker motivate fitness centre members and increase their physical activity participation and awareness regarding their own health?”*

This research question has been divided into the following sub-objectives:

1. Does the use of activity trackers affect fitness centre members' behaviour regarding gym attendance and physical activity level?
2. Does the use of activity trackers affect the fitness centre members' awareness of their physical activity and health related issues?
3. Does the use of activity trackers have same effects on customers with different lengths of their membership history?
4. Does the use of physical activity trackers motivates equally members with and without a personal trainer guidance?

This study is focusing on the use of an activity tracker (Polar Loop) and its role in motivation toward physical activity and exercise as well as its role in awareness related to one's own health and health related behaviour.

The research hypothesis is that an activity tracker motivates fitness centre members to visit a fitness centre more often. The hypothesised mechanism behind this hypothesis is that by tracking their physical activity behaviour makes them more interested and aware on their daily physical activity and that way they become more motivated to be physically active.

4 METHODOLOGY

In this study the basic design is quantitative experimental design. However, some qualitative information was also collected by post-study email interview in order to receive valuable exploratory and explanatory information.

4.1 Research design

The study was carried out in a fitness club located in Jyväskylä, Finland (SATS ELIXIA Seppälä). The study started on 17.2.2015 with an opening meeting where the study design and delivery was planned together with representatives of the fitness club (SATS ELIXIA) and the activity tracker company (Polar Electro Oy). The study consisted of two main groups, called the Loop group and control group. The Loop group was given physical activity trackers as well as heart rate sensors (H7) in the beginning of the test period whereas the control group received their activity trackers after the test period as a reward for participation. Both groups were also divided into three sub groups: members with more than 9 months of membership (OLD), members that used the personal trainer service (PT) and the new members, with no more than two weeks of membership history at the time of recruitment (NEW). Personal trainers were informed about the research and the activity tracker. However, they were not asked to monitor their customers' trainings by using the activity tracker.

It should be noted here that since we wanted to examine how the use of a tracking device alone could have an effect on members' behaviour and motivation, there was no additional external human encouragement. During the test period participants received information only from the trackers. The only exception was the PT group participants who also got a chance to discuss with their personal trainers if wanted.

4.2 Participants

Participant recruitment started at the end of February via the fitness centre member email. All of the about 2100 club's members were invited via customer email to participate for the study and the first 100 suitable candidates were selected and randomly placed in the

Loop Group or control group, both groups having a total of 50 participants. However, the aim was that both groups would have the same number of male and female participants compared to each other. From these 50 members, 25 were old members, meaning their membership had started before 1.6.2014. 13 participants were new members with less than 2 weeks of membership in the fitness centre. The remaining 12 members were members having at least 6 personal trainer sessions sessions (referred to hereafter as PT group) during the study period.

Subcategories were also created in the process of selecting old members. Out of old members 36% had visited the gym less than once per week on average, 32% had visited 1-3 times per week on average and 32% members had visited more than 3 times per week on average. This categorization was made to get the groups as similar as possible considering the participant's gym participation history. The number of visits was based on the fitness centre's visitor data during the period 15.1-15.2.2015. The total amount of participants who volunteered for the research was 282 of which 100 participants, 36% were male. The participants' age was not a selection criterion. As seen below the average age was marginally higher within Loop group participants.

Table 2. Participant info

Group	Type	N	Female	Male	Average Age
Loop	OLD	25	14	11	42.52
	PT	12	10	2	41.67
	NEW	13	8	5	33.08
	Total	50	32	18	38.09
Control	OLD	25	14	11	38.04
	PT	12	10	2	40.42
	NEW	13	8	5	28.54
	Total	50	32	18	36.32
Grand Total		100			37.91

4.3 Procedure and data collection

The participants were selected and divided into two groups by 20.3.2015 after which the 10 week test period started. Some members that were already recruited earlier in March were given their activity tracker during their enrolment and therefore their 10 week period started on 9.3. The rest of the participants started their test period on 16.3. All Loop group

members were asked to create a Polar Flow account and sign up for the Polar coaching group created for this research purposes. By joining the coaching group the participants made their training data visible for the research purposes. The data was also collected from the fitness centre's visitor data which recorded all the fitness centre visits participants did during their 10 week period. All participants were also asked to fill in a questionnaire before and after the test period. The questions were identical both times.

After the 10 week test period was over, the participants were asked to send feedback regarding the study as well as the activity tracker. Besides participants, the fitness centre staff and the personal trainers who worked with the study's participants were asked for feedback.

4.4 Measures

The first dataset obtained from fitness centre visitor data represented the number of members' visit to the gym. Data was used to compare the Loop group and the control group as well as their sub groups together to see whether there were differences in activity as measured by gym visits. The comparison was also made within both groups to see more closely the impact that membership history and having a personal trainer could have on the activity.

The second data source was from the activity tracker's internet database and therefore only refers to the Loop group. The focus of that data was on weekly activity goals and more specifically on how well these goals were achieved. This figure showed the percentage of how well members had reached their activity goals they had set for themselves. It is important to note at this point that weekly goal percentage achieved could also be more than 100%. The idea was to examine how these goals had been achieved throughout the test period and whether there were any radical changes or trends. The purpose was also to see whether there were differences between different Loop group sub categories concerning the achievement of weekly activity goals.

The third data source was from the research questionnaire (Appendices 2-5) that was developed for this particular study based on the needs of the research parties. The questionnaire included subjective questions regarding current physical activity and

satisfaction towards the device, sleeping time, daily sitting time and awareness regarding their own overall wellbeing. Questions based on the transtheoretical model of change were used in order to assess their level of change among groups, before and after the 10 week monitoring period in March-May 2015. Upon request of research parties, the questionnaire also included a question relating to participants' membership satisfaction, in order to see the possible effect this particular research had on that area.

4.5 Data analysis

The fitness centre visitor data and the activity tracker's weekly goal percentages from the internet database were directly entered to SPSS, a statistical analysis and reporting software. The information from questionnaires was transformed into numeric data and also entered to SPSS for further analysis. Means, age range and frequencies were computed in order to obtain the basic information of the test group. This was followed by the test of normality which was done by using the Kolmogorov-Smirnov test for the main groups and Shapiro-Wilk test sub groups due to the difference in sample sizes.

The next analyses focused on the first measurement which related to gym visit activity. An independent sample T-test was performed to test differences between Loop group and control group. Here, the independent variable was the group and the dependant variable was the number of average weekly fitness centre visits within the 10 week period. The same test was also done to compare the sub groups between Loop and control groups. When testing differences within Loop group or control group the test method was one-way ANOVA. The same method, one-way ANOVA, was also used in measurements concentrated on Loop group weekly activity percentages and their development. Here the independent variable was the sub group whereas the dependent variable was the weekly average activity percentage within the 10-week test period. The last phase of the SPSS analyses was done by using repeated measures MANOVA to test for differences before and after the 10-week period among groups.

4.6 Ethical issues

The study design was planned and approved by all three participating parties Jyväskylä University, the activity tracker device company and the fitness centre company. All the participants were able to remain their confidentiality from other participants and their information was only revealed to the researcher and the research parties. The participants signed a consent form and were told they are allowed to drop out of the study if they wanted. The research data will be kept confidential and was handed over to the activity tracker device company after the results were analysed.

5 RESULTS

The tests of normality were conducted to investigate normality for the main variables; average gym visits and average activity percentages (only Loop group). The normality tests were done by splitting the data into different sub groups. Results for the Kolmogorov-Smirnov test for normality (see Table 3) indicated that average gym visits were normally distributed within OLD sub group ($D = .110$, $p = .185$). Due to the smaller sample sizes (< 50) for other sub groups the results from the Shapiro-Wilk test were more appropriate. These tests indicated normal distribution in all sub groups.

Table 3. Tests of normality

	Type	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	df	Sig.
Average gym visits per week	OLD	.110	50	.185	.911	50	.001
	PT	.153	24	.152	.917	24	.051
	NEW	.165	26	.067	.930	26	.075
Average activity percentage (%) per week	OLD	.158	25	.106	.938	25	.134
	PT	.140	12	.200*	.971	12	.918
	NEW	.164	13	.200*	.970	13	.889

5.1 Gym visits and activity percentages

When focusing more closely on the comparison of gym visits (Table 4) it can be seen that the average visit amount for 10 week test period was higher with Loop group (16.5) compared to control group (14.88). Nevertheless t-test did not indicate a statistically significant difference between groups

Table 4. Gym visits during 10 weeks – group comparison

(Gym visits) Group	N	Mean	Std. Deviation	Std. Error Mean	P
Loop	50	16.5	11.7	1.7	.115
Control	50	14.8	10.2	1.4	

The same comparison was made with comparing Loop group and control group sub groups together (See Table 5).

Table 5. Gym visits during 10 weeks – sub group comparison

	Group	N	Mean	Std. Deviation	Std. Error Mean	P
Gym visits (OLD)	Loop	25	13.7	9.8	2.0	.656
	Control	25	14.2	11.3	2.3	
Gym visits (PT)	Loop	12	21.8	14.5	4.2	.210
	Control	12	17.4	9.2	2.7	
Gym visits (NEW)	Loop	13	17.1	11.5	3.2	.535
	Control	13	13.9	9.2	2.5	

No significant differences were found. When looking closer at the average gym visits between the groups, within OLD members, the control group (14.16) had a higher average compared to the Loop group (13.68). However, when comparing the PT and NEW member's gym visits, the trend is opposite and the difference between groups is larger. Within PT members the Loop group average (21.75) was higher than control group average (17.42) as well as in NEW group where the Loop group members (17.08) visited the gym more often than the control group (13.92). Also noticeable is that PT members in both groups tended to be more active than other sub groups. When comparing Loop group OLD and NEW members the NEW group seemed to be more active, though the opposite is the case with control group members. The figure below shows the average gym visits during every week of the intervention period by sub groups.

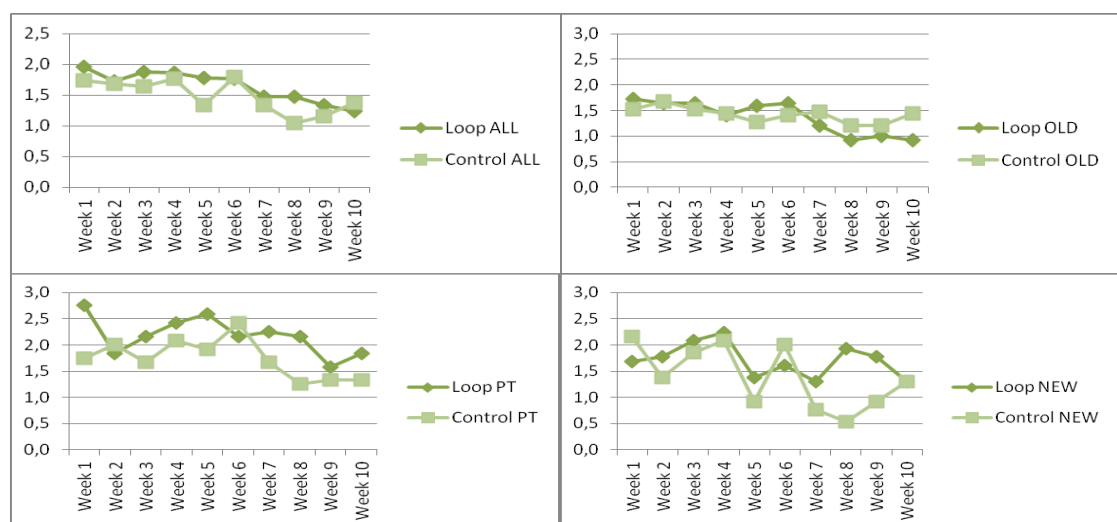


Figure 4. Loop group and control group gym visit trend comparison

All Loop group participants were invited to a coaching group, established in the activity tracker internet database, which gave access to their training and activity data. The focus of this data was on weekly activity percentages, which shows the level of how well each participant reached their weekly activity goal they had set for themselves. The focus was also on the development of these activity percentages during the ten week test period. Participants were asked not to change their activity goal during the test period. The difference between Loop group subgroups was tested by using one way ANOVA test. No significant statistical difference was found between sub groups (See Table 6).

Table 6. Weekly activity percentage – sub group comparison

	N	Mean %	Std. Deviation	Std. Error
OLD	25	101.9	29.3	5.9
PT	12	117.7	46.5	13.4
NEW	13	95.4	22.4	6.2
Total	50	104.0	33.1	4.7

Besides the statistical differences, the trend of activity percentages as well as the amount of gym visits on a weekly basis shows a correlation between the two ($r=.524$, $P=.000$). The correlation was measured using the Pearson Correlation test and the result showed that gym visits and weekly activity percentages are positively correlated. This correlation was from medium to strong.

When looking closer at the development of weekly activity percentages and gym visits it can be seen that both experienced a slight decrease during the test period. However, the decrease is larger when looking at gym visits. When comparing different sub groups together, there was a decrease in gym visits for OLD members whereas, the PT and New group members were stable throughout the 10 week intervention period. The figure below illustrates these trends and their relationship within all participants as well as within different sub groups. The average activity percentages of PT group are noticeably higher than in other sub groups. In the figure (5) below the units presented are the average weekly activity % by the group and the overall amount of weekly gym visits of the group.

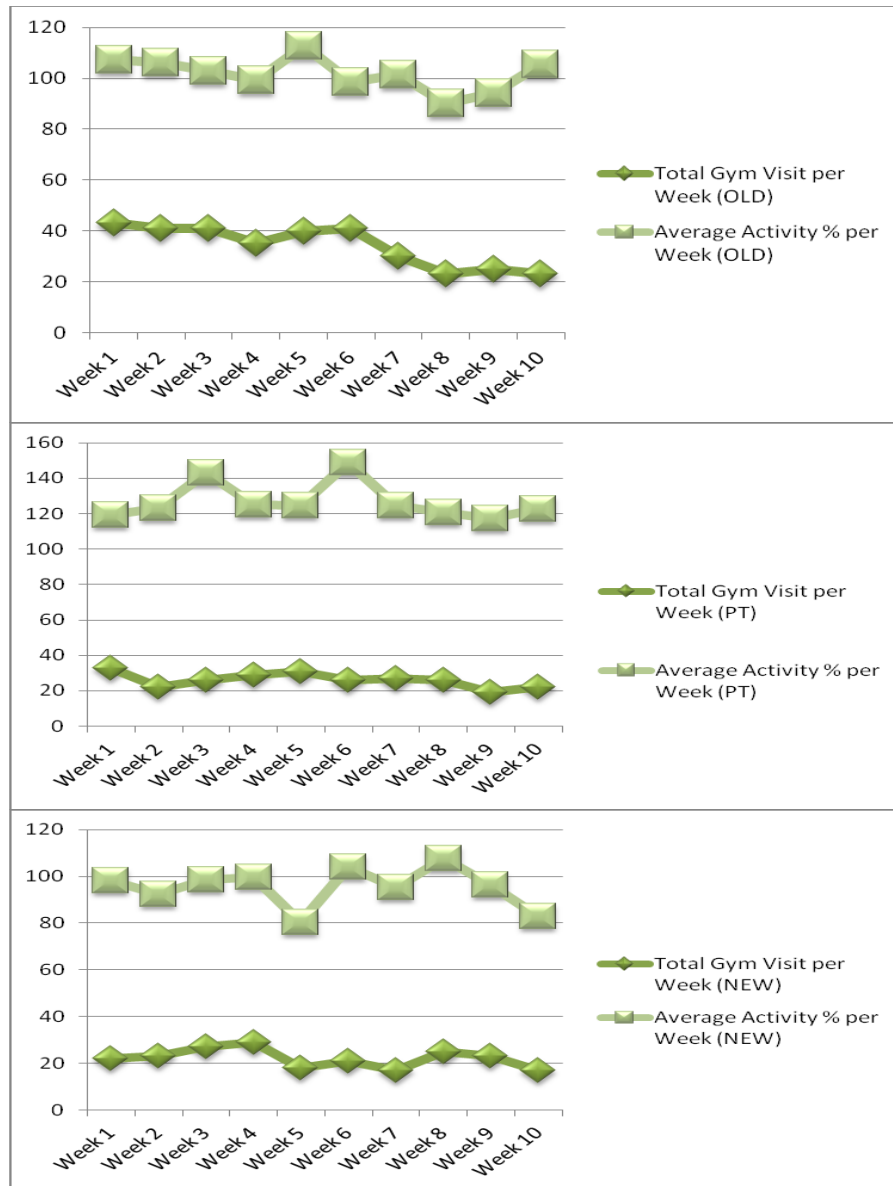


Figure 5. Loop group activity percentage and gym visit trends

5.2 Questionnaire

All participants received a questionnaire at the beginning and end of the test period. The questionnaire included seven different questions related to health and exercise and gym participation, which participants answered based on their subjective feelings. There were no statistically significant differences in the results of the questionnaire, but it is possible to see some trends. The first question related to the fitness centre membership and how valuable participants perceived it. On average both groups experienced a small decrease in the level of satisfaction. However, the difference was bigger in the control group.

Exceptions in this case were Loop group OLD and NEW groups where the level of satisfaction increased during the test period.

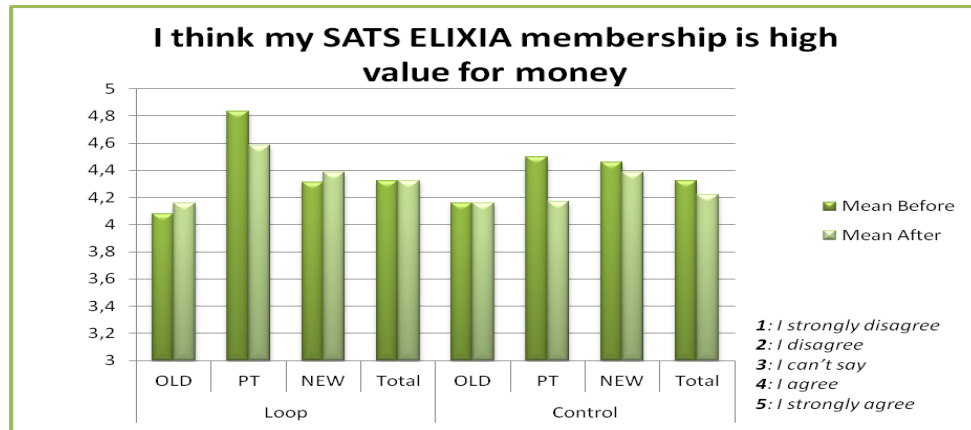


Figure 6. Membership value

The next question measured how physically active participants felt they were before and after the ten week test period. The overall trend was that participants felt they were more physically active after the test period. The only subgroup that experienced a decrease was the Loop group OLD.

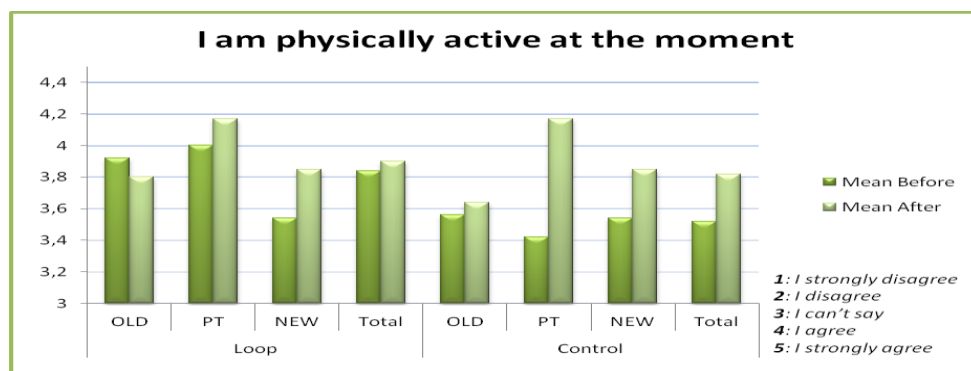


Figure 7. Current physical activity level

After subjectively measuring their own physical activity level the participants rated their own satisfaction related to their activity level. Both groups and all sub groups seemed to be more satisfied with their activity level after the test period, with the exception of the Loop OLD group, which experienced a decrease in their level of satisfaction.

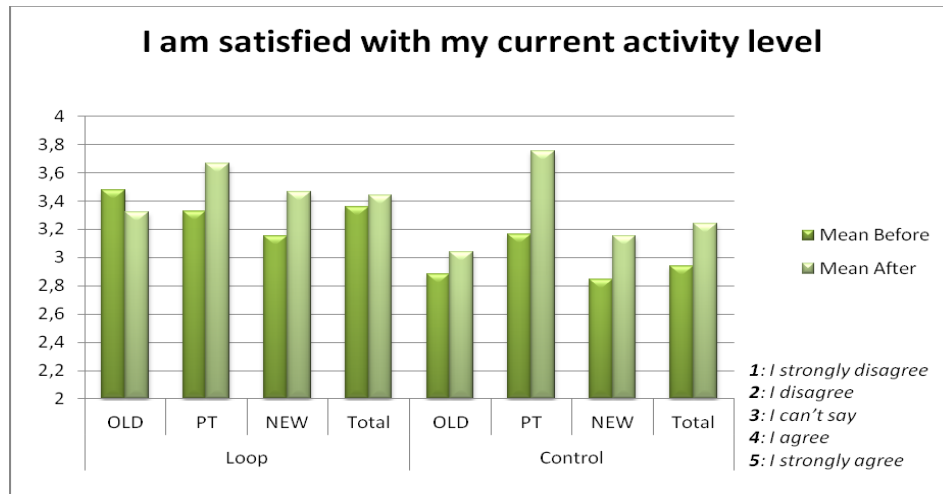


Figure 8. Physical activity level satisfaction

The fourth question measured how satisfied the participants were with their sleeping time and whether they thought it was sufficient. Results showed that all Loop group sub groups experienced an increase, meaning that after the test period they were more certain they slept enough. The result was opposite in the control group. This indicates that Loop increased the Loop group participants' awareness related to their own sleeping.

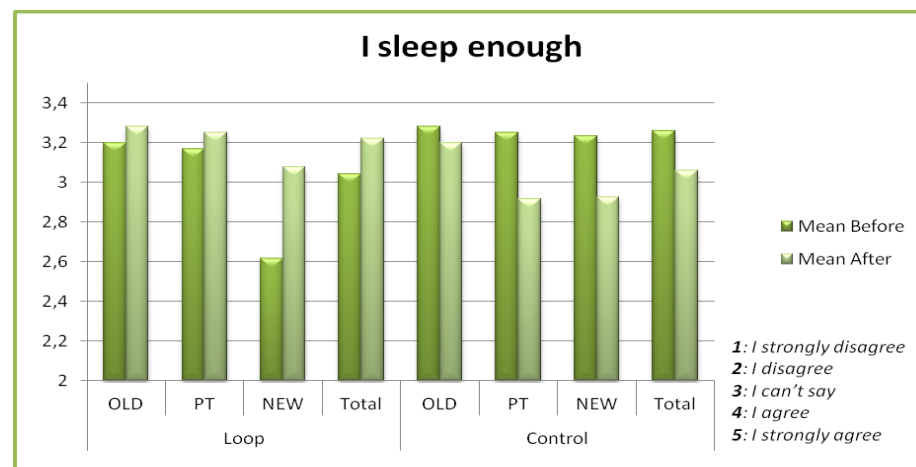


Figure 9. Sleeping duration

The next question was related to daily sitting time and whether participants think they sit too much during the day. Again the trend between Loop group and control group was different. Loop group experienced small increases in all subgroups except within the NEW group. In the control group participants seemed to be more certain after the test period that they do not sit too much during the day. This difference could indicate that Loop group participants received sitting time related information from Loop which made them realize how much they actually sit on a daily basis.

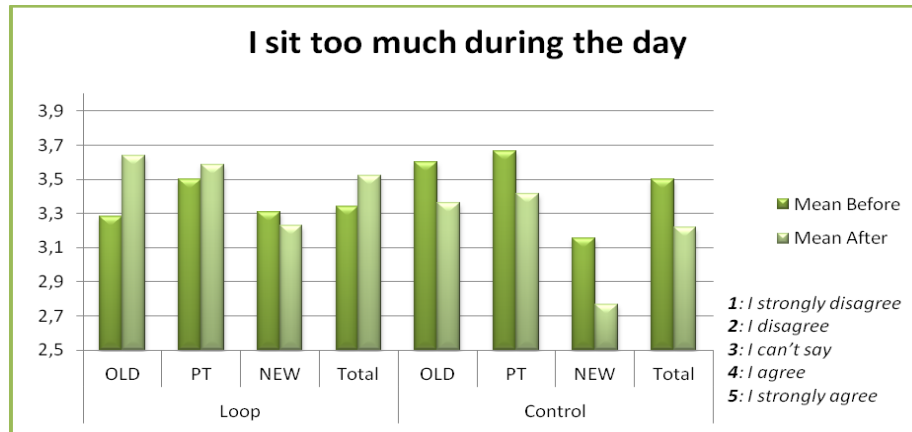


Figure 10. Daily sitting time

One of the assumptions in the beginning of the research was that Loop increases the participants' awareness relating to their own health and physical activity. The results show this assumption is accurate since Loop group participants had an increase of their awareness during the test period. The only exception was Loop group NEW which result remained the same. The results of the control group show a small decrease related to their awareness.

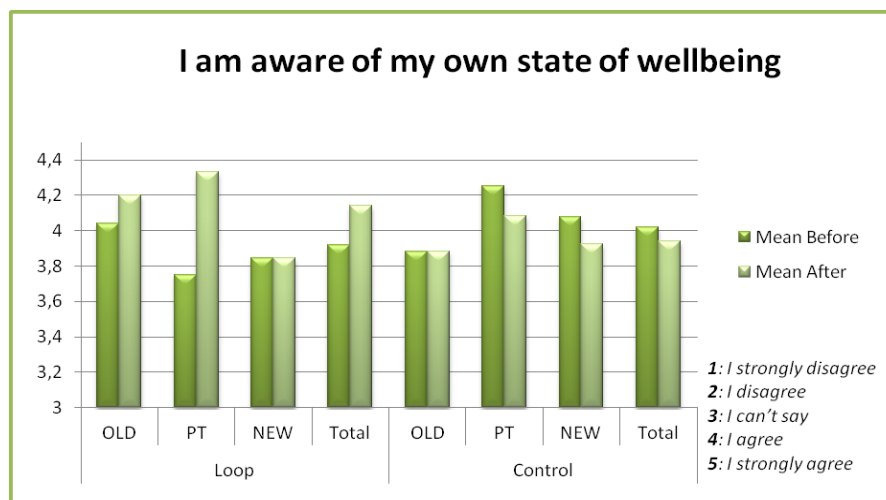


Figure 11. Awareness of wellbeing

The last question was based on the transtheoretical model measuring the participants' development towards a more physically active lifestyle during the test period. Ten weeks is a short time period to make significant changes or even take a step between levels, so it is difficult to make any strong conclusions based on these particular results.

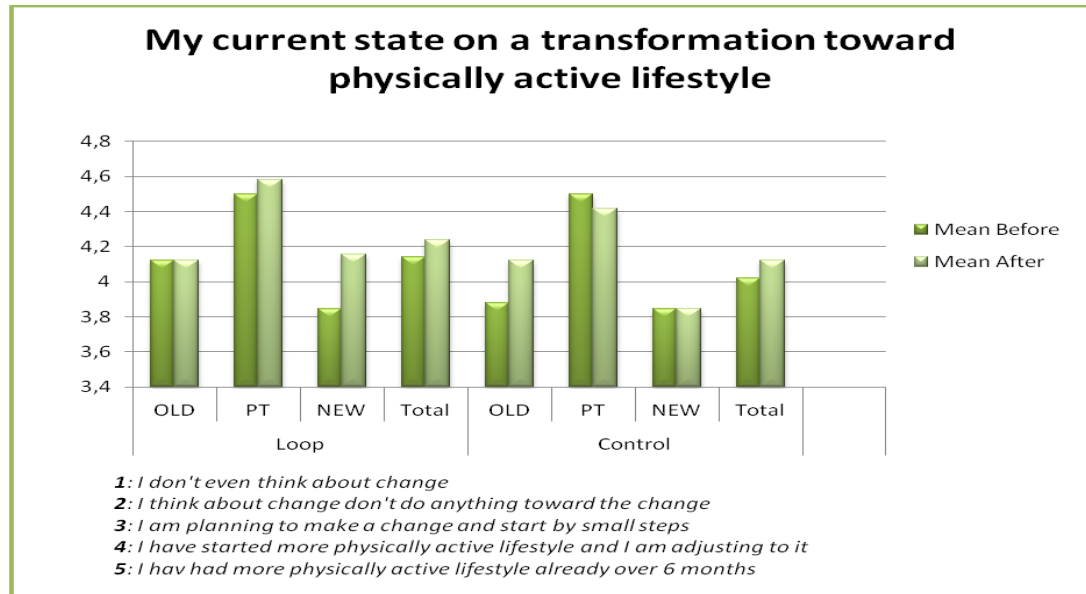


Figure 12. State of transformation

As can be seen from the figure above, the Loop group experienced a small positive increase and after the test period they had a more physically active lifestyle than before. The same results could be found with the control group OLD sub group, but otherwise the control group experienced a marginal decrease. The biggest differences were between the Loop group and control group NEW sub groups which indicates that especially with new exercisers an activity tracker seems to be useful tool encouraging them to obtain and maintain more physically active lifestyle.

5.3 Feedback - Qualitative data

All participants and the fitness centre personal trainers and customer service staff was asked for feedback after the test period.

With the Loop group participants the feedback rate was 70%. Most of the feedback was related to the fact that participants had learned more about their own wellbeing no matter what their initial starting point was. Some participants mentioned that the activity tracker had changed their awareness and perceptions of their sleeping time, sitting time and overall physical activity. Some critical comments were related to the activity tracker's functions and how the activity tracker was not suitable with participants' own electronic devices. The overall opinion seemed to be that the study was interesting and participants

viewed it useful for them. While some participants felt participation was easy, some people would have wanted less strict timelines. A few comments were also related to the pressure that the activity tracker itself and especially its goal setting had created. Some people felt it was positive and motivating whereas others first experienced it negatively but eventually learned to cope with it. However, the only participant who quit using the activity tracker in the beginning of the test period felt the pressure was too high for them since they felt they had to reach the set goal every day.

Only 20% of control group participants gave additional feedback. Most of the feedback was related to the fact that participants still were not aware of the purpose of the study or their role in it. Some participants expected more information during the study. Some of the participants mentioned that the fact that they were selected to the study already encouraged them to be more physically active. Some comments also highlighted the importance of these kinds of studies.

Three of the fitness centre's personal trainers gave feedback regarding the study. The answers were slightly different between them. Some mentioned they had talked about information received from the activity tracker with their customers and given advice whereas some personal trainers did not have had this kind of interaction with their clients. The biggest change was that personal trainer participants with the activity tracker seemed to monitor their heart rate level during their PT session. However, personal trainers were still not convinced whether having an activity tracker would have a positive effect on their personal trainer-customer relationships.

6 DISCUSSION

The purpose of this research was to explore how activity trackers influence fitness centre member's participation motivation and awareness regarding their own health and physical activity. The following discussion targets each sub question at a time and aims at comparing the results to previous similar studies.

6.1 Gym attendance and physical activity level

The first sub-aim focused on gym visits. Participants with activity tracker visited the gym more often on average. However, the difference was not statistically significant. When comparing sub groups together Loop group OLD actually visited gym a bit less than control group OLD. From the Loop group weekly activity percentages were also measured. On average, activity tracker users were able to reach their self-determined weekly activity goals. There were small variation between sub groups but they were not statistically significant. When comparing Loop group activity percentages to gym visits over the ten week period a medium to strong correlation was found. This means that participants using activity trackers reached their activity goal more likely if they went to the gym more often. The development of gym visits and activity percentages decreased during the 10-week test period slightly in both groups and all sub groups. According to the study of Rost et. al. (2015) comparison to other users might have an effect on users' activity. The perception of being above average may lead to feelings of success and may increase their motivation to continue. In this study the participants were not able to compare their results with other participants or average user's result and therefore this possible motivational effect was not part of the study. However, it is possible that some participants shared and compared their results with their own friends and that might have created a feeling of success.

In this particular study participants were not asked to set any specific goals for themselves. However, Polar Loop users were asked to set their activity tracker to a setting 1-3 that best fits their everyday life. Even though members using an activity tracker were not asked to try to meet the weekly activity goals the activity tracker can still be seen as a goal setter by giving people a target on how physically active they should be in order to meet their own set levels.

These results were slightly different from the Health Club Management (2015) study, which showed no difference in gym attendance between the test group and control group. In this study, the aim was only to track attendance and participants did not use any specific tracker but the one they had already been using before. Therefore we cannot know how well these trackers were able to show and teach participants information about their physical activity. In this sense, it could be assumed that tracking exercises is not enough to keep up motivation unless the tracker is also able to increase the participants' awareness relating to their physical activity and health and thus make their motivation more self-regulated.

6.2 Increasing awareness

The second sub objective focused on the change of fitness centre customers' awareness regarding their own health and physical activity. The answers for this sub objective were received from a pre- and post-study questionnaire. Participants self-evaluated their stage before and after the 10 week test period. On average, the Loop and the control groups claimed to be more physically active at the end of the study period. This subjective feeling did not go hand in hand in with the above-mentioned results, which suggested that, statistically, participants went to the gym less often, and were less active according to percentages received from the activity tracker internet database. The satisfaction toward one's own physical activity level followed the development of claimed activity level and has been perceived as an increase. The only exceptions to this pattern were Loop group OLD participants who felt they were slightly less active after the test period and less satisfied with their current activity level.

However, it is important to keep in mind that, as shown in the study of Adams et. al. (2005), there can be some systematic biases in self-reports of physical activity. These biases are often attributable to personality traits, social desirability and social approval. Another important thing to acknowledge is that 10 weeks can be a short time to make significant lifestyle changes. This should be remembered when interpreting the results especially from the transtheoretical change model point of view.

When focusing on the subjective amount of sleep and whether participants felt they had enough, no significant differences were found between Loop and control groups.

However, the means show that after the test all Loop sub groups were more certain they sleep enough, the control group was less certain. This indicates that the activity tracker might have provided participants information related to their sleeping patterns and made participants more certain they sleep enough during the night. According to Chen et. al. (2013) the key issues in sleep monitoring is that it has to remain unobtrusive to the users. Only in that way are these self-monitoring devices such as activity trackers suitable for long-term usage and can impact overall health and wellbeing. Another study by Kim (2014) suggested that since sleep monitoring requires additional steps to facilitate compared with activity tracking; it can result in a relatively lower compliance level. In the case of Polar Loop the daily activity can be monitored from the activity tracker but sleep can only be monitored when logging in to the internet database. According to Kim (2014) these extra barriers can have an effect, especially in the long term.

When looking at the data relating to daily sitting time there were also some differences. Loop group found, on average, that they were even more concerned about their daily sitting time in the end of the test period whereas the control group was slightly more certain in the end of the test period that they do not sit too much on daily bases. This suggests that information the the activity tracker provided participants on daily sitting time made them more aware and more concerned about their daily sitting time. As stated in the study by van Uffelen et. al. (2011) self-reporting sitting time is usually difficult to report and often inaccurate. Therefore using activity trackers or accelerometers makes it easier and more reliable to track sitting time.

The data also showed that the effect of an activity tracker can develop a person's awareness of their own state of wellbeing. Whereas the Loop group experienced an increase in the awareness, the control group experienced a decrease. This indicates that the activity tracker was able to maintain and increase the awareness related to the participant's own state of wellbeing. When measuring the transformation towards a more physically active lifestyle the difference between Loop and control group was not noticeable on average. However, when comparing more closely on a sub group level it can be seen that while the control group PT participants experienced no change or a marginal step back, the Loop group PT participants experienced a small improvement in their progress towards a more physically active lifestyle. The difference was similar but even larger when doing the comparison between NEW sub groups. This implies that,

especially for new fitness centre members, an activity tracker can provide motivation to keep working towards a more physically active lifestyle. In conclusion, customers' answers to the questionnaire showed some trends indicating the importance of the activity tracker in increasing awareness of physical activity and health related issues. Nevertheless, since there was no statistical differences results should be treated with caution.

However, according to Waltz (2012) providing personalized health related information is not enough to make people actually change their behaviour and give them motivation. Despite this, Waltz also suggested that health related information received on daily basis could help people in controlling their health such as weight control issues.

A study by Litman et.al. (2015) suggested that exercise applications will increase exercise level and health outcomes. These outcomes then lead to increased self-efficacy towards physical activity. However, when looking at the results of this study it seems that by increasing user's awareness and providing feedback the activity tracker could have increased the number of gym visits which might be related to increased level of self-efficacy. However, self-efficacy was not assessed in this study. Nevertheless, it can be said that by providing feedback and increasing awareness about health related issues the activity tracker increased the participant's level of perceived competence, which is one element in enhancing intrinsic motivation.

However, if the self-determined goal set by the user is too hard to reach, the feedback received from the activity tracker could also decrease the level of competence by stating how much more the user still should have run or walk in order to have met his/her goal. This might then lead to decrease in motivation. Even though the activity tracker provided a possibility for participants to choose their own physical activity level goal 1-3, it was not supervised that the self-set goals were the most optimal for them.

Similar results were found in a study done by Vallerand & Reid (1984). They concluded that performance feedback can produce changes in perceptions and feelings of competence and positive feedback of performance increased intrinsic motivation whereas negative feedback decreased it.

6.3 The influence of membership history

When focusing on the third sub objective, the aim was to compare participants with different membership histories. Whereas OLD group customers had been going to the gym for more than 9 months, the NEW group customers had been going to the gym for less than 2 weeks. As noted earlier, it can be assumed that old and new participant groups might have had different levels of self-determination and there can also be differences in their types of motivation. Also, their awareness related to health and physical activity related issues might have been different. As the membership history of PT clients was not a selection criteria the strongest conclusions may be drawn by comparing the results between OLD and NEW groups. The NEW group seemed to have higher visit amounts compared to OLD group on average. This difference was higher in Loop group, which indicates that the activity tracker may motivate new members slightly more than the older members.

When considering activity percentages OLD group was able to reach their activity goals better than NEW group. However, all participants were able to set their own goals since the study was not concerned about which level activity goals participants chose as long as they remained it the same during the study. Therefore no conclusions can be made that OLD group was more active during the study period considering the activity percentage variable. Nevertheless Loop group NEW was able to maintain their level better than Loop group OLD with respect to the development of gym visits and activity percentages. This indicates that the activity tracker had a marginally more positive effect on new members in maintaining the training motivation. NEW group seemed to experience a larger increase in the level of physical activity and in satisfaction toward their physical activity. This development was not necessarily related to the use of the activity tracker since it occurred also in control group.

The Loop group's sleep related information also seemed to increase the awareness more with newer members. When comparing the changes towards a more physically active lifestyle within the Loop group the change is noticeable. Whereas OLD group remained the same the NEW group experienced an increase.

These results are somewhat similar to the study done by Litman et. al. (2015) which said

that physical activity applications have more effect on users with higher level of barriers toward exercising. It can be assumed that NEW participants had more barriers regarding gym exercising since they had no previous experience in this particular gym compared to the participants in the OLD category. Since the change regarding physical activity and awareness related to health and physical activity were higher in the NEW Loop group compared to the OLD Loop group these results are in accordance with the claims presented by Litman et. al. (2015).

6.4 The effect of a personal trainer

The fourth sub objective was related to activity tracker's connection to the use of a personal trainer. Even though PT customers seemed to visit the gym more often than other sub groups the difference between Loop group PT and control group PT visits was noticeable. Considering Loop group activity percentages the PT sub group was able to reach their goals significantly better than other sub groups. Loop PT participants were also able to maintain the level of their gym visit activity as well as their weekly activity percentages better during the ten week period than any other sub group. This indicates that the combination of the activity tracker and personal trainer might increase customers' motivation toward physical activity and training. When considering awareness relating to sleeping time, sitting time or overall wellbeing the results indicate that the activity tracker makes PT customers more aware of their own health and wellbeing. This helps them move forward in the process of changing their lifestyle to be more physically active.

These results go together with the proxy agency theory (Beauchamp & Eys, 2007, Bandura, 1982) presented earlier in the theoretical framework. The activity tracker provides users feedback on daily basis, which could be considered as feedback received from a third party. However, the combination of the activity tracker and a personal trainer appeared to be more effective than having an activity tracker without a personal trainer. The reason for this could be that a personal trainer offers extra support and knowledge regarding the information received from the activity tracker and can help the customer improve their awareness regarding their own health and physical activity. When looking at this from a behaviour change perspective it is proven that the more techniques applied to the intervention group the better the result (Webb et. al., 2010) This was also proven

in a study by Hankonen et. al. (2015) where combining several behaviour change techniques lead to reduction in body mass index with people recently diagnosed diabetes.

Even though activity tracker users did not gather together or train as a group, a person could have still associated themselves as a part of a study group that uses activity trackers. Considering this possible association, participants may have also experienced collective proxy agency.

A study done by Fischer and Bryant (2008) focused on the effect of a certified personal trainer on the exercise behaviour of college students. In a one semester long study, they had a control group and an experimental group and they used the transtheoretical model of change as a theoretical background. Whereas cognitive behavioural processes of change, decisional balance and level of self-efficacy decreased in the control group, in the experimental group they remained the same.

6.5 Managerial implications

As explained in the theoretical part of this paper, the most common motives for getting involved with physical activity and exercise are extrinsic factors. However, even though these extrinsic factors work as catalysts for change, the focus usually changes to a more intrinsic motivation, which is supported by an increased level of self-determination (Carron et al. 2003). Considering the high number (282) of fitness centre customers who volunteered for the study it can be said that the activity worked well as an extrinsic source of motivation by attracting a significant number of different types of customers within a short time period. However, according to several participant feedbacks and also reflecting on the study results, the activity tracker also could have an effect in moving people toward more intrinsic motivation by providing personalized information.

A study done by Shin et. al. (2015) discussed the interplay of intrinsic and extrinsic motivation within activity tracker users. One of the key points of the study was that there are some people called as “quantified-selfers” who tend to analyse many things in their life such as sleeping, eating, or training. Whereas other users might stop using activity trackers after a certain point when new habits have been successfully obtained, these quantified-selfers continue collecting data. Their motivation for using activity trackers is

therefore different from other users and not only related to a healthier and more physically active lifestyle. Thus, it is possible that electronic monitoring of daily physical activity offers potential opportunities for implementing personalized interventions in many different settings in the future. However, the key is to find how electronic devices are able to show the information so that it is easy to understand but still diverse and motivating enough (Meyer & Boll, 2014)

6.6 Validity and reliability

The primary limitation in this study is its small sample size. It is too small for larger conclusions regarding fitness center population overall. Also the standard deviation especially with Loop PT group was high. The strength of the study was the experiential design which did not include any extra motivational aspects than the feedback received from Polar Loop.

6.7 Suggestions for further research

One potentially interesting avenue of further research would be to do a similar study with a larger number of participants, which would provide statistical strength to reveal if the positive trends observed in the current study reflect real effects of using activity trackers in promotion of physical activity. A follow up questionnaire and measurements could also be done in order to see how the training motivation has developed after end of the study period. It would be interesting to study how age, gender and the personal trainer relationship would affect the results.

Considering the partners in this particular study it would be highly relevant to further study how effective an active tracker is in motivating new members to join a fitness centre. In other words, would people buy the membership more easily if they receive an activity tracker in the beginning of their memberships? A follow up study then could answer the question: are activity trackers able to increase the new members' motivation and that way increase the average fitness centre membership time?

6.8 Conclusions

In the current study wearable activity trackers did not have effect on exerciser's subjective well-being nor on motivation towards physical activity. Despite that no statistically significant results were found, the direction of the descriptive statistics were to the hypothesized directions. However, the small number of participants in the current study and the overall lack of studies about use of physical activity trackers in fitness centres setting, suggests that further research is needed to provide us with more information.

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APPENDICES

Appendix 1: Definition of key concepts

Physical activity: Physical activity is defined as a bodily movement that requires energy expenditure. It refers to a set of behaviours including exercise, sports and a wide range of lifestyle related physical activities in various settings such as work, home, leisure time and during transportation (WHO, 1986).

Health: Health is defined as a state of complete mental, physical and social well-being. It is not only the absence of infirmity or disease. Health is not an object for living but can be seen as a resource for everyday living allowing people to live an individually, socially and economically productive life (WHO, 1986). In this study, the focus is on physical health.

SATS ELIXIA: SATS ELIXIA is a Nordic fitness centre chain offering a full-service training concept in Finland, Sweden and Norway. The company has a broad range of services from group classes to gym training and personal training. SATSELIXIA is considered one of the biggest fitness companies in Europe (SATSELIXIA, 2015).

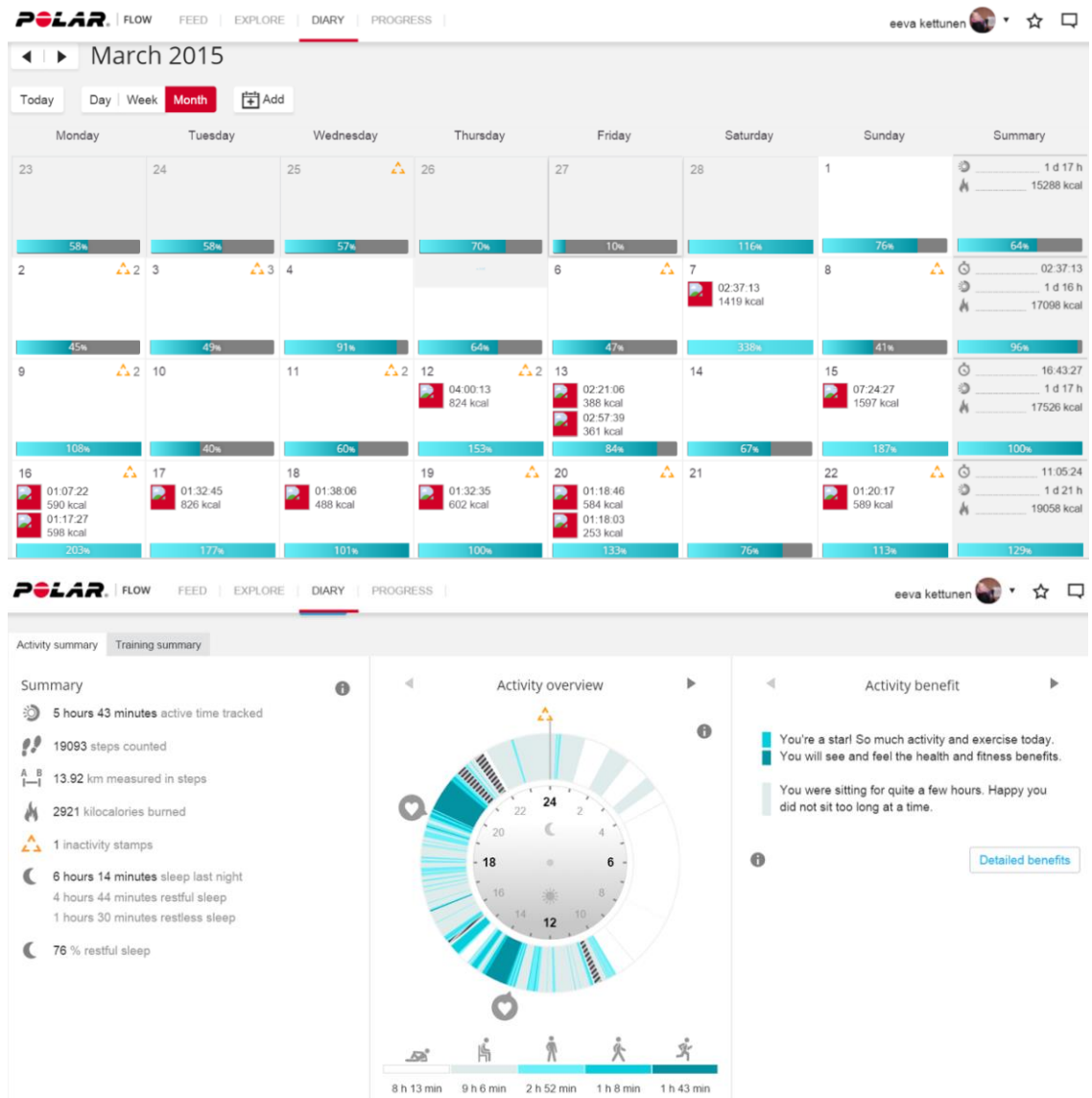
Polar: Polar is a Finnish company that manufactures sports training computers and heart rate monitoring equipment for athletic training and fitness. The company operates globally in over 80 different countries (Polar, 2015).

Polar Loop: Polar Loop is a wrist activity tracker. It measures daily activity level, calorie consumption and steps by using acceleration measurement. The measurements and activity levels are classified according to different activity modes. Polar Loop also tracks sitting time, sleeping time and sleep quality. It provides users with information on health and physiological issues that could work as a motivator. Loop can also help them achieve the set daily physical activity level by providing visual and auditory feedback and a means of tracking progress. The Loop shows how many steps the user has taken in that day, how many calories he/she has burned and also shows the time of the day. There are three different activity levels in the device's settings, so participants can choose themselves which level best suits their own lifestyle. The Loop also shows how well the user has met their goal in that day and how much more he/she has to still stand, walk or run in order to

reach the set daily goal. It also gives inactivity alerts if the user is sitting down for more than one hour at a time without standing up. When Polar Loop is used with a Polar heart rate monitor belt it will also show heart rate (Polar, 2014).



Polar Flow: Polar Flow (presented in figure 2) is a web service database that collects activity data from Polar activity trackers. The information from Polar Loop is transferred to Polar Flow via computer. Polar Flow works as a training calendar and enables long-term analysis as well as tracking and storing information about daily activities such as trainings, steps, sleeping time, burned calories and the overall level of activity. Polar Flow displays short and long term progress and gives feedback on how well the user was able to meet the daily, weekly and monthly activity goals. If the user is also wearing a heart rate sensor the Polar Flow tracks that time as training and provides information about each separate training session by showing, for example, the training intensity and heart rate curve. Polar Flow offers also the ability to share training information with other people. It is also possible to form training groups in Polar Flow, such as with family members or sport teams. These training groups provide the coach access to see all group members' training information and, if wanted, the group members can also share information within other group members (Polar, 2014).



Appendix 2: Questionnaire (Group 1 – Loop group)

SATS ELIXIA and Polar Electro Oy are doing a study during upcoming spring relating to polar Loop activity trackers. By filling out this form I take part in the study by joining the test group and agree to use Polar Loop activity tracker on daily basis until 31.5.2015. I also give approval for tracking my activity via Polar Loop tracker and SATS ELIXIA visitor data. Polar Electro Oy and SATS ELIXIA do not give any personal information to third parties. As a reward I can keep the Polar Loop tracker after the study period is over and after I have filled out the feedback questionnaire. During this test period I am not allowed to end or freeze my SATS ELIXIA membership.

Name: _____

Age: _____

Tel. Nro: _____

Email: _____

(I use this same email when creating my Polar Flow account)

Sex: MAN ☐ WOMAN ☐

By signing this form I agree to the terms mentioned above.

Signature

Place

Time

Circle the right answer:

(1:I strongly disagree 2:I disagree 3:I can't say 4: I agree 5:I strongly agree)

I think my SATS ELIXIA membership is high value for money	1	2	3	4	5
I am physically active at the moment	1	2	3	4	5
I am satisfied with my current activity level	1	2	3	4	5
I sleep enough	1	2	3	4	5
I sit too much during the day	1	2	3	4	5
I am aware of my own state of wellbeing	1	2	3	4	5

Which of the statements below best describes my current state on a transformation toward physically active lifestyle? Circle one statement.

1. I don't even think about change
2. I think about change but do not do anything toward the change
3. I am planning to make a change and start by small steps
4. I have started more physically active lifestyle and I am adjusting to it
5. I have had more physically active lifestyle already over 6 months

Appendix 3: Questionnaire (Group 2 – Control group)

SATS ELIXIA and Polar Electro Oy are doing a study during upcoming spring relating to polar Loop activity trackers. By filling out this form I take part in the study by joining the test group and agree to give approval for tracking my activity via SATS ELIXIA visitor data. Polar Electro Oy and SATS ELIXIA do not give any personal information to third parties. As a reward I will get the Polar Loop tracker after the study period is over and after I have filled out the feedback questionnaire. During this test period I am not allowed to end or freeze my SATS ELIXIA membership.

Name: _____

Age: _____

Tel. Nro: _____

Email: _____

Sex: MAN ☐ WOMAN ☐

By signing this form I agree to the terms mentioned above.

Signature

Place

Time

Circle the right answer:

(1:I strongly disagree 2:I disagree 3:I can't say 4: I agree 5:I strongly agree)

I think my SATS ELIXIA membership is high value for money	1	2	3	4	5
I am physically active at the moment	1	2	3	4	5
I am satisfied with my current activity level	1	2	3	4	5
I sleep enough	1	2	3	4	5
I sit too much during the day	1	2	3	4	5
I am aware of my own state of wellbeing	1	2	3	4	5

Which of the statements below best describes my current state on a transformation toward physically active lifestyle? Circle one statement.

1. I don't even think about change
2. I think about change but do not do anything toward the change
3. I am planning to make a change and start by small steps
4. I have started more physically active lifestyle and I am adjusting to it
5. I have had more physically active lifestyle already over 6 months

Appendix 4: Questionnaire (Group 1 – Loop group) in Finnish (used in the study)

SATS ELIXIA ja Polar Electro Oy toteuttavat kevään aikana tutkimuksen liittyen Polar Loop aktiivisuusrannekkeisiin. Täyttämällä ja allekirjoittamalla tämän kaavalleen suostun tulemaan mukaan testiryhmään ja käyttämään Polar Loop -aktiivisuusranneketta päivittäin aina 31.5.2015 saakka. Annan myös luvan aktiivisuuteni seurantaan rannekkeen tietojen ja kuntosalikäyntien perusteella mittausjakson ajaksi. Polar Electro Oy ja SATS ELIXIA eivät luovuta henkilökohtaisia tietoja kolmansille osapuolille. Palkkioksi osallistumisestani saan pitää Polar Loop -aktiivisuusrannekkeen itselläni testijakson jälkeen palautelomakkeen täytettyäni. Testijakson aikana en voi lopettaa enkä jäädyttää SATS ELIXIA -jäsenyyttäni.

Nimi: _____

Ikä: _____

Puh. nro: _____

Sähköposti: _____

(HUOM! Perustan Polar Flow -tilini tälle samalle sähköpostille)

Sukupuoli: MIES ☐ NAINEN ☐

Allekirjoittamalla tämän lomakkeen suostun yllämainittuihin ehtoihin.

Allekirjoitus

Paikka

Aika

Ympyröi oikea vaihtoehto:

(1: Vahvasti eri mieltä 2: Eri mieltä 3: En osaa sanoa 4: Samaa mieltä
5: Vahvasti samaa mieltä)

Saan SATS ELIXIA jäsenyydestä rahoilleni vastinetta	1	2	3	4	5
Olen liikunnallisesti aktiivinen tällä hetkellä	1	2	3	4	5
Olen tyytyväinen omaan aktiivisuustasooni	1	2	3	4	5
Nukun mielestäni riittävästi	1	2	3	4	5
Istun mielestäni päivän aikana liikaa	1	2	3	4	5
Olen tietoinen oman hyvinvointini tilasta	1	2	3	4	5

Mikä alla olevista väittämistä kuvaa parhaiten omaa nykytilaani muutoksessa kohti liikunnallista elämäntapaa? Ympyröi yksi vaihtoehto:

1. En edes ajattele muutosta
2. Ajattelen muutosta, mutta en osallistu tekemään mitään muutoksen eteen
3. Aion tehdä muutoksen ja kokeilen ensin pieniä muutoksia
4. Olen aloittanut liikunnallisemman elämäntyylin ja opin pitämään siitä Olen ylläpitänyt uutta liikunnallista elämäntyyliä jo ainakin 6kk ajan

Appendix 5: Questionnaire (Group 2 – Control group) in Finnish (used in the study)

SATS ELIXIA ja Polar Electro Oy toteuttavat kevään aikana tutkimuksen liittyen Polar Loop aktiivisuusrannekkeisiin. Täyttämällä ja allekirjoittamalla tämän kaavalleen suostun tulemaan mukaan testiryhmään ja antamaan luvan aktiivisuuteni seurantaan kuntosalikäyntien perusteella aina 31.5.2015 saakka. Polar Electro Finland Oy ja Sats Elixia eivät luovuta henkilökohtaisia tietoja kolmansille osapuolille. Palkkioksi osallistumisestani saan Polar Loop -aktiivisuusrannekkeen itselleni testijakson jälkeen palautelomakkeen täytettyäni. Testijakson aikana en voi lopettaa enkä jäädyttää SATS ELIXIA -jäsenyyttäni.

Nimi: _____

Ikä: _____

Puh. nro: _____

Sähköposti: _____

Sukupuoli: MIES ☐ NAINEN ☐

Allekirjoittamalla tämän lomakkeen suostun yllämainittuihin ehtoihin.

Allekirjoitus

Paikka

Aika

Ympyröi oikea vaihtoehto:

(1: Vahvasti eri mieltä 2: Eri mieltä 3: En osaa sanoa 4: Samaa mieltä
5: Vahvasti samaa mieltä)

Saan SATS ELIXIA jäsenyydestä rahoilleni vastinetta	1	2	3	4	5
Olen liikunnallisesti aktiivinen tällä hetkellä	1	2	3	4	5
Olen tyytyväinen omaan aktiivisuustasooni	1	2	3	4	5
Nukun mielestäni riittävästi	1	2	3	4	5
Istun mielestäni päivän aikana liikaa	1	2	3	4	5
Olen tietoinen oman hyvinvointini tilasta	1	2	3	4	5

Mikä alla olevista väittämistä kuvaa parhaiten omaa nykytilaani muutoksessa kohti liikunnallista elämäntapaa? Ympyröi yksi vaihtoehto:

1. En edes ajattele muutosta
2. Ajattelen muutosta, mutta en osallistu tekemään mitään muutoksen eteen
3. Aion tehdä muutoksen ja kokeilen ensin pieniä muutoksia
4. Olen aloittanut liikunnallisemman elämäntyylin ja opin pitämään siitä
5. Olen ylläpitänyt uutta liikunnallista elämäntyyliä jo ainakin 6kk ajan