

**INTERNET BASED EXERCISE MANAGEMENT SYSTEM FOR  
WORKSITE EXERCISE AND WELL-BEING INTERVENTION**

**Reijo Kangas**

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Department of Sport Sciences  
University of Jyväskylä

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Sometime man must challenge himself and follow the dream. Sometime man has to wake up and see what new people can offer. Sometime man has to humble oneself to learn, where the world has gone.

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## ABSTRACT

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The studies of exercise motivation theories can be used for the requirements of exercise management software systems. User-friendly mobile and web applications may wake up people's interest of their own awareness of unhealthy manners like obesity, sedentary behavior and possible mental health problems of inactivity.

The aim of the present study was to plan, organize and evaluate an internet based exercise intervention for workers. Other purpose of the study was to observe possible changes of exercise motivation and physical activity during the intervention.

Implementation of this intervention as planned needed to develop mobile and web based exercise management system ([www.trainit.fi](http://www.trainit.fi)) to study, enhance and maintain physically active life style. Measurements of exercise motivation were carried out by Exercise Motivations Inventory (EMI-2) and exercise barriers by Barriers Self-Efficacy Scale (BARSE) psychometrics tools.

Fixed exercise plans with instructions at Trainit portal, exercise skills learning, health behavior lessons and supervised training sessions were used to guide and motivate people to be physically active. Interviews and exercise session diary was used to collect experiences and feelings of participation on training sessions. Trainit portal was used to collect data of physical activity rate and, of course, willingness to use the portal.

This study did not reveal any permanent changes in exercise motivation, most probably, because of the short three month duration of supervised group exercise sessions. The whole intervention during eight months time period proved lasting exercise activity in practice when using web based tools for exercise planning, monitoring and peer review purposes.

Internet based applications are effective but cannot replace face-to-face delivery methods. Gaming features and other persuasive systems should be studied and use in the future to make physical activity behavior more attractive and raise awareness of the health.

Keywords: Exercise motivation, Social cognitive theory, Internet based exercise management system, Work well-being, Behavior Change Support Systems.

## TABLE OF CONTENTS

Abstract .....	2
1 Introduction .....	4
1.1 Motivation .....	6
1.1.1 <i>Goal setting and engagement</i> .....	9
1.2 Intentions and expectations to exercise.....	10
1.2.1 <i>Control-based theory of Self-Determination</i> .....	13
1.2.2 <i>Stage-based models</i> .....	14
1.3 Initiating (stopping and resuming) physical activity and exercise .....	15
1.4 Creating an affection.....	16
1.5 Working motivation and performance .....	19
1.5.1 <i>Exercise on the working places</i> .....	21
1.6 Measurement of exercise motivation in adults .....	22
1.6.1 <i>Exercise motivational inventory questionnaire (EMI-2)</i> .....	22
1.6.2 <i>Barriers Self-Efficacy Scale (BARSE)</i> .....	23
1.7 Theoretical background of web based health-related behavior studies.....	24
1.7.1 <i>Weight loss interventions</i> .....	27
1.7.2 <i>Work site and clinic use of web sites</i> .....	28
1.7.3 <i>Cost benefits between face-to-Face and web based studies</i> .....	29
1.8 Video gaming features for motivating people towards physical activity .....	30
1.8.1 <i>Physical self-perception; the model and implementation of progress</i> .....	31
1.8.2 <i>Summary of using gaming features in exercise interventions</i> .....	34
2 Program .....	36
2.1 Internet application for exercise management .....	36
2.1.1 <i>Mobile data gathering</i> .....	40
2.1.2 <i>Profiling and exercise configuration</i> .....	41
3 Purpose of the study .....	45
4 Methods .....	46
4.1 Participants .....	46
4.2 Exercise leader.....	48
4.3 Procedure .....	48
4.4 Research procedure and Data Collection.....	50
4.5 Design and measures .....	52
5 Results .....	56
5.1 Physical activity motivation.....	56
5.2 Barriers to physical activity .....	60
5.3 Perceptions of Exercise intervention .....	61
5.3.1 <i>Exercise history</i> .....	61
5.3.2 <i>Nordic walking session</i> .....	62
5.3.3 <i>Running skills training session</i> .....	63
5.3.4 <i>Resistance training sessions</i> .....	65
5.3.5 <i>Martial arts training</i> .....	66
5.3.6 <i>Post intervention feedback</i> .....	66
6 Discussion .....	69
6.1 Aims and main results .....	69
6.2 Findings of the implementation and results .....	70
6.2.1 <i>Physical activity surveillance</i> .....	71
6.3 Limitations.....	73
6.4 Interactive system features for motivating people .....	75
6.5 Marketing experiences.....	77
6.6 Conclusion and Future recommendations.....	79
7 References .....	80
8 Appendix .....	94

## 1 INTRODUCTION

Information technology has changed our lives from active to sedentary at working places, at school and at home. At the same time mental ill health has been increased causing economically rising costs for mental health care (Aura, 2010). Earlier studies to get an evidence of economical benefits of physical activity to profitability are indisputable. International scientific reviews of the articles in the field have come to well-being input / output - in relation to 1:3 of return of investments (Aura, Ahonen, Ilmarinen, 2009). Potential economic impact in the short term is moderate for health care costs and from moderate to strong for absenteeism and productivity (Kaman, 1988, 1994).

Depression and different stress disorders decrease work well-being, productivity, shorten the length of the work careers and cause sustainability gap at Finnish economy (Wright, 2004; Vanhala, 2006; Mäki-Fränti, 2009). Workplace dynamics and well-being at work is related with peoples' general well-being. One possible settlement aside of medicalisation and psychotherapy could be exercise interventions at working places. Modern people are left alone by their obesity problems and sedentary lifestyle, that only decisive actions can drive people back to more health behaving direction.

First aim of this study is to plan and describe the implementation of internet based exercise intervention. The result of this study aim is an internet portal for exercise planning, monitoring, analysis and feedback purposes. Software development project was started just before the two years master's degree program in sport and exercise psychology at the University of Jyväskylä (Department of Sport Sciences) lasting entire this study and was able to finish by the results of this study and experiences of using and marketing it to the different user groups and institutions.

Second aim is to find out whether intervention can enhance and maintain exercise motivation and physical activity. The purpose of this aim is to investigate human physical activity behavior, motivation, barriers and methods to get people more interested in physical activity. Theoretical studies and feedback of these experiences of promoting physical activity has a major role to make the software requirements for

exercise resource management system, which can really enhance human's exercise motivation and interest of own health.

Third aim is to describe whether exercise motivation and physical activity changed during the intervention. For that purposes, both motivation (EMI-2) and barriers (BARSE) to exercise psychometric tools are used to measure before and after the active observation phase of the intervention. Trainit portal is used to gather data dynamically during and after the active observation phase of the intervention to study how physical activity changes during the phases.

Previous studies of exercise motivation factors, technology requirements, usability and usefulness of web based exercise applications guided the present study and the development of smart phone data gathering and monitoring applications, web base central management system and exercise service product management tools. Marketing studies and competitor analysis proved that there are not similar service systems available yet.

Internet based software applications and Smartphone exercise management systems are practical solutions for automated data gathering worldwide, independent from time and place. It can also be used for gathering human exercise activity or inactivity as well as nutrition and other health-related behavior. Software systems can be integrated with several different purposes: To create an exercise and dietary log, build up an exercise planning and coaching system, providing group exercise features to promote peer group activities and social media for "walking buddy" and social interaction purposes. If software system is well designed, all these features can be translated into the exercise marketing purposes for the actors, who a providing the exercise (psychology) services both active and sedentary people.

Worksite exercise interventions with all practical phases (profiling – planning – execution – data storing) and economical goals can be combined by providing software system, which contains integrated exercise, well-being and productivity data management tools. Cost-effective analysis is very important for work well-being interventions, because it connects well-being indicators and economical indicators of business profitability (Kaman, 1987). Working life quality factors and lifestyle factors together define the goals for workplace exercise intervention. For example sick leave is

not a good metrics, but overweight, smoking, alcoholism, lack of physical activity, monotonous work, poor management, workplace climate and work overload are (Aura, Sahi, 2006).

Future objective for developing exercise management system is to integrate it into the business applications like Enterprise Resource Planning (ERP) systems which are used for the operational business management and economic optimizing. This arrangement can provide a trustful rewarding criteria's of workers improved healthy lifestyle or profitability on behalf of the employer. This is a strategic solution for future effective commercial work of well-being intervention to increase the confidence in physical activity among the business actors.

### *1.1 Motivation*

Motivation is a concept for explaining actions, why people behave or act in a specific but not some or any other alternative way. Personal motivational affect can change upon the situation but can remain similar during the whole lifetime when its persistence is due to the person's characteristic of motivation (Salmela-Aro, Nurmi, Aunola, Jokisaari, Pitkänen, 2002).

Context-sensitive motivation is the source of focus (selection) and energy (intensity and duration) for behavior (Carron, 2005; Vallerand, 2012). Person evaluates the means to the goal and evaluation process varies between long and short term investments of mental and physical force. During the process, the needs, targets and actions can change (Salmela-Aro, Nurmi, Aunola, Jokisaari, Pitkänen, 2002). Difference in motivation components generally varies by internal and/or external forces that produce the initiation, direction, intensity and persistence of behavior (Vallerand, 2000, 2012).

Motivation can be seen from the point of achievement, competition stress and intrinsic motivation view (doing something for its own sake) or as an internal resource (optimism, self-esteem and self-efficacy) (Vallerand, 2000; Deci & Ryan, 2000; Ryan, 2000). Extrinsic motivation view (doing something as a means to an end and not for its own sake) of external (extrinsic) rewards such as economy status, employment or prestige (social support) from others and when participation is free of constraints and

pressure (Deci & Ryan, 2000; Ryan, 2000; Shirom, 2008). These motivation views can be used many different ways to activate people by behavioral change systems, which are based on persuasive systems design, technologies and applications (Oinas-Kukkonen, 2012).

Extrinsic motivation is externally regulated with or without self-determination. People may choose to perform exercises without pleasure for knowing, that externally regulated exercise motivation is introjected (e.g. later disappointment to itself) if they don't participate physical activity or choices are not coherent with other activities, hobbies or source of pleasures (Tenenbaum, 2007 p. 570). The disappointment of inactive behavior can be shown by the personal exercise diary. Activity causes extrinsic motivation and satisfaction when filling the diary and reaching more credits of achievements.

Harter's study (Harter, 1981) of Competence Motivation Theory (CMT) relies on the physical perspective as desire, curiosity, interest, challenge seeking, self-rewarding and environment mastery attempts. Person's perceived competence and success at optimal challenges with realistic goals provides enjoyment and positive affect which partly explains the intrinsic (self-rewarding experience) and extrinsic (awards) motivation (Horn, 2002 p. 106-109). This state of enjoyment and positive affect should obtain by accurate and customized exercise plans and goals.

Three types of intrinsic motivation refer satisfaction and participation to the activity (Vallerand, 2012):

1. Intrinsic motivation to know (pleasure and satisfaction of learning)
2. Intrinsic motivation to accomplish (or surpassing oneself) things, and
3. Intrinsic motivation to experience stimulation (experience of aesthetically pleasant sensations).

These types of intrinsic motivation are included also into the psychological factors of gaming (Wang, 2008). Otherwise person cannot feel positive emotions of achievement. Intrinsic motivation factors must include into the web based exercise applications and preferably with gaming features to create multidimensional interest of exercise execution and activity level. From the point of simple software application,

motivation to know can be achieved with the cause and effect phenomena of exercise plan and informative reports of biofeedback after the exercise bout. The same applies also to the accomplishing motivation, which can be arranged by exercise and nutrition logs but stimulation experiences can't be created without gaming features or other social media features of peer review and same-minded social support.

Motivational aspects must be sized personally and objectively into the realistic level and probably with the aid of personal trainer or consultant when making exercise and dietary plans for the goals. Following useful heuristic guidelines as a translation of the theory of intrinsic motivation into practical exercise promotions (Whitehead, 1993) is suggested to do when providing face-to-face training sessions as well as using web based exercise planning tools or making personal exercise profile. According to Social Cognitive Theory (Bandura, 1986), these guidelines are also appropriate for software application requirements of Trainit configuration tools.

1. Do try to emphasize individual mastery (giving feedback) but don't overemphasize peer comparisons of performance (test scores)
  - Person has a possibility to choose the sport discipline, the level of physical load, physical development targets, goals and time period. Physical tests are advisable but person's own estimation of performance can also be used.
2. Do promote perceptions of choice using a control at the same time but don't undermine an intrinsic focus by misusing extrinsic rewards and recognitions
  - Continuous presence of the coach in face-to-face is adequate control avoiding overestimation of one's performance. Every person has a sense of duty towards the personal coach not to give up reaching goals or skipping planned rehearsals.
  - External rewards are connected to intermediate goals with tests and measurements. Realistic feedback are important, because person can see, hear and feel, if comments are given too praisefully

3. Do promote the intrinsic fun and excitement of exercise but don't turn exercise into a chore or a bore; utilize games and versatile exercises
  - Group events with races or contests are motivating within the program and people sharing the same life situation. New experiences of different or exotic sports can be arranged by web site event planning tools
4. Do promote a sense of purpose by educating the value of physical activity to health, optimal function and quality of life (cognitive skills and problem solving learning) but don't create amotivation by spreading fitness misinformation (unrealistic weight management and diets)

### *1.1.1 Goal setting and engagement*

Goal setting is a motivational issue, but creates a perspective and direction and defines the basics of engagement and costs to the future work for reaching goals. Engagement to the goal expects personal goal appreciation, intention and identity determining role- position, which finally causes feel of pleasure and satisfaction (Salmela-Aro, Nurmi, Aunola, Jokisaari, Pitkänen, 2002).

The difference between motivation and engagement is very slight but can be explained by the outcome or results of activity. Achievement goals and beliefs to success in sport outcomes make the difference between engagement levels. For example "A 2x2 Achievement Goal Framework" can explain the engagement as a definition of competence and valence of striving (Elliot, 1999, 2005; Conroy, 2003). Engagement holds feeling of high energy (the positive counterpart of emotional exhaustion), strong involvement (the obverse of cynicism), and a sense of efficacy. The opposite feeling of engagement is burnout, which includes three dimensions: exhaustion, cynicism, and reduced personal efficacy (Shirom, 2008).

Attitude is a psychological tendency that is expressed by evaluation of a particular entity with some degree of favor or disfavor. Attitude can be divided into three different categories (Eagly, 1992):

- Affect (emotional key feelings about physical activity)
- Cognition (health related beliefs about physical activity)
- Behavior (pain and barrier related approach or avoidance of physical activity)

Engagement is a positive-affective motivational state of fulfillment, a state that comprises three components or dimensions: vigor (high level of energy, resilience and persisting goal-directed behavior), dedication (strong involvement accompanied by feelings of enthusiasm and significance), and absorption (pleasant state of total immersion in one's work) (Shirom, 2008). Exercisers' engagement is a behavioral and attitudinal state of mind which has a purpose of commitment, passion, enthusiasm, focused effort and energy to achieve something valuable in a personal level and as a loyal member of a team (Macey, 2008).

### *1.2 Intentions and expectations to exercise*

The Theories of Reasoned Action (TRA) explains peoples' pre-decisional phase of intention (not expectation), which predicts motivation of physical activity, indicates the degree of volitional planning and effort how intensively people are willing to invest in their physical activity in the future without external barriers (Ajzen, 1991; Hausenblas, 1997). But the conscious process of considering the pros ("weight control", "improve skills", "get fit", "fun") and cons ("bad weather", "costs", "fatigue", "lack of time") leads to the reasoned activity where resources and skills are required. Behavioral barriers are crossed by post-decisional, volitional attitude by the Theory of Planned Behavior (TPB) (Hagger, 2005) where perceived behavioral control like self-regulatory strategies or goals and plans *how, when and where* performance of behavior will take place instead of other interests and goal-directed behaviors (Gollwitzer, 1999). Intentions and Perceived behavioral control (PBC) (closely related to self-efficacy beliefs) lead directly to behavioral engagement from motivational phase to volitional control which means that intention explains attitude behavior towards action and their behavioral goals by personal and/or environmental factors according to the past experiences (Orbell, 2000).

Intentions and expectations to exercise are very difficult to support in the internet based exercise management systems. Elements of Theory of Reasoned Action can be implemented only by exercise planning systems which provides physiologically exact and long-term activities programming. Considering pros and cons of physical activities are impossible to include to the system where the exercise plan itself can be motivating factor.

Advantage of systematic physical activity program that it can create an idea of high quality, save time and likelihood to reach the goals. Self-regulatory strategies how, when and where performance of physical activity will take place can be planned by the systematic web based exercise programs. That can be explained the sense of duty for the coach, who has taken care of planning person's exercise program. Also it is much easier for person to execute the physical activity if someone else has carefully planned it, otherwise monthly payment (as an extrinsic self-motivator) to the coach will be useless causing self-disappointment. Perceived behavioral control arises from the regular use of the web based exercise system and need to maintain and implement the targeted physical activity program.

Recreational exercise can be more or less irregular behavior where exact physical activity program can change behavioral engagement from motivational phase to volitional control. Physical activity program at the internet system is a virtual coaching environment with actual coaches providing proper feedback of the progress and orderliness towards the program.

Self-efficacy expectation is related to the ability to carry out and produce a particular behavior and outcome which is based on the adoption and maintenance of exercise program. People can gain or lose their self-efficacy for particular reasons (Bandura, 1982, 1986):

1. Prior success and performance attainment; personal experience of success and failure in present and expectations in the future

Self-efficacy expectation in most of the cases is related to weight losing programs or smoking cessation intentions. Repeated failures of struggling with lifestyle changes can be prevented by the supervising the execution of person's physical activity program.

2. Imitation and modeling; social comparison particularly of people similar to oneself. Associated to self-presentational processes such as social physique anxiety

Web based exercise system can contain peer group management tools which allows the people to join together virtually to the same group with similar

self-efficacy or body image issue. Group members can share the same experiences and can provide feedback and courage to reach the goals.

3. Verbal and social persuasion; Dependent on the realistic nature of information, which has an influence in perceptions of self-efficacy.

System provided reports and actual data between target and achieved result of body weight creates credibility to the physical activity program, feedback of the coach and peer review messages.

4. Judgments of physiological states, such that states of relaxation can be achieved; Influence to self-efficacy and effort perception if person has capability of self-monitoring during the physical exertion.

Self-efficacy expects assessment in relation to specific behavior or any meaningful effort or potential barriers and self-regulation. According to Trost (2002) a perceived lack of time (work, family) is the most common reason for dropping out of supervised exercise programs and for an inactive lifestyle. Physical exercise associated with efficacy beliefs requires exercise planning and the overcoming of considerable barriers which are typically physical (obesity, age or injury), emotional (courage, temper, not sporty) and availability (economy, environment, facilities or lack of friends) (Bandura, 1986, Trost, 2002, Biddle, 2008 p. 46).

Self-efficacy is one of the most consistent predictors of physical activity behaviors, particularly when physical activity includes elements of vigorous exercise (Bandura, 1986; Ekkekakis, 2004; Tenenbaum, 2007 p. 519, 545). Physical *self-perceptions* under the *global self-esteem* and physical *self-worth* are sport competence, body attractiveness, perceived strength and physical condition (self-appraisal) and these properties refer to how people observe themselves and how they evaluate their worth, their capabilities, and their limitations (Schomer, 2001; Ekkekakis, 2009). People seek out the situations where they can maintain or enhance their self-esteem, but they don't freely choose many (any) behaviors where to demonstrate their incompetence (Biddle, 2008 p. 101-105).

### 1.2.1 *Control-based theory of Self-Determination*

Control is term used to describe beliefs and capacity to control performance and outcomes. Construct of control contains strategy beliefs to produce desired outcome and control beliefs is the belief of capacity and/or instruments to produce a desirable outcome. Autonomy does not mean being able to control outcomes or have the capacity to perform behaviors leading to outcomes but which performance of behavior is volitional by the sense of choice and willingness (Deci, 1987).

According to the Self-determination theory (SDT), human has three psychological needs to be actively engaged and proactive in their interaction with the environment (Deci, 1987, 1991; Ryan, 2000): *Relatedness* (connected to others within a social milieu), *Competence* (function effectively in that milieu) and *Autonomy* (to feel a sense of personal initiative and freedom while doing so) (Deci, 1987, 1991; Ryan, 2000). These needs can be apply as parallel factors when comparing them into the psychological needs of video game features.

SDT contains personal desire or goal to reach, because needs are necessary for human development and growth therefore SDT changes motivation into dynamic concept. Need is satisfaction, enhanced health and psychological well-being for human development and growth otherwise if needs are not satisfied ill-being will be result (Ryan, 1995, 2000). These needs are essential for understanding *why* (engage to the process) and *what* (engage to the content) is behind the motivational set-up called "goal". An exercise instructor who makes people think, feel, and behave towards the goals and fulfillment is likely to contribute to the development of an interpersonal control (Tenenbaum, 2007 p. 547). Creating the gaming features for internet based exercise management system requires the consideration of the SDT theory.

SDT expect that human has tendency to engage interesting activities (curiosity), to exercise capacities, to pursue connectedness in social groups and to integrate intra-psychic and interpersonal experiences into a relative unity (Ryan, 2000). Providing autonomy support (relative to control) is associated with more positive outcomes in working places, including greater intrinsic motivation, increased satisfaction, and enhanced well-being (Ryan, 2000).

### 1.2.2 *Stage-based models*

Physical exercise participation must understand as a process of involvement. Physical activity participation is merely a "smooth" process with up's and down's, continuous and dynamic state between active and inactive or "adherers and dropouts" than a discrete behavior like "all or none" (Prochaska, 1997). People are considering "pros and cons" of their exercise behavior by moving between stages of contemplation, decision-making and behavioral involvement (Marshall, 2001; Marcus, 2003). In a general manner, Like Transtheoretical model, natural history model of exercise contains also stage-based models with transition phases (Sallis, 1990):

1. Sedentary behavior to exercise adoption
2. Exercise adoption to maintenance or dropouts
3. Dropout to resumption of exercise

Transtheoretical model (TTM) is used in psychotherapy as an analysis of change systems to treat addictive behaviors but useful also to understand readiness to begin physical activity (Glantz, 1985; Prochaska, 1997). Change process precedes containing factors of (Tenenbaum, 2007 p. 549):

- Individual's self-efficacy for change
- The weighing up of perceived advantages (pros) and disadvantages (cons) of change (decisional balance), and
- The strategies and techniques individuals use to modify their thoughts, feelings, and behavior (referred to as the processes of change).

TTM is based on the behavior change process, involves movement through a series of stages of Pre-contemplation (Little or no physical activity), Contemplation (Little or no physical activity), Preparation (Small changes in physical activity), Action (Physical active for less than 6 months) and Maintenance (Physical active for more than 6 months) (Marcus, 1994, Prochaska, 1997). Behavioral changes between the stages, for the decreases of cons, changes was largest from pre-contemplation to contemplation because their feelings of vulnerability and aware of their risk of ill health becomes relevant.

Cognitive processes of change are more important during adoption, and the behavioral processes are used more in the later stages even though actual behavior changes and efficacy cognition are smallest from action to maintenance (Prochaska, 1997, Marshall, 2001; McAuley, 2011). According to McAuley (2011) self-efficacy as a cognitive variable enhances more when the task is physiologically and/or psychologically demanding and that correlates the strong self-efficacy during the initial stages of an exercise program (McAuley, 2011). Exercise planning should focus on increasing pros and reducing cons, particularly at the transition from pre-contemplation to contemplation. Initial phase of new exercise behavior is novel, barriers such as fatigue and time constraints are not preventing maintaining exercise routines and behavior is supported by the belief that change is possible and responsibility for change lies within the individuals' self-liberation (Prochaska, 2010; McAuley 2011).

Long-term maintenance of exercise behavior is connected to intrinsic reasons even though the rewards (e.g. body mass index) may not be immediately apparent compared to extrinsic motivation setup. Participation to exercise at early stages can be motivated extrinsic perceptions of health and fitness benefits (Ingledeu, 1998). Transtheoretical model contains a sort of long term and short term goal setting strategy to get people more likely to maintenance level. In the beginning of the intervention people used to have or they must start to think about a long term intrinsic reason or goal for exercise. To reach that goal, person must have on his exercise plan a series of short term extrinsic goals at the early stages to create better adherence towards exercise, for example some races, competitions, skill adoption goals or physical test to get rewarding feeling.

### *1.3 Initiating (stopping and resuming) physical activity and exercise*

Self-efficacy, knowledge and attitudes were generally associated with the adoption of vigorous and moderate exercise. People can start their physical activity quickly and vigorously in groups or in a natural way by themselves, which mirrors good self-perceptual need of activity (Sallis, 1986). In a more sedentary cases people (should) seek for social groups for exercise, personal trainers to improve the efficiency of exercise or structured exercise programs for acute need of exercise for example in case of progressive coronary and cardio diseases or increasing obesity (Biddle, 2008).

Relapse is a good example of self-regulation and relapse is defined as a 14 weeks of sedentary period (Simkin, 1994). Most common relapse antecedents are boredom, lack of time, laziness, vacation, and illness or injury and the highest risk to slip from a single rehearsal is bad weather or being alone (Marcus, 1993; Stetson, 2005).

Planned exercise program and identification of the risks of relapsing situations with the aid of health education can restrain the effects of relapsing causes. People with high self-motivation, fitness and good coping skills from injuries with behavioral strategies has better prognosis to among those who relapsed (Stetson, 2005). Behavioral barriers (obese, embarrassment, lack of enjoyment etc.) associated with structured exercise may be much greater than those of habitual physical activity but still structured exercise programs may be more successful (with coaching plans and personal trainers) than habitual physical activity or at least by the help of “walking buddy” will increase the level of habitual activity (Stetson, 2005).

#### *1.4 Creating an affection*

Most people are aware of the benefits of exercise and its inspiring effect during and after the physical exertion but possibly not cognizant of reaching more satisfaction by the high level physical exercise. Levels of exercise according to the feel of pleasantness and affective effects are associated to the Ventilatory Threshold (VT) and Lactate Threshold (LT). Vigorous (60 % of  $VO_{2max}$ ) exercise intensity is a necessary condition for affective benefits and significant reductions of anxiety (Hall, 2002; Backhouse, 2007; Ekkekakis, 2009).

High exercise intensity is believed to cause negative impact on affection and adherence but latest studies indicate affective benefits in exercise intensity characterized at a “vigorous” level (Hall, 2002). Vigorous exercise or work has emotionally positive charge by endorphins, which causes both energetic and exhausting feelings during the activity (Shirom, 2008). Vigorous is not totally exhausting but is a mixture of moderate arousal and moderate pleasantness (Macey, 2008). Every exercise plan and single exertion is obviously aiming to the feeling of pleasure and the next bout would be easier to execute. This “runners high”, as the enjoyable sensation is called, is based on a dose of  $\beta$ -endorphin released into the blood stream to calm the sympathetic nervous system and provide analgesic relief from pain associated with strenuous exercise.  $\beta$ -endorphin

has also an antidepressant effects showing that post-exercise mood elevations are associated with increasing basal  $\beta$ -endorphin levels (Brosse, Sheets, Lett & Blumenthal, 2002). Like vigorous exercise, highly competitive game also increases in physiological responses, such as heart rate, blood pressure, and oxygen consumption while playing computer games (Goh, 2008).

Relationship between the intensity of exercise and the affective responses that occur during and after a physical exertion was not under the study of physical activity theories but partly explains the applicability of self-determination theory. Connection between sense of competence and regular vigorous exercise behavior can be partly explain by the feeling of the former physical exertion and improve upon that. During the vigorous exercise or capability of finishing it creates the feeling of competence, which can be verified both subjective and objective way immediately after the performance. The sense of relatedness is associated to the high level sport goal setting and achievement of it. Athlete can feel relatedness among the other famous athletes when achieving something big e.g. at the Olympic Games. This requires the engagement in the regular bases exertion of vigorous exercise. Autonomy can be combined loosely to the need of vigorous exercise. Vigorous exercise plans and execution needs independent participation to the planning process with the coach. The decision and engagement to follow the plan demonstrate the sense autonomy which also expects concentration and ability to tolerate performance pain.

Intensity of the physical exertion is also one important variable when developing gaming features of the web based exercise system to follow up person's capability and credits over the game with other players / exercisers. The feel of vigorous exercise can be numerically adapted to each person's own performance, which is indicated by the performance of the avatar, the virtual image of animated figure of self at the computer system.

People have a sense of pleasantness and unpleasantness and they tend to move toward behavioral choices which make them feel better and avoid behavior which makes them feel bad (Hall, 2002; Backhouse, 2007). On the other hand, they tend to avoid options that make them feel worse or cannot compete successfully with other, more pleasant alternatives which means emotional struggle between pain (physical activity) and pleasure (watching TV). Gaming can be struggle over one's mind of

sustainability towards active lifestyle or being sedentarily satisfied or contacted with other persons belonging to the same game assembly (Wang, 2008)

Motivation over the use of the internet application and gaming features may rise up from the achievements or the growing pleasure of feeling vigor. The strong mentally seducing influence of the video games is based on the survival struggle and great effort for the game's goal. On the other hand, physical effort and fatigue is not, however, wanted to experience in live but the same effect is achieved during the game in the mind (Goh, 2008). Common element between motivation of vigorous exercise and playing games is challenge. Game (or physical exertion) must be challenging enough to capture the interest of the player, providing an enjoyable experience that engages him or her to continue playing without getting frustrated or giving up till the final goal has been reached (Goh, 2008).

Lot of studies has been done about the psychological needs and motives to play video games which chapter 1.8 will prove later. Very few or none of the studies has concentrated on the motivational aspects of promoting physical activities by gaming features of web based exercise management systems. Some studies has defined the principles of Behavior Change Support Systems (Oinas-Kukkonen, 2009), which contains the theoretical framework for designing such a features of the system but not from the point of exercise psychology view. The most interesting study field would be the requirements of the software system supporting gaming features of exercise motivation, activity and self-reflection of the change of physical self.

Affective response to vigorous exercise is merely survival-critical adaptive process with metabolic changes in the body, reaching both physiologically and mentally maintainable steady-state. Above the critical energy supply steady-state level is difficult to maintain performance and affective responses serve the primitive function of "alarming" (much like pain) and person likely to stop the performance both mental and physical reasons (Hall, 2002). That moment clearly separates the motivation of pro athletes and recreational exercisers, but it could be possible to rise up the mental steady-state threshold among the non athletes if affective motivator is created by gaming features. Studies concerning about exercise affect and pleasure-displeasure acquaintance is supported by the Theory of Planned Behavior containing self-regulatory strategies (how, when and where) and perceived behavioral control (Ekkekakis, 2004).

Self-selected level was experienced more pleasant than imposed intensity level of rehearsal and because of the freedom to regulate one's intensity, it creates better adherence in the long run (Ekkekakis, 2009). Individuals who don't have self-monitoring skills are in need of close external monitoring to regulate their intensities for example by heart rate monitor and planned physical activity program to avoid negative affect and displeasure (Ekkekakis, 2005, 2009). For that reason internet based planning and monitoring tools are useful to control person's exercise behavior towards sustainable direction in the beginning of the plan. It is crucial to ensure that the exercise stimulus will not be paired to negative affect in memory (Hall, 2002; Backhouse, 2007). Exercise-affect variables are highly dose-sensitive with mood and anxiety states of tension, depression, anger, vigor, fatigue and confusion but also persons' exercise condition (Backhouse, 2007). Physical exertion changing interval basis over and below the VT intensity leads to *post-exercise pleasure* improvements and bout below the VT intensity leads to a significant increase in pleasure *during exercise*, whereas the intensity at or over the VT leads to a significant during-exercise decrease of pleasure (Backhouse, 2007):

After two years of regular exercise better adherence was achieved in a high-intensity, home-based program (67.8%) than a low-intensity home-based (49%) or high-intensity supervised group-based (36.4%) program (King, 1995). Reporting tools in analyzing and planning exercises with software application and heart rate monitors in real time trainings have a key role in adjusting the person's physical activity level. Otherwise person easily renounces to exercise because of its excessive experience of vigorous intensity, duration of exercise or amount of bouts per week.

### 1.5 Working motivation and performance

Engagement for the work is composition of job satisfaction which is enthusiasm and feelings of energy for work. Organizational commitment creates a binding force, how long and how hard person work and psychological empowerment includes meaning (sense of purpose), competence (self-efficacy), feelings of self-determination (feelings of control), and impact (belief that one's efforts can make a difference). Job involvement defines task engagement and feeling of self-worth from goal attainment when focus is on work rather than organization (Macey, 2008).

Performance at working places has seven parameters: Effectiveness (in appropriate scale), output ratio (or efficiency in minimum waging), quality (expediency), productivity (amount of right decisions), work well-being or quality of work life (optimal conditions), innovations (new and better solutions) and profitability (bigger incomes than outcomes). All of these criteria's can be measured directly or indirectly from the amount of processed products or used production time and single human labor input where workers mental and physical performance plays a key role (Hovila, 2005).

Total productivity is unique definition, which divided into a partial productivity (Käpylä, 2008): work, capital, and material and energy productivity. Immaterial factors of productivity are work well-being, ethics of labor, atmosphere of the work community, maternity of the markets and loyalty of the customer (Käpylä, 2008). It is a challenge to measure and analyze the total productivity according to the separate results in parallel, but that is the way to proof the effectiveness of work well-being and the investment into it. If the company's strategic goal is innovativeness, agile and efficient, its workers must be capable, competent, skillful, experienced, motivated, engaged, co-operative and appreciative to each others in a fair manner (Hovila, 2005). These principles match ideally to the coherent sports team, which is coached efficiently both physical and psychological way.

Recent studies, including by Conservation of Resources (COR) theory, have found, that physical well-being does not correlate with productivity, but mental well-being has great positive relationship with employers' engagement to workers, human resources and productivity (Wright, 2004; Mäki-Fränti, 2009). Conservation of Resources (COR) theory highlights the construct of internal and external resources to retain, protect and build resources, because the actual losses of these resources are threatened by psychological stress (Hobfoll, 1989). An internal and external resource at resource-matching hypothesis contains energy mobilization and utilization capacity (Hanin, 2000 p. 84-85) which individually determine emotional state of willingness to exercise.

Problems at working environments (working climate and stress) are lowering internal and external resources, job satisfaction, increasing sick leaves and employees' perception of pay fairness. Approximately 10 % increase on mental well-being has productivity effect with 6 % wage rise among the workers (Mäki-Fränti, 2009).

### *1.5.1 Exercise on the working places*

Sport and exercise is understood to belong to personal life as a free time activity which usually does not have any connections to working life. Physical activity is a concept which is included both personal and working life. Physical activity in work is usually understood as a complicating factor of the work but can also be desired working condition.

Ikonen has introduced on her thesis (2011), how workers are extrinsically motivated to physical activity by bonus fees in the working places. Financially supported exercise activity of workers has positive influence to work ability and company's profitability by the contribution of smoking cessation and reduction of sick-leaves. Ikonen found that voluntary attendance to the physical health education, rewarding and monitoring of physical activities has best way to guide physical activity behavior. Study case company enabled to exercise during the workday but on the same time sense of relatedness and duty towards the work was very high among the workers. After all, case study company had an unique pattern to arrange its physical activities among the workers where efforts, challenges and a kind of extreme stretching both work and sport activities was emphasized. Occupational health and safety at work plays the major role of workplace well-being and productivity but this study case also prove the importance of physical activity and supported exercise efforts.

Maintain or improve health factors, weight loss, self-challenge and feeling better or physically feel in good shape are the main motives for joining an exercise program (Biddle, 2008). Motives for continuing in the exercise program are enjoyment, feel a sense of achievement, act in an organization's leadership, activity type and social factors (Weinberg, 2007, Biddle, 2008). Most frequently reasons to stop regular participation in moderate to vigorous sport, exercise and physical activities are working, loss of interest and the need for time for other things (Ekkekakis, 2005).

## 1.6 *Measurement of exercise motivation in adults*

### 1.6.1 *Exercise motivational inventory questionnaire (EMI-2)*

Person may have some specific reason to exercise (achievement goal) or motivation is caused by some reason or justification to exercise. If certain barriers are not exceeded and the adherence towards exercise is not reached, motivation is not strong enough to cause permanent behavior change to exercise. What are the issues which influence to motivation to participate exercise bout, how such motives might influence the choice of activities undertaken, how affective responses to exercising may be influenced by reasons for exercising and how involvement in physical activity might have a reciprocal influence on participation motives (Markland, 1993). These questions are the main objects to study Deci's and Ryan's Self-determination Theory (Ryan, 2000b) and development of internet based software application.

EMI-2 survey was developed for analyzing intrinsic and extrinsic motives where intrinsic motives are connected with experiences of competence and interest-enjoyment and extrinsic motives are connected to the achievement of outcomes (Markland, 1997). However Ryan and Deci (Ryan, 2000b) suggested, that motivation may better predict behavioral regulation than intrinsic-extrinsic dichotomy. This supports the assumption of regulated processes by external constraints providing more self determined feelings (Markland, 1997).

Aim of the study of Markland and Ingledew (1997) was to refine and develop original Exercise Motivations Inventory (EMI) by getting more consistent theoretical basis with participants group of civil servants working in a large (424 participants) government establishment (Markland, 1997). Markland et. al. found in 1992 that the EMI discriminates women taking part in community aerobics classes and members of a weight watchers group taking part in aerobics as part of their weight reduction program (Markland, 1997). Ryan's (1985) theory showed that community aerobics participant's exercise motives would be more intrinsically oriented than those of the weight watchers. Markland and Hardy also pointed out in 1993, that EMI fitness scale was found to be relatively low in internal consistency. Health related motives, such as Health Pressures and Ill-Health Avoidance had negative connotations among the more positive, intrinsically motivated recreational exercisers than extrinsically oriented highly active

semi-pro athletes making EMI applicable to individuals who do exercise. The result of developed EMI was that new EMI-2 contained twenty five more items than before.

EMI-2 approach can explain how an individual can be both extrinsically and intrinsically motivated at the same time (Markland, 1993, 1997). This finding is used for trainit marketing and profiling strategy. Extrinsic motivation is used for reversed motivating and engagement purposes: Person can choose a suitable exercise service and plans which supports his goals and at the same time is as cheap (or expensive) as possible to support the engagement and motivation. This can be either a feeling of frustration of own laziness (probably for the fear of wasting money) after paid for the program or it can also mirror person's ambitious behavior to buy an expensive exercise service package. Ambitious behavior rises up person's own perceived intrinsic importance when first buying quality service but also forces to follow the program more accurately and engaging to the physical activity development process directed by internet application.

Markland and Ingledev (Markland, 1997) suggested that extrinsic motives may be important to some individuals, particularly in the decision to adopt exercise in the first place, which is implemented to the marketing and profiling strategy of the internet application. For the others EMI-2 survey's sub-model motives towards health related behavior could be more positive, intrinsically oriented motivational force.

#### *1.6.2 Barriers Self-Efficacy Scale (BARSE)*

Barriers Self-Efficacy Scale is developed by Edward McAuley during the number of interventions of middle-aged and older adults exercise programs (McAuley, 1992, 2011). Studies are mostly adopted a social cognitive framework to examine personal efficacy in adherence to exercise in different activity stages.

Measured adherence of the exercise program attendance is effective only if participants are monitored by frequency, intensity and duration of activity (McAuley, 1992). BARSE is used for internet application development project to understand the progress of dynamic (continuous) exercise processes (profiling, planning, executing, monitoring and documenting) and adherence of exercise program using self-reflection tools like profiling configuration tools during the process.

Efficacy cognitions are more important in the adoption phase of exercise behavior. Despite the facts like physical disabilities, one's possible lack of confidence to continue exercising in the face of numerous barriers and obstacles, or aversive stimuli, the need to achieve quick results in the beginning of the program is more important than in the maintenance phase (McAuley, 1992). On the other way; while planning and executing an exercise program, one should not being bored with the activity, should feel more self-conscious about his appearance e.g. progress in weight loss program. Self-regulatory strategies such as self-monitoring, eliciting social support, and managing time with the clear evidence of results of progress strengthen self-efficacy, belief to the goal setting and engage in physical activity over time (McAuley 2011b).

Efficacy cognitions and motivational elements of self-regulated behavior such as multitasking are changing by conditions, environment and perceptions of capability to overcome barriers to exercise (McAuley 2011b). Individual's own judgment of positive experience of new useful skills mastery -not just an abstract ability- or coping with the challenge of short term goals like competitions, increases self-efficacy and coping efficacy (Bandura, 1982; McAuley, 1992, 2005).

McAuley's future vision of dynamic physical activity program is implemented to the developed internet based software application, where all possible sources of efficacy play concurrent roles in the process of maintenance. McAuley's idea was, that physical activity program should be progressive, containing challenges to win and creating one's ability to cope with increase duration or intensity of physical activity program with supportive social network of fellow participants (McAuley, 1992, 2005).

### *1.7 Theoretical background of web based health-related behavior studies*

Transtheoretical model (TTM) is proven to be effective theory with both web-based interventions (Spittaels, 2007; Dawson, 2008) and in traditional print handouts forms of interventions at the time when web technology was not so advanced (Napolitano, 2003). Stage change matched internet pages have been demonstrated to increase physical activity, motivation to exercise, help people identify their pros and cons, overcome barriers and plan effective exercise sessions (Napolitano, 2003, Hurling, 2006, 2007; Dawson, 2008; Mailey, 2010). Drop-outs were more frequent among the younger participants, pre-contemplators and contemplators and those who did not meet

the guidelines in the beginning of the intervention, but on the other hand participants in the first four stages of change showed a greater increase in moderate- to vigorous-intensity than participants in maintenance level (Spittaels, 2007). The obtained finding just an exemplary way reflects the nature of the model and the role of the coach to put people think about their feelings, motivation and goals for health-related behavior.

An internet application of exercise planning system provides a wide range of tools to increase the likelihood to exercise more (Hurling, 2006). Spittaels has given a good example of using Transtheoretical model to increase exercise adherence (Spittaels, 2007) asking for the participants in first to click-on one of five corresponding statements of Transtheoretical variable (which could be an animated figure) that best describes their current stage of change. After that, participants were automatically guided to the website for more personalized information corresponding with particular stage of change which helped participants to change their sedentary behavior (Spittaels, 2007). On the Spittaels program, the web page provided standard information about the benefits of physical activity, current public health recommendations, the difference between moderate- and vigorous-intensity activities and tips and suggestions to assist in becoming more physically active (Spittaels, 2007).

There is no evidence or studies of greater change or better adherence towards exercise by increasing video gaming features to the web based systems, but Dawson (Dawson, 2008) has proposed to use a "game-like" software intelligence to determine participants stage phase accordance with TTM model in the beginning and during the intervention.

Bandura's Social Cognitive theory (SCT) (Bandura, 1986) and self-management skills like role and emotional management and health related behavior can be used for developing internet based exercise systems to support self-efficacy and PA behavior change (Steele, 2007; Dawson, 2008). Mehta (2011) suggest to develop an independent theory for internet based interventions (specially focusing on males) aside of the SCT and TTM theories using various ethnic and socioeconomic backgrounds, which is clearly understandable argument because of the global and virtual nature of the internet.

Social Cognitive Theory is a process involving personal, behavioral and environmental factors interacting and influencing individual perceptions of self-efficacy (ability to achieve a desired behavior of regular exercising) and outcome (exercise planning system for weight loosing and performance improvement) expectations (Bandura, 1982, 1986). Outcome expectancies contain three sub-categories: physical, social and self-evaluation outcome expectancies which are all good parameters to develop gaming features for internet application. The self-management skills include (i) problem solving, (ii) decision making, (iii) resources utilization, (iv) formation of patient-provider partnerships, (v) action planning, and (vi) self-tailoring (Steele, 2007) which are all used for designing an exercise configuration tool for personal profiling purposes to achieve SCT based goals.

Internet-based intervention are reported by several studies significantly greater improvement in physical activity levels to increase in life satisfaction among the participants than in the control groups (Napolitano, 2003; van den Berg, 2007; Dawson, 2008; Mehta, 2011) although most of the studies have not demonstrated any significant difference between theory-based and non-theory-based interventions conducted through the internet (van den Berg, 2007). Theoretical high fidelity was the aim of Rovniak's (2005) study when using Social Cognitive Theory in web-based walking program. Compared to the low fidelity group, the high fidelity group improved more than twice as much as the low fidelity group on walking speed (affection to the vigorous exercise), goal setting, and positive outcome expectations, reported greater program satisfaction, and was approximately four times more likely to report high interest in registering for 12 additional weeks of the program (Rovniak, 2005). High fidelity program were able to implement accurately only by internet-based tools (Rovniak, 2005).

Nevertheless, internet systems have been shown to cause greater change in physical activity during the first month of the intervention requiring also supportive group to grow up the feeling of self-efficacy (Napolitano, 2003; Dawson, 2008; Steele, 2009).

### 1.7.1 *Weight loss interventions*

Theory of Planned Behavior (TPB) has been used to predict dietary change of behavioral beliefs (what I expect to occur), normative beliefs (social pressure) and control beliefs (things I can do). Combining TPB theories in a gaming mode with tailored information is more effective in motivating people to make dietary changes than general nutrition information (Hurling, 2006, 2007; Booth, 2008).

Social media tools for feeling relatedness, having peer support and pep talk by presenting information on other peoples' exercise (social comparison) and / or weight loss levels will significantly increase life satisfaction over the course of the intervention, indicating a positive influence of the received information regarding physical activity (Napolitano, 2003; Hurling, 2006, 2007; Dawson, 2008; Booth, 2008; Mehta, 2011). Obese people are more likely to participate in web based intervention because of a personal and non-stigmatizing approach via the Internet (Carr, 2008, Watson, 2012). Internet-based tools and resources such as targeted weekly lessons and formal e-coaching models have been demonstrated to be beneficial in promoting activity in the most common weight loss interventions compared to static internet education programs (Hurling, 2006; van den Berg, 2007; Carr, 2008; Watson, 2012) and specially in the case if static web pages contains new and interesting information every day (Napolitano, 2003; Dawson, 2008).

Collinsons's study (2011) was a great success (73 % of the participants lost weight) when she encouraged participants to partake in daily physical activity and complete food/exercise charts, and to record their weight into an online 'weight tracker'. Diaries were reviewed by the dietitian who gave monthly personalized feedback. A biweekly online chat room was held where participants (50 % of participants) could support and motivate other participants and ask questions to the dietitian and recipe developer (Collinson, 2011).

Greater change in physical activity have shown when expecting people to follow specific plans and hence providing multi interactive tools e.g. text, internet links, video links (e.g. "YouTube") and photos for providing exercise instructions, social media messaging, peer review and feedback features with graphical reports for giving feedback about fulfilled dietary and exercise logs (Hurling, 2006):

- Multi-interactive system will be more engaging, providing higher percentage of using exercise and dietary log. The reason for that will lie under the Self-determination theory of gaming adherence.
- Multi-interactive system will lead to higher intention, expectation and satisfaction with motivation to exercise. Feel for control is caused by the regular feedback, exercise reminders and biofeedback of the Smartphone and heart rate monitor.
- Multi-interactive interactive system with self testing tools will lead to a greater increase in self-reported levels of satisfaction with fitness. Game like features at the internet based interventions will increase adherence and physical activity.

#### *1.7.2 Work site and clinic use of web sites*

Workplace exercise intervention initiated by the web based application will succeed, if application is properly integrated to the company's own pages or information systems (Dawson, 2008). Providing exercise and dietary plans about when and how to eat healthily or when to exercise, can increase levels of healthy eating and exercise, but hyperlinked web site articles, e-mail reminders or mobile phone text messages (SMS) are unable to hold the interest of the smoking cessation program (Hurling, 2006, 2007; Booth, 2008).

Steele introduced in her study (2009) a possibility to promote online recruitment, data collection, and retention in real-life settings to provide support for the public health care within clinical and community settings (Woolf, 2006). For example, patients may be referred to the web site as part of their usual preventive community-based health care with other behavioral change.

Woolf's study indicated that interactive Web sites can facilitate behavior change in dietary, smoke cessation and physical activity among the patients. Web site can be used with electronic health records when clinicians own resources about patient records are limited to offer health behavior change strategies to the patients (Woolf, 2006). The Web site would enable the educational information beyond the time and place of the clinical encounter; encourage patients to use appropriate information for exercise

purposes when they need it or to write an exercise prescription for the patient when needed. Interactive sites can also collect information on individuals' health behaviors and expectations for using that experience to develop more functioning health behavior strategies among different people and cultures (Woolf, 2006).

### *1.7.3 Cost benefits between face-to-Face and web based studies*

Large numbers of individuals can be reached by internet based systems at lower costs than with face-to-face interventions and same time avoiding barriers associated with face-to-face delivery method, such as time, cost, geographical location, work commitments, and child care (van den Berg, 2007; Steele, 2009; Mehta, 2011; Watson, 2012). Using the Internet, people can access large amounts of exercise and nutrition information, and they can choose the self-paced time and place when they would like to send, receive and interact with information (Napolitano, 2003; Steele, 2007; van den Berg, 2007). Developing effective, automated self-management programs, that offer a relationship and personalized feedback, may prove essential to developing scalable solutions to deal with large populations faced with chronic disease, such as diabetes and heart disease, and in the promotion of healthy behaviors, such as adherence to medication (Watson, 2012).

The internet mode of delivery was discovered as effective as traditional face-to-face delivery. Although the internet may attract and therefore potentially reach more people, the participants of face-to-face coaching were usually more satisfied with their group allocation compared to the Internet groups (Dawson, 2008), but some of the participants belonging to the face-to-face group only were getting burdensome after couple of sessions (Steele, 2007, 2009; Mailey, 2010). Combined internet based and face-to-face interaction was motivating, because they had a system for self-coaching purposes and also a person "report to" for reinforcing their behavior, when participants found both possibilities equally valuable (Steele, 2007; Mehta, 2011).

According to Woolf's study, web site or by other virtual face-to-face media, is sufficient to help patients sustain long-term behavior change but with no further follow-up (e.g. telephone, e-mail and face-to-face office visit) may be inadequate to change lifestyle (Woolf, 2006). Web site interventions that include multi interactive face-to-face internet technology to promote physical activities are needed to attract participant's

interest of interactivity with other people, such as: chat rooms, web camera chatting features (“Skype”), social networking websites, blogs, forums etc. (Mehta, 2011).

Virtual coaches have demonstrated that people can successfully form a working relationship with a nonhuman system and processes. People can form a social bond with a virtually presented computer agent, even though they are aware that the agent probably does not represent an actual human (Watson, 2012).

### *1.8 Video gaming features for motivating people towards physical activity*

Psychological needs and motives to play video games are intrinsically satisfying having an experience of survival act (“killers”), growth or interact with the virtual world (“explorers”), performance (“achievers”) and social integrity (“socializers”) are most used features in artificial intelligence engines of the games to create similar recreational contexts such as sport (Deci & Ryan, 2000; Ryan, 2006; Wang, 2008). Players behavior is divided into (a) acting (on) versus interacting (with) the game elements, and (b) focusing on other players versus the virtual world itself in one’s actions. Lack of these psychological social factors of gaming features causes negative emotions such as anxiety and anger and intrinsic motivation for gaming will undermine (Ryan, 2006; Wang, 2008). SDT seems to be suitable theory to explain gaming motivation as the theory has been applied to other recreational contexts such as sport as well as well-being as a function of psychological need of satisfaction (Ryan, 2006).

Motivational pull of video games and tremendous appeal of gaming environments causes a high motivation to engage in games (Johnson, 1999; Ryan, 2006). The problems of the video games are in their nonhuman nature and disability to feel empathy and create socially normal relationships. Achievement players (competence) used to put their focus on mastery of the game. High level perceived autonomy is achieved by personal choices, interest of the game and personal value of the game rewards (Johnson, 1999; Ryan, 2006). Social players may look for relationships and interaction with others (relatedness), which may not need highly sophisticated gaming software but merely a simple, internet based social media application environment. Social players’ autonomy will be enhanced by feedback of the others and rehearsal to enhance their health locus of control and self-efficacy (Goh, 2008). Immersion players are escaping the real life problems, engage in role-play and

virtual stories (Ryan, 2006). Immersion players seem to have problems with the volitional sense of duty or carry the responsible of them, so they may feel more autonomy while playing games. Game goals are not naturally self-determined is the reason for rapidly diminishing appeal and interest of one particular game. Massively Multiplayer Online (MMO) games, which involve multiple players interacting within a virtual environment through their on-line characters or avatars (Kuss, 2012), can create artificial emotions of self-efficacy and self-esteem and also addiction, but their impact to physical activity is insignificant (Ryan, 2006; Kuss, 2012).

Volitional engagement to the video gaming can cause harmonious passion (HP) or obsessive passion (OP) (Wang, 2008). Because behavioral engagement is more flexible in HP, it was generally found to be related to positive emotions, concentration, and experience of Csikszentmihalyi's concept of flow (Wang, 2008). Obsessive passion (OP) was related to negative emotions, rigid persistence, anger, frustration and self-destructive behavior because of feelings of being controlled by external forces or lack of internal contingency that control the person (Wang, 2008; Ream, 2011; Kuss, 2012).

Obsessive passion may lead to the conflicts with activities in other life domains such as poor academic results, damaged relationships and sedentary behavior (Wang, 2008). Problem video game playing is associated with most affective motivations as caffeine, tobacco, alcohol, marijuana and painkiller use problems but video games are also associated with development of attention problems among young children and need of dopaminergic medication for caused ADHD symptoms (Ream, 2011).

Active "exer-gaming" video games (ball games, boxing, martial arts) with motion sensors, where players physically interact with images onscreen, may have utility to increase physical activity approximately to 3-6 Metabolic Equivalent (MET) level and improve body composition in younger children (10-14 years) but not with older (Maddison, 2009).

### *1.8.1 Physical self-perception; the model and implementation of progress*

Physical self is considered to be an important psychological outcome, correlate and antecedent of physical activity behavior of physical education and exercise programs (Fox, 1989, 1997). Self-esteem theory can be used for to the study of self-perception in the physical domain (Fox, 1989) to combine physical and mental image of

self. Mental constructs such as perceived competence, physical self-efficacy, self-confidence, movement confidence, and sport-confidence can be the motivational aspects of physical activity and sport involvement when person has need to improve his global self-esteem (Fox, 1989, 1997).

Self in the physical domain is viewed as an important contributor to overarching, global perceptions of self-worth in the multidimensional, hierarchical models of self-esteem (Fox, 1989). Self-esteem structure has formerly seen as unidimensional (too complex) or multidimensional (life domain based), but hierarchical model has been found to be evaluative and descriptive representations of self in each of the academic, social, emotional, and perceived physical ability and appearance in the physical domain (Fox, 1989).

Physical self-perception model has three levels of hierarchical self-esteem structuring at sub-domain, domain, and apex levels (Fox, 1989). Hierarchical model of self-esteem pattern can be used for modeling a physical self-perception metrics tools but also to create the domains of self-esteem variables of the human embodiment at the software system. These variables on the sub-domain level are bodily attractiveness, sports competence, physical strength, and physical conditioning which are also constructed along with a general physical self-worth subscale as the basis of the Physical Self-Perception Profile (PSPP) psychometrics tool (Fox, 1989). Other methods of measuring physical self-perception are e.g.:

- Physical Self-Perception Profile for Adults (PSPP-A), containing nine dimensions: appearance, health/disease, functional capacity, active living, sports, health/wellness, and fitness/conditioning (Esnaola, 2011).
- Physical Self Inventory (PSI-6), dedicated to the collection of time series data individually twice a day. Adapted from Fox and Corbin (1989)'s PSPP.

There is some evidence that individuals are able to personalize their self-esteem structure by attaching different degrees of importance to self-perception domains (Fox, 1989) which supports the hypothesis that self-esteem during the exercise intervention can be animated by the gaming features and also measured during the intervention allowing to take a systematic view of practical physical education and coaching. Especially PSI-6

may be effective psychometric tool integrated into the software system providing dynamic time series reflecting person's day-to-day self-perceptions (Fortes, 2004).

Animated figure a.k.a. "Avatar" as a physical self is reflecting person's progress towards the desired capability or deformation of the body. Avatar is used for the physical profiling purposes in the beginning of the exercise program, which is done by the virtual coach or by the aid of personal trainer during the first face-to-face consultancy meeting. Avatar cannot be shaped illustratively into desired image of the body or prowess like games but based on the facts what person is physically as such in self-monitored situation normative influence and social comparison (Oinas-Kukkonen, 2012). Avatar as a mental self or self-awareness is an initiative shape of global self-esteem containing general feeling of happiness, satisfaction, pride, respect, and confidence in the physical self-worth, professional and social competence (Fox, 1989; Fortes, 2004).

Virtual coach can be automated with algorithm-driven scripts, using simulated pre-programmed computer-tailored feedback (Steele, 2007), face-to-face conversation and / or graphical self-image shape editor (Watson, 2012) where the person engaging to the weight management program creates an animated figure of the self in mental and physical form. Algorithm-driven script also employs behavioral and social cognitive strategies (SCT) to promote exercise behavior change. These strategies include goal setting, shaping, self-monitoring (weight and waist circumference measurements), positive reinforcement, problem solving, education, and social support (Mailey, 2010; Collinson, 2011; Watson, 2012).

The use case of avatar is to shape it at will during the dietary and physical activity program towards the goal of mental and physical condition and progress. Because obese people have poor self-image and likely avoid presenting their habitués, (Watson, 2012) an animated figure with gaming features can be used as an avatar for relatedness with the other people.

### *1.8.2 Summary of using gaming features in exercise interventions*

Long-term studies have demonstrated the varying results of dietary and physical activity interventions. Mostly with no difference in overweight status between study groups but some multi-media approach appeared to be effective in preventing obesity, when using games solely for physical activity intervention (Maddison, 2009; Talbot, 2011). Games are also used with combined advice on diet and physical activity, but none had a significant impact if person can't get personal feedback e.g. from physiological sensors like heart rate monitors or global positioning systems (GPS), where Smartphone applications can be used as a game like devices (Maddison, 2009; Talbot, 2011). The biggest challenge of using games for increasing and maintain physical activity is based on the novelty of the games and the nature to maintain interest with biofeedback devices for self-development (Maddison, 2009; Talbot, 2011).

Exercise psychology and health care specialists has faced the fact, that physical condition and performance has been deteriorated during the last years among the adolescents and working age people. Video gaming is not the less guilty for that progress because of its affective features, realistic and developed technology and rising amount of players at the internet (Pentz, 2011). Same time social media applications like Facebook and the other similar forums are binding people more tightly in their chairs increasing sedentary behavior. Software engineers, marketing people and social psychologists have been used the same facts and theories as exercise psychologists to seduce people to buy and play the games, which is enormous business in the world having a retail sales in 2010 approximately \$ 15,5 (US) billion (Kuss, 2012).

One solution to resolve progressive obesity and back problems could be the interactive exer-gaming software development as Nintendo, Sony and Microsoft has already done. These alone do not resolve the attitude of permanent active lifestyle and conscious attempt to keep the good physical condition but only play the particular game as long it is fun. Software applications should contain physical information of self and must be integrated into people's everyday life at work and home. These "games" are internet based exercise management systems, which has both social media features and all gaming role features. This system must have life monitoring devices and possibility to plan one's life, goals and development.

As mentioned in the literature review above, gaming features and exercise motivation psychology has been studied in depth but few or any research programs has study software systems which are extending through the life having continuous monitoring and support of the physical activity lifestyle. Goal setting, engagement and intrinsic motivation seem to be the most effective way to create the adherence towards exercise. One common way to develop a challenging game with a positive interactive experience of exercise is to build multiple-levels or sub-goals so that there is a chance of achieving a sub-goal even when the ultimate goal is beyond the reach of person. Game should be intrinsically rewarding and offer the right amount of challenges to match with the player's ability (maintenance of mood) (Johnson, 1999; Goh, 2008), having positive feedback from the others, providing economical rewards (from the working place) and better self-esteem (Goh, 2008).

Avatars, shaped by physical exertion of exercise game players, must include the characteristics of the target population or exercise group. Their respective development, emotional and physical states when enhancing the self-esteem and satisfaction of the body image is included into the game itself. User context must be analyzed and featured by the selection of reinforcement factors and editable motivation strategies (Goh, 2008; Oinas-Kukkonen, 2009) and as Ryan (2006) has studied; person must have sense of being within the game world, both virtual and real people, manipulating controls and own avatar.

Semi-artificial intelligence with knowledgebase, which is actually an exerciser's self-profiling tool or "Configurator" is one of the future research subject. Oinas-Kukkonen (2009) has introduced in his own studies, what information is relevant for a user in a given situation profiling one's own exercise program in physiological and psychological manner. Profiling analysis should concentrate mostly in the relationship between conscious performance goals and the level of task performance, but in a theoretical context, the whole profiling system should take into the consideration a user's whole cultural background: interests, needs, motivations, pre-existing attitudes, commitment, consistency, compromises, life styles, persistence of change, deep-seated attitudes, social anchors, and perhaps even the whole personality (Oinas-Kukkonen, 2009).

## 2 PROGRAM

### 2.1 Internet application for exercise management

Exercise planning, monitoring, recording (exercise log) and statistics for the intervention of the present study was planned and executed by www.trainit.fi portal. This Exercise Resource Management (ERM) system is meant to organize participants, coaches, exercise places, sport equipments and safe conditions.

Most of the time, social media does not have an interactive growth, educational or developmental viewpoint. When people are growing they suppose to develop and change at the same time and behavior change support systems (BCSS), like Trainit portal, are featured for that purpose. A BCSS is defined here as follows (Oinas-Kukkonen, 2012):

*A behavior change support system (BCSS) is an information system designed to form, alter or reinforce attitudes, behaviors or an act of complying without using deception, coercion or inducements.*

Behavioral change systems are based on persuasive systems design, technologies and applications are supporting three different types of changes called C-, B- and A-Change (Oinas-Kukkonen, 2012):

- C-Change only expects, that user adapt the request of the system without proper motivation, but takes the action and comply using the application. This phase will help to adapt more enduring B-Change
- B-Change is long-term, not permanent, behavior change presuming skills, and attitude in practice between the system and the actual activity.
- A-Change is a goal and engagement oriented change supported by the system strengthening motivation and self-efficacy putting knowledge and attitude into practice.

Transtheoretical model of exercise behavior change (TTM) can be combined with the behavior change of using information system (Trainit portal) in a way of forming, altering or reinforcing outcome (Oinas-Kukkonen, 2012):

- Forming outcome (F-Outcome) is new pattern for a situation where person has never been before e.g. intention or decision to exercise.
- Altering outcome (A-Outcome) changes a person's attitude or response to the activity e.g. increasing the level of exercise, decreasing using alcohol or smoking cessation.
- Reinforcing outcome (R-Outcome) provides reinforcement of current attitudes or behaviors, creating strong engagement to the goals and increasing resistance to another change.

Trainit portal represents a typical behavior change system fulfilling the definition of BCSS and supporting all change states, what most of the social media applications e.g. Facebook does not. Facebook is providing only computer-mediated persuasion (social communication) between people persuading each other through computers (Oinas-Kukkonen, 2012). Both Trainit portal and Facebook can persuade people to change through C to A and the outcome can also F to R but the difference is the supporting tools, which kind of an outcome of change is supported. If desired outcome is not useful and easy to use, motivation of change is threatened by deficient tools of building goals and execution analysis with automated reports (Oinas-Kukkonen, 2012).

Web sites, telephones, and e-mail have the potential to deliver physical activity interventions to a large number of participants at low cost. Earlier we already stated that telephone and e-mail is un-ergonomic and impractical method for continuous operations of interactive exercise planning and management (Booth, 2008). For that reason, Trainit was started to use as an ERP which was created by the author. In the present study, Trainit portal was used with study and comparison group.

Trainit portal implements the model of the “exercise industrialization and management”, which in principle means a mass customization of exercise planning according to the athlete's profile, goals and interests. Profiling is made by configuration wizard tool, a phase driven set of data gathering dialogs of athlete's physical parameters and goals. Configuration tool, which was developed for the present study, is integrated to training planning tool. It suggests the right plan according to the person's profile. This is a semi-artificial intelligence where a certain or 3<sup>rd</sup> party prepared exercise plan

with certain or generic rehearsals is indexed for certain set of profile parameters. In the last dialog, the configuration tool suggests a suitable training plan with exact rehearsals for the person. On that phase person can refine the plan with rehearsal planning tool, configure the duration and efficiency of the plan. Trainit portal creates the seamless process from tests, personal trainer session to exercise plan and interactive coaching for continuous development and self reflection for reaching goal settings.

Electronically implemented exercise plans must consider the issues of engagement and retention, especially with middle-aged and older adults who are not dedicated users of information technology (Leslie, 2005). This problem was avoided by giving proper information of using Trainit.

Support for health and body related motives of health pressures, ill-Health avoidance, positive health belief, weight management and appearance is easy to implement with the Trainit portal. The system itself (either mobile or web application) actually creates the psychologically motivating situation in use. Trainit portal has a functionality to prepare a goal for body weight and wanted performance level. Trainit measures the exercise activity data, calculates the calorie consumption after the rehearsal and calorie intake after the dining. Trainit portal dynamically calculates the status towards the goal if nutrition and exercise activity is on the positive balance. User must only give the proper anthropometric parameters during the own profile configuration.

Trainit portal is used for the exercise and nutrition recording purposes or exercise itself is the reason for using the system. Goal setting features for weight loosing with body shape tracking and measurements provides motivating follow up reports for user. Translating graphical and numeric goal settings to animated figures enhances the system with gaming features in the future application version of Trainit portal. Physical testing tools are used to estimate person's anthropometry and performance but also giving reliable information of the person's health status.

Trainit portal has a full social media features built inside with proper authentication properties to support the privacy if person wants. Social media is used to understand as a web-based and mobile technology communication application for global interaction with people by their ideological interests. Social media is featured by

computers and software applications to enable more than traditional social communication like conversation. Social media can contain text, voice, pictures, videos and all of the combinations above linked together.

The social media of Trainit portal is based on same architecture as Facebook (FB) including data connection interface directly to the users own FB account. Every actions stored into Trainit can be sent to FB if user has authenticated himself by FB account. Trainit portals' own social media messaging tools, based on friends networking and grouping features, are instant messaging (“chat”), mailbox and group mailing. User's own FrontPage contains stored physical and nutrition activities and messages of friends, where user can leave or get feedback and peer reviews. People at the same exercise group can see each other progress and they have possibility to give feedback and to keep live contact by each other. Group event planning and event messaging fulfils the functionality of feeling relatedness with social media friends. User has a possibility to write articles, particularly as role of coach, but every user has alternative blog writing and passive message writing option to get noticed by his efforts and feelings including “liking” feature.

Trainit portal group management system analyzes athletes and exercisers profiling data with all physiological and psychological aspects to combine certain people to the same demographic segments. Virtually generated groups have lot of common factors and destinies for share, that they all can be supportive persons to each other's even though they might never seen before or living all over the world.

According to the EMI-2 metrics tool, fitness motives (Strength and Endurance, Nimbleness) are belonging to the category of “exercise adherence” which is technically supported by data gathering equipments of Mobile Trainit application and the most common heart rate monitors. Fitness motives reveal the importance of self-motivation which includes elements of self-regulation such as goal-setting and self-monitoring. People like to observe themselves to improve and for that reason simple goals of sport executions are placed to the exercise monitoring applications like smart phones and heart rate monitors.

### 2.1.1 *Mobile data gathering*

Technological solutions for monitoring and acquisition of exercise activity and strenuousness are already developed for single exercise bout. Pedometers measure approximate amount of physical activity and heart rate monitors are used for monitoring efficiency and quality of endurance training. Smart phone applications including GPS tracking device for speed, distance and route recording and / or Bluetooth based heart rate data acquisition are called “performance recorder”. That can be used for continuous physical activity data gathering purposes for measuring both planned exercises and habitual physical activity at work and home.

Aura and Sahi have stated on their book “Työpaikkaliikunnan hyvät käytännöt” (Aura, Sahi, 2006), that the future technological equipments and solutions must be mass customized for different physical activity related purposes. Applications will be motivating and game like content, challenge, information and race or rewards are more important issues than technology itself. System will be based on web and wireless data connections and can tell continuously and reliably the amount and quality of physical activity to exercise service providers and company management to estimate effectiveness of exercise interventions.

Customization, data gathering and analyzing of physical activity can be combined to company’s normal rewarding programs or even into salary politics (Aura, Sahi, 2006). Trainit mobile exercise data gathering system with Android smart phones used in the current study, enables recording the road track at Google map, distance, speed, heart rate and calorie consumption automatically. Studies has demonstrated (Steele, 2007), that login to the web site constantly after every rehearsal can be a major barrier for using systems like Trainit portal because of forgetting a password, lack of time to power on the computer or just time consuming user interface for routine data-entry. Mobile Trainit bypass this problem sending recorded data from smart phone automatically and seamlessly to Trainit portal enabling continuous monitoring process between individuals and exercise service providers (fitness and sport clubs, sport institutions and independent coaches). User can’t enter his own subjective estimation of the rehearsal; “cheating” is not possible. The major benefit of using smart phone application is unbounded possibility to access and store personal exercise plan and executions.

### 2.1.2 *Profiling and exercise configuration*

Industrialized exercise service process contains a logistic “supply chain” between actors and exercise service providers starting from individual’s contact with personal trainer or coach. Customer can estimate appropriate exercise plan with Trainit Configurator wizard after physical tests. In the end of the profiling process an individual customer - coach relationship profile (similarly as “friends” on Facebook -portal) for exercise monitoring, redesigning and motivating can be created at Trainit portal.

We have assumed the personal login operation to the Trainit portal as a self-evident feature, but it actually creates fully features of personalization and self-tailoring capabilities enabling participants to store personal information. Based on personal authentication properties, Steele (2007, 2009) and Dawson (2008) in their own studies introduced Social Cognitive Theory (SCT) based process steps and flow diagram for interactive web site features of exercise planning system, containing following phases (Napolitano, 2003; Steele, 2007, 2009; Dawson, 2008):

1. “Let’s get started” as an introduction phase with possible physical and psychological tests of motivation
2. “Lifestyle physical activity”, “Monitoring sedentary behaviors” and “Identifying barriers”: Identification (and recording) of personal barriers and social support strategies
3. “Goal setting”: A process of using e.g. the “Social Marketing Assessment and Response Tool” (SMART) principle (Walsh, D.C. 1993) which is a combination of customer markets and project management identification process.
4. “Self-monitoring” or “Planning and scheduling behaviors” is focusing on lifestyle activity with logbooks for self-monitoring.
5. “Nutrition” or “Other behavior changes” for adopting good nutrition practices with the aid of interactive nutrition log
6. “Self-talk” for identifying positive and negative thoughts. Also telling out goals to other people loud will confirm one’s will to achieve goals. A public

statistics of “twenty high score exercisers” at the web site will keep up the pace

7. “Self-reinforcement”: Rewarding according to the achievements
8. “Relapse prevention” Personal strategies for maintaining an active lifestyle and coping with relapse explored
9. “Resistance training” for creating new activities and avoiding boredom
10. “Time-management and stress management” Daily exercise plan developed, reviewed and recorded.
11. “Social support” Social Media tools (chat, e-mail, blogs) for increasing social support in order to enhance physical activity maintenance.

Comparing to the Steele’s steps of interactive exercise promoting web site, Walsh’s (Walsh, 1993) SMART principle are used more actively in Trainit portal configuration wizard to start a customer (exerciser) personal service processes:

1. Personal trainer or coach creates during the conversation the customer’s physical activity profile, which contains parameters of:
  - Short welcome text which guides person shortly, how the profiling process will progress and also a warning not to overestimate performance, activity or goals.
  - Age, gender, weight, height
  - Fixed goals (weight loose and or better performance), present performance and activity level.
2. Weigh loosing plan with different setup options: Start and end date, goal weight settled by the amount of total weight drop, weight drop per week or calorie consumption per day. Daily calorie consumption is supposed to be 400 kcal to reach a healthy level of physical activity. Depends on the, customer’s anthropometrics, that calorie consumption must over the Basal

Metabolic Rate and food calorie intake. Also the minimum activity should be at least 9000 steps or 7 km per day (Vuori, 1999).

- EMI-2 survey claims that for men Weight Management scale predicts good physical activity by body mass index but not body shape dissatisfaction, whilst for women Weight Management predicts good physical activity by body shape dissatisfaction but not body mass index (Markland & Ingledew, 1997).
3. For the nutrition setup, customer decides a diet between “none” and other diets like “Atkins”. A target of carbon hydrates, proteins and fat is given by chosen diet which defines the nutrition recommendation and alarming limits of nutrition log.
  4. Setup of the exercise plan can be provided by customer’s own interest of sport and physical properties (strengtheners, skills, agility, elasticity etc.) with rehearsals per week. Customer has an opportunity to create intrinsically rewarding long-term goals and extrinsically rewarding short term goals (Ingledew & Markland, 1998; Ryan & Deci, 2000). According to Steele’s study (Steele, 2007), it is important to provide multimedia video clips for example resistance training exercises and other movement information of stretches or other equipment usage, along with written instructions.
  5. A suitable exercise products and services with plans are provided to customer to buy. This phase of the configuration is reserved for the exercise providers ads and product marketing purposes. A profile created so far defines the setup parameters to return applicable products for customer to choose. A product definitions and profile parameter values are fitted together and that combination is used to exercise plan proposals. Customer can pick up the product to the shopping cart and pay it by his bank account or credit card.
  6. Last phase of the configuration is designed by semi artificial intelligence. That is not planned on this study and would take another study to introduce. If customer did not pick up a readymade product on previous phase, he gets a proposal plan, which can be modified by following parameters:

- For selected period, usually 4-16 weeks
- The ratio between training and resting periods in weeks
- Continuously adjustable parameters of amount, power and variation of the exercises
- Setting fixed training days to planning weekday grid with favored sports

This is the most demanding phase for semi artificial intelligence, but works mainly by indexing previous phase parameters. Customer and/or personal trainer has a fully featured tools for making an exercise plan following the year – season – period – week modeling principles. Depends on the duration of the plan, amount of coaching or personal trainer sessions per month and other rights to modify the plan later, customer decides the payment fee on this phase. Customer saves the plan and makes the agreement of continuous supply chain of information, support services, training sessions and data gathering with reporting tools.

To remedy the situation a sort of “personal trainer” features were found out useful to connect people more actively, more realistically to the coach and goal setting purposes. The implementation of personal trainer as a “configurator”, can motivate to exercise and help people to achieve their goal more effectively. Finally this tool can also provide a business opportunity for real personal trainers and fitness clubs. At least it will ease their personal training work when profiling exercisers and planning more accurate exercise plans.

### 3 PURPOSE OF THE STUDY

Research design in the beginning was to offer a work well-being program for employees. General idea was to determine whether the physical exercise can develop company's working atmosphere, decreasing sick leaves and analyze effectiveness of physical activity behavior to the profitability of business operations. However that was too wide and time consuming aim for the master's thesis and research will continue on that area later.

The aim of the present study was to plan, organize and evaluate an intervention to develop and provide web based exercise planning tools to support physically active life style. Background of the intervention is in interactive information systems, and in gaming features and how they could be seamlessly connected together in use case procedures.

Intervention is partly implemented doing exercises under the supervision of sport and exercise specialist a.k.a “work in the field” and partly connected by social media featured internet based application for physical activity called [www.trainit.fi](http://www.trainit.fi) (“Trainit”). Purpose of this combination of supportive aids was to study, how different peer groups and platforms can adhere people to exercise. Exercise data was collected automatically by mobile (Android) application and semi automated system at Trainit.

The aims of the study were:

1. To plan and describe the implementation of internet based exercise intervention
2. To find out whether intervention can enhance and maintain exercise motivation and physical activity
3. To describe whether exercise motivation and physical activity changed during the intervention

## 4 METHODS

### 4.1 *Participants*

The study was decided to be implemented at working place of service station organization in Oulu as a pilot study before implementing at the whole corporation. The personnel was earlier educated and coached by different consulting company containing information and skills of team working, leadership and exercise behavior to promote good working environment. Study group was after that ready to start their practical exercise program in a small test group.

The original number of the employees was 50-60. 27 (men: 10, women: 17, average age 34.1 SD= 12.33) were willingly to participate in the intervention. Rest of them was at vacation and some were not interested in the study (or exercise). All employees were informed that joining to the questionnaire and exercise group was totally voluntary.

Study group was working in a time shift periods and some of them having slight over weight and decreasing physical performance but not measured. All had an irregular, different amount of continuing working days and day offs. A specific software system is used to control workers shifts in a way, that there were always enough people to serve customers by their specific needs: Food preparing, car service, gas station activities, cashing, cleaning etc. Workers were multi-skilled to do wide variety of different works, but for the certain specialties and day offs, there must be an optimum amount of people on duty and reserve. All of these are affecting to the workers motivation and attitude towards exercise and the most important intention was to avoid future problems of sick leaves, incapacity for work and early retirement.

Comparison group was an active elderly people from Jyväskylä and they were initially included in this study due to well-known and regular high level physical activity behavior. Comparison group was supposed to collect predictable information for Trainit portal in order to study generally the willingness and ease of use of the Trainit portal during the intervention and observe how their motivation and activity attitude towards exercise may vary and what is their performance or working ability after they have been retired.

Comparison group contained 29 participants; sport social group in Jyväskylä, mainly consisting of older adults who were informed about the current study via email and through the group representatives. All of those who received the information about the project, 22 individuals, ages ranging from 56 to 69, were interested to take part in the information session about the project. Two information sessions were held which recruited 15 and 7 participants respectively. In the end of the information sessions, 18 persons (men: 5, women: 13, average age 59.5 SD=9.26) were willing to participate in the motivation study and measurements.

Comparison group, a sport social group in Jyväskylä, mainly consisting of older adults, was created to get comparative data of exercise motivation. Comparison group were basically very active, because of their original life style adopting exercise and active attitude in their early age. All are the members of the sport club favoring and promoting recreational cross country skiing. Interviews with comparison group indicated them to be interested in Nordic walking, cycling and cross country skiing in winter. Exercise plans were made for them also for the study of exercise activity, which is not the aim of this study, but the results can reveal the motivation of using Trainit portal and possible reasons of the cessation of using the portal. The motivation and activity level of the comparison group was already very high, so the findings of the execution performance were pretty different compared to the study group.

The participants of comparison group took part five times into supervised sports training session during the intervention: Running skills, Kettle Bells and stick training, motor skills learning, Pilates and Martial arts training with agility. Meaning of the exercise sessions was to acquaint people with new skills, exercises and sports and to raise up the interest to different exercises and experiences of mastery of sports skills. These sessions were arranged for the comparison group to make event the motivational effect of supervised sessions towards willingness to use Trainit portal in both groups. On the other hand, absolute interest of using Trainit portal might be measured just informing only the web address of the portal. High exercise motivation level was already noticed among the participants of comparing group, but prompting to use the Trainit portal, the messaging and group training features required a short group training session plan.

#### 4.2 *Exercise leader*

Training sessions were run by the researcher himself: a 47 year old white Finnish male, M.Sc. (engineering), Degree of Coaching Profession (martial arts and cross country skiing) with 24 years of teaching and coaching experience of endurance sports. Training sessions aimed to be motivating, inspiring and fun with insights of competence. All necessary equipments e.g. kettle bells and ski poles were delivered by exercise leader to avoid inconvenience of buying something, what may not need any more by the participants.

#### 4.3 *Procedure*

In the beginning, group training sessions was planned by the working day shift list to provide the same training session as many workers as possible within 1-2 times of same rehearsal. The purpose was to reach all workers within the same week, but after all that was impossible. Pretty soon a certain pattern was noticed: Most of the people were able to join the practice within one day and the rest, if more than two people were missing the first session, a second chance was held for those. The second session was open for all and the workers who were at the first session too. Even with this arrangement it was impossible to reach all the workers into the training session of some certain sport.

A time shift worker needs an exercise plan, which was not tied up to their working shift. It causes disappointments, if they can't participate in a certain sport session, especially if that one is on their interest or the favorite sport. When making an exercise plans for time shift workers group, a short "sport school" creates an opportunity for all workers to join at least 1-3 sessions. That enables the worker's positive (or negative) feelings toward the sport, sessions, moving techniques and the specific personal trainer if that is used for some certain sport.

Group training sessions started at the end of June, week after the questionnaire. Sessions took one hour and arranged approximately 5-6 times per month pending into the end of September. The implementation methods of the exercise sessions were Nordic walking, running, kettle bell sport, Pilates and karate. All sports contained complete technique rehearsals and personal guidance to correct mistakes.

In the beginning of the intervention's physical activity session, exercise plans were sent by e-mail to the participants when they meet exercisers at their own practice, because appropriate internet based software application was not ready yet. That is the most common way for personal trainers according to the articles of earlier studies and marketing research and interviews done during this study.

E-mail was invalid messaging way to provide exercise plans for the participants. For that reason, internet application started to develop for using it planning, sending and analyzing the physical activity program. Personalized training plans and supervised sessions were used to create or raise motivation towards exercise but also to define the specifications for mass customized planning methods with automated profiling and exercise configuration tools. Participants were able to see their plans from the web pages or by their android smart phones when and where ever they want.

Taking the advance from the internet application in the beginning was technically success. All participants were able to create their account with passwords, login and join to the virtual study group to get exercise plans and messages of the group rehearsals. They were also able to report their sport activities and nutrition into the exercise and dietary log, which information could be used to record participants' physical activity dynamically. Some problems were discovered when using system for entering implemented exercises or checking out the plan at the first time:

*"I probably can't use this system, do I have to remove the planned rehearsal if I haven't done it and how I copy the planned rehearsal to the completion column, if I have done it as planned"*

*"I'm going to start to use this application. Do I enter all the activities, what I'm doing even though I haven't done it as a rehearsal, but in a practical manner e.g. cycling to the workplace and natural walking?"*

*"When I enter a rehearsal, do I have to add the efficiency of it? I'm not sure, how efficient was Nordic walking or gym rehearsal"*

*"What is the name for the abdomen or back muscle exercise...when I put more reps? I'm a beginner"*

Most of the problems were solved easily but also some ergonomic deficiencies of the application were found during the program.

Comparison group was also expecting to utilize internet application to record their physical activities and to receive daily exercise plan. At the starting point, participants got prepared accounts by their own names and e-mail addresses. Just the e-mail confirmation of the user account was expected to send from the confirmation link at received e-mail before the first login. This operation was done to be sure, that everybody has the access to the messaging system.

Experience of earlier studies (Schwartz, 2008, 2010) has been demonstrated that elderly experienced fear, anxiety and nervousness when they had to learn to use the internet. After all, the feedback from comparison group showed that age is not an obstacle to increase motivation factors by internet based software application:

*"It was difficult" (1) "I am still learning it" (1) "Difficult in the beginning, but got easier after using it" (4)"*

Some of the training sessions were kept for the comparison group to provide same starting point to execute planned physical activities. Comparison group was known to be very active by their physical activities before the intervention. For that reason qualitative analysis of exercise motivation level can be done comparing study and comparison groups. Also usage activity and regularity of internet application, opinions of using it and its effects to exercise motivation can be analyzed for developing more practical application.

#### *4.4 Research procedure and Data Collection*

Initial survey for study group and comparison group was kept during the first meeting immediately before anything else was told about the intervention. Avoiding the bias towards the survey or exercise intervention and avoiding motivating them too early, the survey was given for answering before the lecture of the benefits of exercise for physical and mental health.

The lecture of physical activity and sports medicine was given for increase the awareness of the benefits of exercise influencing to general health. At the same time the disadvantages of immobility was told, which raised more questions than the benefits. The same cognition was noticed among the comparison group, who was also more

interested in disadvantages of immobility, exercise methods for losing weight and different sports skills.

Study group took part into the supervised exercise sessions during the first 3 months of the intervention. After supervised sessions, participants were left alone to do their planned exercises individually. Some of them establish the small groups to support the feeling of relatedness or just having a “walking buddy” to avoid the boredom of the exercise. After the eight months of individual training, exercise plans were removed to evaluate if this has any influence to the exercise motivation or willingness of using the Trainit portal as well.

Study group was instructed to provide feedback after the every exercise session by the e-mail which allowed them to structure their thoughts and feelings more exact than by the free speech during and / or after the sessions. In this way it was also able to avoid the courtesy bias when all participants were present at the conversation situation. In addition to getting direct feedback from the participants during the sessions, an exercise session diary was also kept for recording subjective feelings of the session for qualitative analysis. Conversations and opinions (feedback) could be collected by opening a conversation issue during the exercise session. Many times very fruitful conversations and question were raised up by the proper and interesting physical education topic appearing during the winding conversations. Conversation diary was fulfilled manually just after the session and also in private away under the participants eyes, that they would not know they are under the surveillance. Conversation diary was combined to the participants e-mail answers to create an overall conception of the sessions.

According to the feedback and session diary, the attitude towards exercise was positive among the participants but those who rejected the offer, they behavior was somehow totally negative towards exercise. Someone was told that they even sold their free, company offered sports vouchers to the other workers because being inactive. This however does not tell us, that those people hate exercise or does not exercise in natural way e.g. hunting or doing forest work. Some of study group decided to stay out the group and kept continuing their own exercise activities and natural exercise behavior instead.

For the study and development of the Trainit portal a specific exercise plans were made for the study group members. Using the exercise and nutrition log by web or by mobile application of the Trainit portal was one exercise motivation study theme but also personally planned, high quality, goal oriented physical activity program was also under the investigation if it would motivate people to exercise.

#### 4.5 *Design and measures*

This study contains both qualitative and quantitative methods to investigate exercise motivation, willingness and easy to use internet based exercise management system. Quantitative motivation measurements were implemented by EMI-2 (Appendix 5 and BARSE metrics tools (Appendix 6) and qualitative part was implemented by exercise session diary, session interviews and feedback of the participants. Both study and comparison group were told to participate voluntarily to the survey and all ethical principles were told to them in written words in the first page of the questionnaire (Appendix 2). The permission for intervention was asked from the Administrative Director and HR manager of the corporation before the intervention was decided to keep among the service station's personnel.

Exercise motivational inventory questionnaire (EMI-2 Markland & Hardy 1993) was used to measure exercise motivation (Appendix 5). EMI-2 is a survey of exercise motivation and adherence and includes questions of fitness-related and health-related reasons to exercise, what to take care of when motivating people to exercise and arrange an appropriate process to keep that pursuit as motivating as possible. Compared to EMI, EMI-2 is applicable to both exercisers and non-exercisers although both would be useful to assess the reasons that non-exercisers might have for taking up exercise (Markland & Hardy, 1993).

EMI-2 survey has 51 questions with six point Likert type scale ranging from “not at all true for me” to “very true for me” and each of them indicate whether or not each statement was true for participants personally, or would be true for them if they did exercise. EMI-2 survey is grouped in five grouping sets of conceptually related factors as sub-models to test separately. Sub-models contain a set of measurable items of items describing intrinsic or extrinsic motives of exercise participation (Table 1) (Markland & Ingledew, 1997). Finnish language translation (Appendix 2) of the EMI-2 survey is not

available and therefore translation was made for this study by the researcher himself consulting the main supervisor of the study.

Table 1: Subscales and items of Exercise Motivations Inventory - 2 questionnaire (EMI-2) (Markland & Ingledev, 1997)

Subscales	Items	Interpretation of items	Items
Psychological Motives	Stress Management	Reducing tension and stress	6, 20, 34, 46
	Revitalization	Feel good, refreshment and rest	3, 17, 31
	Enjoyment	Activity is satisfying and rewarding	9, 23, 37, 48
	Challenge	Goal and challenge setting, limit exploring and skills development	14, 28, 42, 51
Interpersonal Motives	Social Recognition	Comparing abilities. Recognitions	5, 19, 33, 45
	Affiliation	Social connections and having fun	10, 24, 38, 49
	Competition	Enjoyment of winning and competition	12, 26, 40, 50
Health Motives	Health Pressures	Because of medical advice or condition	11, 25, 39
	Ill-Health Avoidance	Future health problems in general	2, 16, 30
	Positive Health	Promotion of well-being and health	7, 21, 35
Body Related Motives	Weight Management	Lose or control weight	1, 15, 29, 43
	Appearance	Body attractiveness and outlook	4, 18, 32, 44
Fitness Motives	Strength and Endurance	Being strong or increasing strength	8, 22, 36, 47
	Nimbleness	Flexibility, agility and performance	13, 27, 41

Earlier EMI-2 surveys have proven that it can be valid when making meaningful comparisons between levels of males' and females' exercise motives. Internal consistency of the items has been proven good: Cronbach's alpha reliability coefficient between 0,832 – 0,954 except Health pressure 0,686 and Standard Deviation between 1,632 – 1,059 (Markland & Ingledev, 1997). Quantitative analysis for EMI-2 items is done by excel statistical analysis tool. The confidence level is a value which can be used to construct a confidence interval for a range of values that are centered at a known sample mean. Confidence level for mean value is set 95% according to earlier studies of Cronbach's alpha reliability coefficient.

The only problem of the survey (and future research will needed) is that being such a large model and having many degrees of freedom, it is difficult to pinpoint sources of poor fit between exercisers and non-exercisers at the same study (Markland & Ingledev, 1997). In this study EMI-2 is used only for supporting the development of physical activity processes and internet application by quantitative analysis of survey's results.

Fitting EMI-2 structure to Transtheoretical Model (TTM) of readiness to begin physical activity and exercise adherence, pre-contemplation phase favors extrinsic motives (Appearance/Weight Management) over the intrinsic (Enjoyment/Revitalization) motives. While following and executing the exercise plan, extrinsic motives dominate again over the intrinsic motives but in maintenance level intrinsic motives dominate over the extrinsic motives (Ingledev, 1998).

At the same time while measuring exercise motivation, the major barriers to exercise are measured to find out the possible reasons of lack of motivation. That information can be used for arranging the exercise conditions and sessions during this study and in the future.

Barriers Self-Efficacy Scale (BARSE) survey (Appendix 6) is 13-item, 10 point Likert scale (0=don't agree, 10=agree) designed to measure for complex and dynamic behavior of self-efficacy patterns in exercise intervention with health related behaviors, where physiological performance, exercise intensity, cognition and adherence variables towards exercise are main study goals (McAuley, 1992). BARSE is applicable in the case and this study particularly, when measuring subject's perceived exercise capabilities during the three months intervention and three times per week (McAuley, 2011). Finnish language translation (Appendix 3) of the EMI-2 survey is not available and therefore translation was made for this study by the researcher himself

Some empirical parameters were used to measure study groups' everyday life behavior (Appendix 4). Alcohol usage, smoking habits, sleep hours and activity level was measured to get more perspective to physical activity. Same practical questionnaire contained possible barriers to go for one single exercise session asked directly "yes" or "no" if particular reason prevents to go for training: Busy at work, tired at evening, physical barrier or other hobby or children's hobby takes the time. Personal attitude like "I don't keep exercise important", "work is physically active" or "I don't have time for exercise" are very common reasons to inactive behavior even though maybe none will admit that. This unofficial interview was not used for this study either qualitative or quantitative purposes but only for estimating interest, performance level and possible methods or suitable sport for supervised exercise sessions.

Participants' interviews, session diary and exercise logs are used for the qualitative analysis of using web based exercise management system and getting feedback from the participants feelings of driven exercises. The way, how training sessions were driven, how vigorous was the intensity and what kind of equipments were used is important to rise up the exercise motivation. Training logs gives immediate and direct evidence of physical activity level and sport during the active intervention phase and after. Training logs are also an evidence of the effectiveness of driven training sessions towards exercise motivation. After the active intervention phase, exercise motivation level towards structured exercise plans and web based system can be estimated in qualitative way by recorded physical activity level.

Qualitative data analysis of interviews, feedback and training sessions was used for the analysis of the intervention results but also for the development of Trainit portal system and its selling and earning logic.

## 5 RESULTS

### 5.1 *Physical activity motivation*

Initial measurement of EMI-2 survey indicated natural emotions of intrinsic motivation, enjoyment. Stress management, revitalization and enjoyment are important motive for physical activity as a counterweight to shift work. Challenge appears to be neutral experience but not rejected, if occurs. Social relatedness is not so important and competition or other peer pressure factors haven't been affecting to their behavior. Physical performance fascinates them moderately or more and probably they have had earlier experience of competitive sport or their personality (salesmanship) supports their ambition to commit themselves.

In the beginning of the intervention, participants are not concerned about their health, but they are generally aware of the impact of the human sedentary behavior and the positive influence of exercise to the healthiness. More likely they are aware of the causal interdependence of ill-health and obesity which has been told to them at consultancy company's lectures but outlook or body image does not affect to their physical activity.

After the intervention health pressure is still the least motivating factor of workers exercise behavior. Despite the earlier education of the health benefits of physical activity, participants are nonetheless worried about their own healthy status or at least they may assume that exercise have only slight influence of their medical illnesses now and in the future. On the other hand workers seem to understand, that exercise may have a positive influence into their general well-being affecting their mood and physical capabilities which is understood as a weight management goal or mission and desire of strength and endurance.

Post intervention measurements reveal that exercise motivation has changed very little during the program. Table 2 demonstrates the statistically almost identical results between pre and post measurements of exercise motivation factors. Some scales have come down little bit since the initial measurement. Psychological motives are lower, which probably means that exercise does not have the actual influence to the mental empowerment. Interpersonal motives are also lower.

Participants have endured that exercise or its absence will not cause any peer pressure or other needs to prove themselves their physical capability. Health based motives has been come down which may prove their assumption of good health, because participants recognize to have good body weight control and they are satisfied to their outlook. Fitness motives are constant to continue their physical activities. During the intervention planned and supervised activities was arranged for the participants once per week to notice the change in exercise motivation. Standard deviation between the factors were low in both measurements, but only peer pressure or affiliation into some exercise group raised up some disagreements.

Table 2: EMI-2 measurements of study group

Items	Mean (pre/post)						Standard Deviation (pre/post)						Correlation (pre/post)		Confidence level (95,0%) (pre/post)					
	All		Women		Men		All		Women		Men		M	All	All	Women		Men		
<i>Stress management</i>	2,98	2,77	2,84	2,91	3,23	2,50	1,36	1,52	1,46	1,40	1,16	1,76	0,60	0,66	0,54	0,96	0,75	1,17	0,83	2,80
<i>Revitalisation</i>	4,01	3,19	3,98	3,00	4,07	3,56	0,85	0,82	0,96	0,61	0,66	0,88	0,52	0,80	0,34	0,52	0,49	0,51	0,47	1,39
<i>Enjoyment</i>	3,60	3,48	3,65	3,44	3,53	3,56	1,07	1,19	1,21	1,12	0,82	1,44	0,47	0,55	0,42	0,76	0,62	0,93	0,59	2,29
<i>Challenge</i>	3,06	2,63	2,96	2,34	3,25	3,19	1,34	1,44	1,55	1,37	0,86	1,36	0,58	0,52	0,53	0,91	0,80	1,15	0,62	2,17
<i>Social Recognition</i>	1,47	1,54	1,37	1,59	1,65	1,44	1,33	1,35	1,40	1,29	1,10	1,62	0,35	0,85	0,53	0,86	0,72	1,08	0,79	2,59
<i>Affiliation</i>	2,84	2,21	2,75	2,06	3,00	2,50	1,23	1,71	1,18	1,39	1,34	2,42	0,50	0,88	0,49	1,08	0,60	1,16	0,96	3,86
<i>Competition</i>	2,28	1,60	1,96	1,59	2,83	1,63	1,55	1,69	1,66	1,75	1,14	1,70	0,67	0,65	0,61	1,07	0,85	1,46	0,81	2,70
<i>Health Pressures</i>	1,57	1,06	1,67	1,03	1,40	1,13	1,58	1,29	1,80	1,18	1,12	1,24	0,27	0,20	0,63	0,82	0,93	0,99	0,80	1,97
<i>Ill-Health Avoidance</i>	3,16	2,56	3,14	2,41	3,20	2,88	1,30	0,90	1,42	0,64	1,07	1,04	0,56	0,45	0,51	0,57	0,73	0,54	0,77	1,65
<i>Positive Health</i>	3,70	2,94	3,65	2,69	3,80	3,44	0,86	0,85	0,92	0,70	0,78	0,60	0,43	0,36	0,34	0,54	0,47	0,59	0,56	0,96
<i>Weight Management</i>	3,56	3,23	3,68	3,63	3,35	2,44	1,33	1,36	1,19	1,18	1,57	1,24	0,71	0,56	0,52	0,86	0,61	0,99	1,12	1,97
<i>Appearance</i>	2,69	2,96	2,91	3,16	2,33	2,56	1,25	1,37	1,25	1,23	1,16	1,60	0,41	0,43	0,49	0,87	0,64	1,03	0,83	2,55
<i>Strength &amp; Endurance</i>	3,81	3,79	3,71	3,50	4,00	4,38	1,06	1,14	1,15	1,18	0,89	0,76	0,59	0,56	0,42	0,72	0,59	0,99	0,64	1,21
<i>Nimbleness</i>	3,59	2,48	3,59	2,34	3,60	2,75	1,16	0,86	1,34	0,71	0,79	0,78	0,62	0,17	0,46	0,55	0,69	0,59	0,57	1,24

Table 3 contains summary about participants of study group, who voluntarily used the internet application's exercise log. Most of the participants demonstrated a remarkable increase of physical activity in the beginning and during the intervention and independent activity was good. After the intervention activity let down, but motivation towards exercise was still good and 9 months after intervention, activity is still at the same level. Unfortunately physical activity was monitored only 11 months and in the end of the monitoring period, spring thaw came and both study and comparison group suddenly stops using exercise log. Reason is probably the bad outdoor conditions to run, cycle or skiing. Graphical representation of Table 3 is at the Appendix 1 (figure 1), which shows study group's different sport activity hours during the intervention months.

Table 3: Exercise log during and after the active period of intervention

Month	Hours of exercise during the month (2011-2012)							
	A	B	C	D	E	F	G	H
June	5,50	24,00	46,00	36,00	18,00	38,00	23,00	0,00
July	11,00	34,50	45,00	60,50	32,50	27,00	21,50	12,50
August	17,30	23,00	26,00	25,00	22,50	13,50	20,50	19,50
September	9,00	18,00	25,50	17,50	20,50	12,00	6,50	22,00
October	10,80	15,50	23,00	9,50	19,50	20,00	3,00	18,00
November	5,80	6,00	13,50	8,00	5,50	19,00	2,80	7,00
December	4,00	2,00	28,00	16,00	10,00	19,50	1,50	3,00
January	1,00	4,00	24,00	25,00	12,00	17,50	14,00	11,00
February	9,00	0,00	28,00	39,00	10,00	10,00	16,50	9,50
March	7,80	0,00	24,00	10,00	13,00	27,00	16,50	11,00
April	16,00	0,00	22,00	0,00	13,50	19,50	19,80	1,50
May	9,50	13,00	5,00	0,00	2,50	13,00	17,00	5,50
June	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Comparing the study groups' and comparison groups' together; an identical tendency can be seen, which proves the accuracy of the EMI-2 tool. Comparison group (Table 4) has been adopted a strong motivation to exercise long time ago and especially that can be seen from the point of revitalization and enjoyment scales. All members of the comparison group were cross country skiers or at least they are doing their physical activity in the nature and by themselves, so peer pressure does not play any part of their activity behavior or exercise motivation.

Table 4: EMI-2 measurements of comparison group (only one measurement)

Items	Mean			SD			Cor	Confidence Level(95,0%)		
	All	W	M	All	W	M		All	W	M
<i>Stress management</i>	2,97	3,02	2,85	1,51	1,68	1,04	0,43	0,75	1,01	1,29
<i>Revitalisation</i>	4,37	4,51	4,00	0,71	0,70	0,60	0,58	0,35	0,42	0,75
<i>Enjoyment</i>	3,69	3,88	3,20	1,12	1,09	1,04	0,39	0,56	0,66	1,29
<i>Challenge</i>	2,81	2,71	3,05	1,31	1,48	0,77	0,46	0,65	0,89	0,95
<i>Social Recognition</i>	1,00	0,81	1,50	0,94	0,92	0,82	0,41	0,47	0,56	1,02
<i>Affiliation</i>	3,28	3,27	3,30	1,17	1,24	1,05	0,52	0,58	0,75	1,30
<i>Competition</i>	1,04	0,87	1,50	1,06	1,11	0,74	0,38	0,53	0,67	0,92
<i>Health Pressures</i>	1,80	1,74	1,93	1,74	1,79	1,59	0,51	0,86	1,08	1,97
<i>Ill-Health Avoidance</i>	4,22	4,38	3,80	0,81	0,62	1,12	0,69	0,40	0,38	1,39
<i>Positive Health</i>	3,94	4,08	3,60	1,00	0,95	1,06	0,29	0,50	0,57	1,31
<i>Weight Management</i>	3,10	3,33	2,50	1,37	1,31	1,38	0,50	0,68	0,79	1,72
<i>Appearance</i>	2,39	2,46	2,20	1,09	1,23	0,52	0,37	0,54	0,74	0,65
<i>Strength &amp; Endurance</i>	3,85	3,90	3,70	0,87	0,79	1,15	0,57	0,43	0,48	1,42
<i>Nimbleness</i>	3,69	3,79	3,40	1,11	0,96	1,42	0,50	0,55	0,58	1,76

Most of them told to enjoy being alone at the nature in silent peace. Maybe the age of the comparison group was one of the reasons for this kind of a behavior. Members of the comparison group were physically in pretty good shape but they have been become aware of their fragile healthy and for that reason body related and fitness scale motivates them a lot to exercise without forgetting their possible old competitive instinct. Some of them had some concern about their body weight but none of them were obese.

Table 5 contains graphical summary of the comparison group's physical activity, which voluntarily used the internet application's exercise log but most of them didn't want to give the permission to browse the reports.

Table 5: Exercise log during and after the active period of intervention

Month	Hours of exercise during the month (2011-2012)					
	A	B	C	D	E	F
October	1,00	12,00	22,00	18,00	32,00	24,00
November	14,00	51,00	53,00	44,00	31,00	49,00
December	7,50	50,00	57,00	42,00	18,00	39,00
January	0,00	92,00	75,00	40,00	33,00	41,00
February	0,00	62,00	60,00	21,00	39,00	20,00
March	0,00	60,00	73,00	36,00	45,00	0,00
April	0,00	61,00	72,00	23,00	20,00	0,00
May	0,00	0,00	55,00	19,00	21,00	0,00
June	0,00	0,00	3,00	0,00	4,00	0,00

Graphical representation of Table 5 is at the Appendix 1 (figure 2), which shows comparison group's different sport activity hours during the intervention months.

According to the information from diaries and reports, comparison group was interested to use internet application as an exercise log from the beginning of the study until the end of the winter, when cross country skiing season was over. After that comparison group probably become inactive because the lack of meaningful sports such as skiing, jogging, cycling or Nordic walking.

## 5.2 Barriers to physical activity

Vacation is one of the biggest barriers (Table 6) with bad weather even though the schedule seems not to be a conflict for them. Psychologically bad feeling of appearance and being stressed is also a big problem to being active. This can be due to the hectic shift work and probably bad self-confidence being stressed at work.

Table 6: BARSE measurements of study and comparison group

Barriers	Average					
	M (pre)	M (post)	W (pre)	W (post)	M (C)	W (C)
<i>Bad Weather</i>	6,00	5,00	8,29	6,88	7,40	6,62
<i>Bored by the activity</i>	4,90	7,50	5,65	6,25	6,00	5,85
<i>On wacation</i>	6,00	6,75	8,06	8,38	8,20	7,85
<i>Not interested of activity</i>	5,40	7,25	6,24	6,63	5,40	4,46
<i>Feeling pain or discomfort</i>	4,80	4,50	5,88	5,63	4,80	5,00
<i>Want to exercise alone</i>	7,50	7,75	7,65	8,25	7,40	6,92
<i>Was not enjoyable or fun</i>	6,20	4,50	6,53	5,75	7,00	5,77
<i>Bad location</i>	6,20	4,50	5,65	4,88	7,20	6,31
<i>Don't like the exercise program</i>	5,30	5,00	5,71	5,75	4,60	5,15
<i>Schedule conflict</i>	4,30	1,50	5,47	5,25	5,20	5,31
<i>Bad feeling of appearance</i>	7,10	8,00	7,65	7,13	7,00	5,92
<i>Missing pep talk</i>	5,90	9,50	6,18	7,25	7,00	6,85
<i>Stressed</i>	6,80	3,25	7,47	8,00	7,69	7,692

Some contradictory opinions were given about exercise program. In the first place bad location restricts taking part to the exercise program or going to the gym and if exercise event is not enjoyable or fun. Their initial opinion on supervised programs is somehow negative being not interest of activity, most willingly want to exercise alone but also at the same time they are missing pep talk. This just show the missing experience of supervised group trainings and used to being active at home-based homing exercises.

Some vigorous training session demonstrate them “runners high” effect, which can be seen that participants merely don’t agree feeling pain or discomfort as a barrier and probably on the opposite way; they have learned to enjoy moderate or vigorous exercise. Other possibility is that they just have much better performance to execute physical activities.

Activity based attitude correlate highly the content of the supervised training program. Participants are most probably aware of their sport interest and they are both bored and not interest of certain activities but not the activity itself. Also vacation is noticed to be a general barrier to join the supervised training sessions or interventions, not to the home-based activities, because they mostly like to exercise alone.

Feeling pain, being discomfort or just stressed by the physical activities does not play a major barrier for the participants although they seem to be more aware of their body image and therefore wants to exercise alone. Bad location and schedule conflict are learned to organize more convenient way. They seem to understand that both barriers are more or less attitude based problems. Also bad weather is not so crucial barrier any more or they just are used to different weather during the intervention.

At the same time comparison group measurement revealed similar barriers behavior like study group in the beginning. Bad weather and location, bored activity and vacation seem to be major barrier with low self-confidence of body image and other stress factors. Maybe just because of the social group, they are used to exercise together, they willingly to have peer reviews and pep talk of others. Comparison group has a long history of physical activity and sometimes own pro athlete career too, so they are not afraid of feeling pain or discomfort. Most of the members of the comparison group are retired and even then they have schedule conflicts, which cannot be explained by any reasons.

### *5.3 Perceptions of Exercise intervention*

Exercise session diary was used to get instant feedback during and after the training session to fulfill the picture of exercise interest of particular sport. Participants of the intervention were instructed to provide feedback after every session and some of them sent regularly a written report reflecting more precisely their own feelings of the certain sport and practice.

#### *5.3.1 Exercise history*

Preliminary interviews clarified the motivation climate of physical activity behavior before supervised trainings started. Physical activities were various depending on the practical circumstances of each person's situation and interest:

*“I don’t have regular exercises. I occasionally do activities, what just inspires me at the moment; sometimes I go for walking, doing cross training while watching TV, playing activity games or dancing. I don’t have found my specific sport yet”*

*“Mostly I go to the working place by bike and sometimes I go for walking, but nothing else”*

*“I’m practicing wrestling and concentrating to the age group championship games, so I don’t have any time to participate other activities after this and family duties”*

*“I like to do forest work at my spare time. Sawing and chopping wood is good exercise therapy for me”*

*“I like to participate all new things. Otherwise I get bored easily, so I’m still looking for my own sport”*

*“I used to be in good shape, but now I have gained weight and I want to be better condition, maybe not so good as years ago but better than now”*

### 5.3.2 Nordic walking session

Supervised trainings were started with the easiest and convenient way of Nordic walking. The walking track at the forest was a little bit challenging with small hills but not too steep for anyone. Warm-up with broom sticks was new stretching method for all and couple of uphill climbing was a personal test to create an opinion to the traditional Nordic walking training. Feedback was mostly neutral but some insights were noticed about the walking and pole pushing techniques. The most important points to gain self-confidence were personal guidance for techniques and intrinsic satisfaction to notice one’s own capabilities to cope with challenging up hills.

*“Learning the right pole pushing technique was surprisingly challenging. Movement skills coaching and tips for avoiding injuries were good. Last two up hills felt a little bit exhausting because of using poles, but feeling was good”*

*“This was totally new thing for me! I’m positively surprised, how effective Nordic walking is and much more comfortable than just walking. I’m going to by my own poles tomorrow”*

*“I liked to go with the group having good conversations. Usually I do rehearsals by myself and then I can keep up my own pace. I’d liked to take some heats into the uphill, because that was the best part of the practice.”*

*“It was energizing Nordic walking afternoon for the working day. Personal guidance was fantastic to have, so I will be there at the next time too”.*

People who are just used to work and do their family homework, were little bit stressed about the regular exercise plan. They illustrated quickly and clearly all of their barriers preventing to participate to the supervised trainings and exercise plan:

*“Pretty hard plan you put right in the beginning. It was nip and tuck whether to come. In the first place, I can’t cope with running but Nordic walking I can do.”*

*“What I told in the beginning, that July is hurry at work, so I don’t have energy to do anything but compulsory duties at home in the evening. At August I can come for the training while I’m at vacation, but if you think, I can come doing exercises with my own pace, I could come. It would be nice to get some tips for exercises”*

### 5.3.3 Running skills training session

Second training was to learn right technique and the safest way for the joints to run. During the hour several details of different running and jumping technique was introduced. Participants were very motivated but some over weight problems prevented to participate into the first session. Before the second session, good feedback among the workers encouraged the rest of the people to come for the training session. The most important thing for the participants was to notice what the right technique to run is if having back, knee or hip pains, especially when having too much weight on the joints. After coping with the right running technique, over weight participants were able to lose their weight efficiently. Once again, short moderate level

*“It was very good and detailed running skills coaching session. It is useful to understand the effect of incorrect running position and wrong stepping techniques. Actually it was pretty hard to do it right way after running couple of years with modern running shoes. Next time I will include some intervals to my own rehearsal at home. They refresh the running in a surprising way”*

Second running session (after couple of kettle bell sessions) was pretty much longer for the people who were not afraid of challenging themselves. Most of the participants followed the others, but some of them had to put into the short cut route. One of the over weighted participant got a new attitude and motivation towards running after adopting the new techniques, because he was not able to run for several years.

*“This was absolutely the best session so far. Various condition levels and abilities were noticed very well and everyone got a lot from this session. There was still lot to learn but this time running was much easier even this was much longer. Especially the intervals were refreshing.”*

Same person noticed the motivational impact of the exercise plans:

*“By the information of coaching, my own running exercises are getting better all the time. It is much easier to feel my own pace and the effect to the performance. This session was good to prove all this for me in practice.”*

Other feedbacks were quite a similar instead of some differences in autonomy and mastery experiences:

*“It is amazing to see, how much better, easier and faster I can run with right techniques. It is also new for me, that how much training I need to adopt new skills, even I have been running for several years. My enthusiasm for running raised up a lot even though “wrong” running has been enjoyable too”*

*“It was good to notice the effect of concentration and right running techniques after getting little bit exhausted in the end of the session. I was able to complete 8 km by running! This was longest run for me ever and I believe myself now, that I can do this again”*

Relatedness was presented for the one participant:

*“I think, that the group was the thing, I was able to complete this session. The following night was pretty sleepless. ”*

One person was suffering the physical and emotional barrier, which has been affected to him since after the school days:

*“It was a quite an accomplishment for me to run 4 km for a long time. I’m so bad. I’m not a sporty type and my gym grades at school were my worst too and I was always the last one then. No wonder I don’t like to exercise and I have bad feeling for that.”*

The same person also got some motivation to exercise just getting a little bit better self-esteem after mastery experience of running skills. Self-talk behind the awareness of possible ill-health and over weight:

*“I thought that I have hopeless running technique, because you didn’t mention about it at all. It just felt so bad, but probably I’m probably just so bad shape or too lazy.”*

*“I told to my friends, that I will offer beers for all, if anyone gets me for running. I have started to run 40 m and walking 40 m at the time to get one exercise session completed. I’m going to exercise by my own just because I’m so embarrassed if anyone else see me for huffing and puffing there.”*

#### 5.3.4 Resistance training sessions

Resistance training sessions were done with kettle bells, which is a popular sport in Finland nowadays. Participants have been heard about it, but the right technique is pretty difficult and people just don't know, that kettle bell is not for lifting but swinging. After all everyone managed to adopt the basic techniques though the body language revealed a slight stress by the painful techniques errors or exhausting type of resistance training. Participants were after all very motivated for the both session and the whole study group was there at the both time.

*"It is obviously a matter of skills. This is heavy for the beginner even with the small kettle bells. It is good to have another session to get better technique."*

*"It was good to have good coaching, because it is pretty easy to get injuries by the wrong technique. It was nice feeling of fatigue at whole body in the evening but no pain at all. I like this and I probably start to use this for resistance training, which I was afraid to do at the gym before."*

Everything new and unprecedented is frightened for the participants. Some of them felt fear before and some after the training:

*"I was afraid to get hurt or at least lot of pain after the rehearsal so I almost skipped the session. It was as hard as I thought but surprisingly I'm not so pain yet. Probably this is good for me."*

*"I noticed at the next day, that something different has been done. I had a strange but nice pain in my arms and sides. I'm going to try this another time too."*

Peer review and relatedness was strongly presence, because the rehearsal was kept at the same spot at the whole time:

*"It is nice to practice with friends at the group. People had a good jokes and it was nice to give and get comment from the others. Feedback is valuable to get immediately after the mistake and hopefully we have same kind of rehearsals in the future too."*

Qualitative analysis demonstrates a high enthusiasm towards group training and barriers measurement revealed also, that pep talk is needed to motivate people to exercise.

The feeling of autonomy and the release of the many barriers was encapsulated to the one sentence:

*“This is excellent, because I can do this outside and in many ways without going to the gym for resistance training.”*

### 5.3.5 *Martial arts training*

The last couple of sessions were even more exotic to observe if people are open minded and if they have prejudices towards self-expression and fighting skills. Martial arts session was told to be “like karate”, but no preliminary skills are needed.

*“It was purpose to develop agility, mobility, balance and body control. I’m not a competitive person so I don’t like fight with others, not even sparring”*

*“This session was absolutely the best! It was nice to learn new movement and punching techniques, step figures and kicks. Sensei was excellent and I would like to swing the others more. This is potentially my sport and I got a lot of energy for the rest of the day”.*

*”This was thoroughgoing session to the karate and fighting skills. Content was pretty good and easy to learn because of the ballet background, but I like ballet more.”*

*“At least I’m not going to practice karate in the future. I didn’t like at all; punches and kicks; no thanks. But it was interesting and sweaty (because of the fight or the fear?) too. Everything new must try, but so far this was the last time. Could you please give a taiji lesson too?”*

### 5.3.6 *Post intervention feedback*

After one month from the end of the supervised training sessions, participants were asked to give feedback about their planned home based exercise behavior and motivation. They were also asked to evaluate whether supervised sessions were more motivating or easier to implement compared to home based exercise or if they have some experiences of physical activity behavior change during the intervention. They were also encouraged to ask, if they might have something on their mind or don’t know, how to execute planned exercises. Participants were also encouraged to use the social media features at Trainit to exchange their experiences, challenge each other to exercise together, getting a “walking buddy” or sending me a consultancy request of exercise psychology or physiology. Participant’s feedbacks to this request were:

*“It does not bother me, if there are not supervised sessions. We have started to exercise together with my friend in Nordic walking, whenever it is possible after the workday and as I told I was depressed after the running session, because we each other are physically so different levels. If the others are really so good conditions, that they are able to run a marathon, what am I doing there? It would be nice to arrange suitable sessions for less competitive people too. This exercise program is very motivating when I’m looking for your plans and if everyone else is also doing them, I will do too. Now I’m started to looking for my friend to go for walking in the evenings, so I think this is a great thing.”*

That feedback demonstrated a frustration to heterogeneous exercise group, person’s body image and un-sporty type of personality. A stressful extrinsic motivation source was produced by persons own imagination. Person thought about the other workers, if they are executing the planned exercises person does not want to feel itself less capable or less active person than the other workers. Person has found a good intrinsic motivation source, a walking buddy which ability to exercise seems to be at the same level. Walking buddy reflects good self-esteem and allows feeling relatedness to exercise and person’s friend and possibly one meaning to the life. These two persons have quite a similar opinion of exercise motivation and group training sessions:

*“Group training time-out hasn’t affected to me at all, although I have missed our nice sessions. Of course, I exercised more when we had our group session. They were very motivating to my exercise behavior at my home too. Group training sessions works for me fine, although they could be more vigorous, because group force motivates also to push harder. I can understand that we must take consideration to the other participants and their capability too. The most important point having group training session is to get both good and bad feedback of my sport techniques. Unfortunately I can’t come to every group sessions because of my working duties.”*

Exercise motivation seem to be sustainable at least in a short term as previous person said, but other person were suspicious of his motivation:

*“Motivation to home-based exercise has been found pretty easily, because group training sessions are good motivators and inspiring with new sports. New information and viewpoints has attracted the interest to new sport a lot. It is easy to stay grinding myself to the same sport, same routes and same thoughts and easy to give up when you are alone at the track. It is much more comfortable and motivating to exercise in the group and it is more refreshing too. Group training time-out hasn’t affected to me, but if the time-out will last longer, it possibly affect pretty quickly to my exercise behavior. As a whole exercise program has been affected to my exercise behavior and motivation very positively”*

Both persons have commented about their good exercise motivation and group sessions. They underline the cognitive and informative interest of training; they have to concentrate to the execution according to the provided instructions of the right techniques which helps them to understand the meaning of exercise and enhances self-confidence.

Following person has commented only from the point of physical view. Probably the motivation is not the issue and person is already adopted the maintenance level of exercise behavior.

*"In the very beginning, when I heard about the exercise program, I was willing to take part to it. I appreciate new sports and I was eager to try them especially when a professional coach is giving a good guidance. Nordic Walking was very effective, when doing it with right techniques and poles of right height. I felt it versatile way of doing exercise while walking running or loping into the uphill. I'm going to buy own poles pretty soon. Thanks for the running technique guidance. It seems to be so, that I have never run in a right way before. It is nice to run at the group but when running alone, it is pretty monotonous compared to the Nordic walking. I tried kettle bells at the first time. That sport might be little bit risky but probably if I learn the right technique; it will enhance the power a lot. Karate was interesting sport to try. It requires a lot of engagement and many years to progress, so time management will be the problem for me to continue this sport. I have aim to increase my physical activity and you are right: increasing physical activity will affect to the vitality and coping stress. My aim is also to diversify my sport habits to go out more often and not just training at the gym."*

## 6 DISCUSSION

### 6.1 *Aims and main results*

Primary task and aim of this study was to plan, organize and evaluate an intervention to develop and provide web based exercise management system, which could provide as simple, effective and time saving method to plan, implement and monitor an exercise intervention. All requirements of previous studies (13 studies during 2003-2012 noticed in this research) have been taken into consideration while developing features and tools for the internet system: The latest web and mobile technology and innovations are used for this development project.

Experiences of developing and test using of the system has demonstrated the problems both participant's and researcher's side during the 18 months of the studies. For these studies fundamental ergonomic and minor problems were fixed to provide the most pleasant user experience of the system. Most of the cases corrective actions have been satisfying from the point of usability view but not always for the purpose of another primary task of this study; to investigate exercise motivation. The intervention was technically smoothly and easy organized by the Trainit portal, but it won't replace the real life face-to-face coaching operations. Exercise motivation was high during the supervised exercise period in the first three months, but the overall exercise motivation did not change compared to the initial state. The motivation of using internet based system was high supporting the exercise motivation as long as a real coach was taking care of the planning and implementation of the exercise session, but maintaining physical activity level most likely need more than 12 months face-to-face intervention.

This study practically prove the fact, that getting people physically active, they should think it actively, speak it with their friends, look for the suitable group with same gender, habits and same phase of life, and if possible find a suitable personal trainer and exercise planning system. Situation is more difficult if person does not want to think about being physically active, can't adopt it because of health barriers or simply can't see any specific benefits about exercise.

## 6.2 *Findings of the implementation and results*

EMI-2 exercise motivation metrics tool was noticed to be static and giving only an instantaneous insight of the level of motivation. EMI-2 tool also measures only the motivation to exercise but not the intention. EMI-2 measurements taught a lesson about the one-sided viewpoint of the structure of exercise motivation. If people are asked “do you think it would be important for the people to exercise” or “do you think that exercise could be healthy for you”? Probably most of the people will be affirmative but if the question is “how likely do you think go for exercise today” or “do you like to exercise” the answer may need much longer explanation than “yes”, because exercise barriers are much more complicated subject to handle; Actually it contains emotionally contradictory information about the health effects of exercising and willingness to sacrifice time, effort and money for that.

Exercise barriers study aside of the motivation study reveals the reasons not to exercise and also provides some guides and solutions to organize physical activity being more interesting, attractive and motivational. Exercise barriers study was important to the internet application development program as well. Exercise barriers are the real reasons to refuse exercising and reject the usage of the Trainit system. The information of the exercise motivation can be used for the modeling exercise resource planning tools but barriers identification is for the designing the traits and conditions of physical activities. People can be motivated towards the exercise behavior but every time, even in the front of single exertion, person must overcome the barrier to exercise. For that reason, there must be an alternative and appendage motivation source for affecting to another factor of feeling pleasure, for example gaming features.

Awareness of barriers does not help the coach to design more versatile exercise plans, which can take into the consideration all possible options to make exercise plan as convenient as possible. The earlier studies of using internet based software application for exercise interventions revealed the fact, that face-to-face consultation is needed aside of the internet application. The nature of the consultation can be supervised training or a conversation session at the comfortable place. Both sessions are effective to overcome an exercise barrier by using these together or separately. Discussing about the barriers in face-to-face will help people to identify the preventive

reasons to exercise or being more active and after that it would be much more productive to discuss about the motives, goals, methods and plans to exercise.

After all, Trainit was noticed to be a useful resource to inform exercises, training sessions and asking online questions and getting feedback of exercisers. Using Trainit for coaching purposes, it can't replace face-to-face coaching sessions but being merely a self service application, as mentioned earlier (Dawson, 2008).

### *6.2.1 Physical activity surveillance*

Although exercise motivation did not change neither study nor comparison group, some positive progress has been noticed in physical activity. Exercise activity can be measured and verified in practice from the internet based system records. According to the Trainit activity reports (Appendix 1), study group demonstrate lot of exercise interest from the beginning and during the intervention. This can be proved as an exercise activity but probably not the exercise motivation, even though that could be raised up by supervised training sessions and / or using Trainit portal. After the end of the supervised training session, activity reverted to the same level as before the intervention, and so did the exercise motivation.

According to the qualitative data of following exercise plans and using Trainit exercise log, exercise motivation can be seen to increase. Despite of the lack of exercise plans, study and comparison group are interested to use electronic exercise and dietary log for self monitoring of their physical activity behavior still after 10 months from the beginning of the intervention. It seems to be so, as my 14 years old daughter told me (she is also using Trainit exercise log): "I feel somehow guilty or lazy, if there are empty days at the monthly exercise log". Probably the exercise motivation is raised up somehow, because using the exercise log which probably provokes the desire of "collecting bouts" or just having a better self-esteem. People can observe log markings and summary reports as a tangible proof of their efforts compared to the very slowly increasing performance or varying weight loss.

This research design demonstrated as well, that exercise motivation and activity change cannot be proved if the duration of the study is not at least 6-18 months and preferably home based multiple, short-bout rehearsals (Jakicic, 1999; Adams, 2003; Jacobsen, 2003). During that time Transtheoretical model can predict stage change in

physical activity behavior but not the actual outcome (Adams, 2003, 2005). Exercise rehearsals should be supervised at least in the beginning of the intervention to rise up the level of physical activity, adherence (Troost, 2002), and future participation for adult fitness, cardiac rehabilitation, and weight loss (Morgan, 2001; Borg, 2002).

Supervised and Trainit planned rehearsals were partly implemented in vigorous intensity and participants gave immediate feedback; they were surprised of their capability, positively satisfied of their achievement and encouraged to repeat the bout in their own time at home. According to the studies, intensity of the home-based physical activity should implement at moderate or high-intensity level to create better adherence (King, 1995) although supervised rehearsal and leisure time physical activity should put into the practice in moderate or low-level intensity regardless of frequency (Dishman, 1996).

As a result of using Trainit portal, getting exercise plans, possibility to keep a dietary and exercise log for following the progress of training or weight losing was mentioned to be useful. People who have been exercising earlier continue to exercise but their sport interests remain the same during the intervention. Some of the participants were able to increase their motivation towards exercise during the intervention, but we can't say if Trainit, group support or training sessions were the reason for that.

During the intervention, group training session had a positive influence to the physical activity level, but it returned to the same level after the group sessions were over. Exercise plans were still provided after the group sessions participants were interested to follow and execute them and also to keep the exercise log. After the end of the exercise plans (2 months after the end of group sessions and 6 months from the beginning of the intervention), participants are still motivated to use Trainit application and to continue in approximately 15 hours / month in maintenance level of physical activity (Appendix 1).

Comparison group was included into this study because they were representing an older cohort than the study group revealing possible system usage problems. Comparison group had a well-known, predictable and regular high level physical activity behavior. They used the Trainit exercise log actively, especially during the

wintertime, but in the end of the cross country skiing season, when frost heave began to prevent outdoor physical activity, they stopped to use the Trainit. That phenomenon is probably not the question of the exercise motivation but the lack of activity because of the conditions barrier and possible frustration and/or depression towards weather too.

Compared to the study group, comparison group did not reveal any interest to the different sport, even they were eager to participate supervised training sessions. They didn't change their long lasting habits of activities or sport. Only kettle bell training was little bit interesting and some of them started to use kettle bells but all the other agility or Pilates etc. training was rejected after the experiment. The exercise behaviour of the comparison group is more stable compared to the study group. Their activity level remains the same during the whole intervention and follow-up period.

Comparison group has achieved their maintenance level of physical activity and exercise motivation is stable too in one point of view. From other point of view their motivation to alter the exercise behaviour is very low and possibly they are "totally sedentary" what becomes to the adopting new sport habits. There is a great danger of dropping out from maintenance level to inactive level, if any interruption (environment, conditions), trouble (stress or injury) or change in their present performance level occurs. From that point of view motivation towards exercise behaviour must contain also the motivation or interest to the different sport.

### 6.3 *Limitations*

Exercise motivation study raised up a lot of questions but also solutions to create affective internet application for activating people to exercise. Earlier studies of increasing physical activity and health-related behavior with internet based applications do not consider the source of motivation to exercise. Making people to use internet applications to improve their willingness to exercise and achieve their goals needs to determine all possible motivation sources, even computer gaming features to use web applications and being physically active. This problem is more or less a marketing issue, but intrinsic motivation to use web applications must rise up from the engagement force of web and mobile application use.

Motivation study with EMI-2 tool probably was not the right choice to measure exercise motivation, because the motive models were too health or psychologically related. Some other motivation questionnaires like barriers (reasons to or not), commitment (goal setting), participation (sport or relatedness specific) or process of change (lifestyles change) (Adams, 2005) related tools would characterize better the participants and study case.

EMI-2 questionnaire would fulfill its purpose if it had been used constantly from the beginning, during and in the end of the intervention. Dynamic, time series based tools e.g. Physical Self Inventory (PSI-6), which is dedicated to the collection of time series data individually twice a day, would be more accurate to adjust participant's interest of physical activity. In that case, a paper form would be out of the question because it would be laborious to score. Automated, internet or preferably Smartphone based data gathering and metrics tools with automated analysis algorithms must be used in the future for continuous measurements of exercise motivation.

The biggest challenge of this study was at the members of the group. Study is very heterogeneous working community requiring multi-skilled people for different service duties, technical and social skills. Shift work, wide variety of age and physical capability also increases the heterogeneity of the group but on the other hand the working community represents the average working place by the demanding level of skills and physical workload. The biggest challenge was to get people to participate into the study. Initial measurements about the exercise barriers prove the same as qualitative interviews. There were a lot of different physical, emotional, motivational, time and availability barriers (Biddle, 2008 p. 44-45) among the workers but from that point of view, workplace represents also the average attitude towards the exercise.

Instead of using this particular comparison group, which was heterogeneous and conveniently available, there could be a possibility to choose a random working community from university, community organization or hire the group virtually from the users of the Trainit. That would have been unlikely available and would took a lot of time to hire and create a contact with random individuals which would be biased by their exercise motivation as well after the introduction of Trainit portal and the purpose of the intervention. The same information of using Trainit was able to get from this particular comparison group.

Exercise motivation source can be easily mixed into some other external motivation source for example promising a prize or reward (Mailey, 2010) for answering to the questionnaires or participating into the experiment of using Trainit. Motivation source can be also biased by the awareness of being a comparison group in a certain exercise program, but not supposed to increase physical activity or motivation towards exercise behavior and continue sedentary and/or unhealthy lifestyle. What is expressly forbidden is worth for trying! That could be the reason to exercise and the measurements and using experiments are biased at least in the end of the intervention. On the other hand comparison group was decided to taken as an “other” group, not a control group for double test purposes because of their known, pretty stabile high level active lifestyle. It would be highly possible that they would not change their physical activity behavior during the intervention and study period. It is possible to compare their opinions and feedbacks to the different sport with the study group and, most important, to follow their activity behavior to use Trainit portal, to compare their experiences with study group and opinions to use it. If study group start to active like comparison group, it is a signal of behaving like an active lifestyle. Also the difference and change in physical activity and lifestyle can be compared to the known activity behavior.

Usually the participation to this kind of a studies are generally volunteer, but if business companies wants to have more commercial effectiveness to their own physical activity interventions, the compulsory participation of the workers should be considered. For example first group meeting and conversational lecture meeting with a specialist of, for example, exercise psychology should be compulsory just justifying it by the paid working day. This way it would be possible fall down the barriers of biased attitude towards the health related physical activity.

#### *6.4 Interactive system features for motivating people*

As told at the chapter of motivation, extrinsic motivation contains more short term goal settings than intrinsic long term goals (Salmela-Aro, Nurmi, Aunola, Jokisaari, Pitkänen, 2002). Short term goals can be more sustainable than long term goals, because results can be seen more rapidly. Goal setting should contain both long term goals and several short term milestones to support the exercise motivation. One possible solution of growing extrinsic short term exercise motivation could be

integrated gaming features to the internet based exercise applications. Gaming features are for the people, who are used to emphasizing shortsightedness quartile economic and having difficulties to adopt a long-term physical activity behavior getting visible results in performance or body image. Therefore games may be needed, because the immobilization has become a disease like a nuisance for humans.

Theoretical review was extended to the video game behavior study to discover, if physical activity behavior could be supported and motivated by internet application with gaming features in the future. Exercise and nutrition behavior, activity and the results can be illustrated by different enjoyable gaming feature e.g. figures, games, races, matches, achieved points and awards or stages to resolve. Social media like Trainit portal should provide editable image of self-perception which could be numerically or graphically provided report, but will not arouse any deeper emotions of collective pride.

Trainit portal's gaming attraction was minor compared to the possibilities, what are used at the real video games and what persuasive systems (Oinas-Kukkonen, 2012) supposed to be creating an affection towards the certain lifestyle. The persuasive factor of Trainit portal is based on the usage of exercise and nutrition log and goal setting tools. Automated reports of progress will provide satisfaction of intrinsic motives, but will not influence to the extrinsic motivation like modern video games will do.

More illustrative object would be "avatar", a virtual personality, representing the actual state of person's goals, desire, mood, feelings, body image, weight and figure. Most of the gaming features are based on the shooting (destroying), gathering or surviving chances with strategies and capabilities of the avatar. A demo version of the gaming features was developed during the intervention. The Configurator included both goal setting and profiling tools for creating a basic shapes of the avatar, but that project was freeze because the lack of time and technological challenges. The future of the internet based exercise management systems will be on the educational, entertaining and motivating gaming features integrated into social media. Some of the major sport equipment producers has already simple applications integrated their own biofeedback acquisition systems.

### 6.5 *Marketing experiences*

Marketing experiences during the study was divaricated; most of the actors, specially sport institutes were professionally interested and willing to use the system stating it to be the future of the sport and exercise industry. On the other hand, fitness clubs were also very positive on their attitudes, but virtual coaching system encountered a strong resistance from the personal trainers and the workers of the fitness clubs. Their attitude to the sport and exercise business is laying on the physical activity itself and most of the cases, using software applications for training were repulsive idea.

The main business strategy of Fitness clubs is renting room and equipments for the exercisers and to use the rental fee as a driving force of self-disappointment, which represents a negative appearance of peoples extrinsic motivation view. It is not cost effective to sell too small monthly payment, which does not motivate people enough and they can relapse knowing that the loss is not devastating, but too high payment causes the risk of losing customers to another fitness clubs. Monthly payment works in the same way as self-talk, being an actual promise, causing self-disappointment by the useless investment to himself if person stops to exercise (being lazy). Web application's motivational force to use exercise and dietary log is based on the frustration of cessation of training after having a good period of time of "collecting bouts". Person may feel collective shame or guilty when other person and friends can see the relapse from the web application's social media tools and reports.

Consumer markets are behaving more by the basis of the images and feelings of free benefits. Professional coaches are interested in good ergonomics of making exercise plans, active and semi-pro athletes are interested in getting versatile information (report graphics) and to store physiologically specific data about their exercise bouts. Basic exercisers are interested to get a good feeling from the single bout and likely to "after play" it later from the web site. They also have an intrinsic motivation to collect exercise bouts, which generates actual feel of progress and achievements and yet, if a real coach is making the exercise plan for them, a sense of duty drives people to being active.

Intrinsic motivation creates a need of making process driven goals for single customers, where 1) motivation to know (pleasure and satisfaction of learning) is caused

by tutoring impact by using web based exercise and dietary log to change eating habits and physical activity level more active. On-line coaching facility through web application enables continuous monitoring of several exercisers by the coach if personal guidance or psychological consultancy needed. 2) Intrinsic motivation to accomplish (or surpassing oneself) things is provided by exercise and dietary log, reporting features with statistics and summaries about accomplishments of rehearsals, calorie consumptions and biofeedback measurements e.g. distance, speed, heart rate and action time. 3) Intrinsic motivation to experience stimulation (experience of aesthetically pleasant sensations) is implemented when automated exercise and dietary log is combined to the achievement of more vigorous physical activity experiences. Diary data acquisition parameters (heart rate, distance, speed, calorie consumption etc.) indicate the level of achievement and the development of physical performance and or weight loss. Numeric, graphical or animated data can concretize in objective manner, which was felt subjectively during the physical exertion a few moments ago. Same statistics can easily demonstrate the progress, which again causes pleasant sensations in short and long term periods.

Promoting a sense of purpose by educating the value of physical activity to health, optimal function and quality of life is implemented in the most effective way by social media applications. Social media features can cause an external motivation growth from the person's feel of mastery while demonstrating the performance progress or weight-loss objectives achieved. Web application with social media features, blogs and articles are the channel of sharing ideas, stories, fortunes and information with other people of currently spoken topics.

One important marketing strategy for the consumer markets is self service and ability to configure personal exercise plans. Most of the cases it is difficult for the person himself to choose a suitable sport, without knowing whether it could be interesting sport and can it create a sustainable motivation towards exercise. The answer for this question will be very valuable information for personal trainer, when keeping a consultation meeting with that person. Motivation direction or choice contains the domain or interest (sport, music, business, swimming, tennis) which is significant for decision-making process. Web application wizards are used in several software systems as a personal Configurator of positively individualistic choices of sport and other interests. Motivation intensity explains adherence to the direction, habit or goal where

adherence quantify behavioral outcome containing regularly and precisely implemented exercise intensity, duration and frequencies per week (Tenenbaum, 2007 (ACSM) p. 509). Web application wizards for profiling one's personality by self reflective actions are used in the profile configurations to estimate one's own performance and activity level and health-related behavior goals.

## 6.6 *Conclusion and Future recommendations*

Compared to the previous studies, this study revealed that exercise motivation is difficult to increase and exercise barriers are difficult to overcome. Only the dynamic exercise behavior, the physical activity, was able to demonstrate by the Trainit portal varying during the intervention without any possibilities to record or demonstrate the changes of exercise motivation. This study gives a lot of information to practice and these findings will lead the future development programs into the situation, where dynamic, software system supported data gathering tools for psychometric measurements must be taken in use.

This study was not able to reveal official information about the effectiveness of the intervention at the particular working place. That will need much more time and different study setup. Unofficially the manager of the working place told to achieve 9 % increased revenue and 1000 hour less sick leaves compared to previous year, but this cannot be fully or even partly connected into the achievement of the intervention.

Future studies of the effectiveness of exercise interventions at the working places should concentrate into self-efficacy and self-perception which will lead researchers closer to the economical issues of the "human capital". Connection between productivity, competitiveness and profitability will be tied up closely to the human labor than the degree of process automation. In the near future every major manufacturing country will have closely similar industrial cost structure. After then, a genuine care of workers will need physical activity programs being more productive and happier and programs will be valued by the effectiveness in relation to its operating benefits.

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Figure 2: Physical Activity log of comparison group

## Appendix 2: Exercise Motivation Inventory-2 (finnish version)

**Liikuntamotivaation arviointikysely EMI-2**

Seuraavassa esitetään väittämiä ihmisten liikuntamotivaatiosta. Riippumatta siitä, käytkö säännöllisesti harrastamassa liikuntaa, lue jokainen väittämä ja vastaa HUOLELLISESTI HARKITEN miten itse tunnet väittämän osalta ja onko se sinulle HENKILÖKOHTAISESTI TOSI tai EPÄTOSI.

Jos väittämä on mielestäsi omalta osaltasi TÄYSIN TOTTA, ympyröi numero 5. Jos väittämä EI kuvaa omaa tuntemustasi lainkaan eikä siis pidä paikkaansa, valitse numero 0. Jos väite on osittain totta, ympyröi "1", "2", "3" tai "4", sen mukaan, kuinka vahvasti tuntuu siltä, että se heijastaa tuntemuksiasi.

Huomaa, että haluamme henkilökohtaisen mielipiteesi siitä, miksi juuri sinä harrastat tai haluaisit harrastaa liikuntaa. Vastauksia ei pidä antaa sen mukaan miksi liikuntaa pitäisi harrastaa. Täytä lopuksi muut tämän paperin toisella puolella kysyttävät tiedot, lukuunottamatta nimeäsi. Siis älä kirjoita nimeäsi kyselylomakkeisiin

Tuloksia käytetään vain tutkimustarkoituksessa ja ne julkaistaan yrityksen sisällä vain yhtenä kokonaisuutena, joka kertoo liikunta-intervention lähtötilanteen yrityksessänne. Intervention lopussa pidetään sama tutkimus, jolloin tiedetään tarkemmin liikuntaan liittyviä motivaatiotekijöitä. Yksittäisiä tuloksia ei julkaista missään muodossa.

Kiitos vastauksistanne



Reijo Kangas

Jyväskylän liikuntatieteellinen tiedekunta  
Urheilu- ja liikuntapsykologian laitos.

Ikä: \_\_\_\_\_

Sukupuoli: Mies  / Nainen 

Harrastan (tai harrastaisin) liikuntaa koska...	epätosi					tos
1 Pysyäkseeni hoikkana	0	1	2	3	4	5
2 Välttääkseni sairastumista	0	1	2	3	4	5
3 Koska se saa minulle hyvän olon	0	1	2	3	4	5
4 Auttaa näyttämään nuoremmalta	0	1	2	3	4	5
5 Voin osoittaa arvoni muille	0	1	2	3	4	5
6 Antaa minulle tilaa ajatella	0	1	2	3	4	5

**Pidä noin minuutin tauko**

Harrastan (tai harrastaisin) liikuntaa koska...	epätosi					tos
7 Voin saada itselleni terveellisen vartalon	0	1	2	3	4	5
8 Vahvistaakseni itseäni	0	1	2	3	4	5
9 Koska pidän ponnistelusta ja fyysisen harjoituksen tuomasta tunteesta	0	1	2	3	4	5
10 Viettääkseni aikaa ystäväni kanssa	0	1	2	3	4	5
11 Koska lääkäriini neuvoi minua harrastamaan liikuntaa	0	1	2	3	4	5
12 Koska haluan menestyä liikuntaharrastuksissani	0	1	2	3	4	5
13 Pysyäkseeni tai tullakseni ketterämmäksi	0	1	2	3	4	5
14 Saadakseni toteuttaa liikunnallisia tavoitteitani	0	1	2	3	4	5
15 Pudottaakseni painoa	0	1	2	3	4	5
16 Ehkäistäkseni terveysongelmia	0	1	2	3	4	5
17 Koska liikunta on mielestäni virkistävää	0	1	2	3	4	5
18 Saadakseni erinomaisen vartalon	0	1	2	3	4	5
19 Vertaillakseni kykjäni muiden ihmisten kanssa	0	1	2	3	4	5
20 Koska se auttaa minua vähentämään jännitystä	0	1	2	3	4	5
21 Koska haluan pitää yllä hyvää terveyttä	0	1	2	3	4	5
22 Kehittääkseni fyysistä kestävyyttä	0	1	2	3	4	5
23 Koska liikunta on jo sinällään tyydytystä tuottavaa	0	1	2	3	4	5

**Pidä noin minuutin tauko**

<b>Harrastan (tai harrastaisin) liikuntaa koska...</b>	<b>epätosi</b>					<b>tos</b>
<b>24</b> Nautin liikunnan sosiaalisista tilaisuuksista	0	1	2	3	4	5
<b>25</b> Ehkäistäkseni perheessäni olevaa sairautta	0	1	2	3	4	5
<b>26</b> Koska pidän kilpailemisesta	0	1	2	3	4	5
<b>27</b> Ylläpitääkseni liikkuvuutta	0	1	2	3	4	5
<b>28</b> Liikunta antaa minulle henkilökohtaisia haasteita	0	1	2	3	4	5
<b>29</b> Auttaa minua kontrolloimaan painoani	0	1	2	3	4	5
<b>30</b> Välttääkseni sydän- ja verisuonitauteja	0	1	2	3	4	5
<b>31</b> Ladatakseni pattereitani	0	1	2	3	4	5
<b>32</b> Kehittääkseni ulkonäköäni	0	1	2	3	4	5
<b>33</b> Vahvistaakseni saavutusteni huomionarvoa	0	1	2	3	4	5
<b>34</b> Hallitakseni stressiä	0	1	2	3	4	5
<b>35</b> Jotta tuntisin itseni terveemmäksi	0	1	2	3	4	5
<b>36</b> Tullakseni vahvemmaksi	0	1	2	3	4	5
<b>37</b> Kokeakseni liikunnan iloa	0	1	2	3	4	5
<b>38</b> Pitääkseni aktiivisesti hauskaa ystäväni kanssa	0	1	2	3	4	5

### **Pidä noin minuutin tauko**

<b>Harrastan (tai harrastaisin) liikuntaa koska...</b>	<b>epätosi</b>					<b>tos</b>
<b>39</b> Toipuakseni sairaudesta tai loukkaantumisesta	0	1	2	3	4	5
<b>40</b> Koska nautin fyysistä kilpailuista	0	1	2	3	4	5
<b>41</b> Välttääkseni jäsenten kangistumista	0	1	2	3	4	5
<b>42</b> Kehittääkseni henkilökohtaisia taitojani	0	1	2	3	4	5
<b>43</b> Koska liikunta auttaa minua polttamaan kaloreita	0	1	2	3	4	5
<b>44</b> Näyttääkseni viehättävämmältä	0	1	2	3	4	5
<b>45</b> Saavuttaakseni asioita, joihin muut eivät kykene	0	1	2	3	4	5
<b>46</b> Laukaistakseni jännitystä	0	1	2	3	4	5
<b>47</b> Kehittääkseni lihaksistoa	0	1	2	3	4	5
<b>48</b> Koska liikkuessani tunnen olevani parhaimmillaan	0	1	2	3	4	5
<b>49</b> Saadakseni uusia ystäviä	0	1	2	3	4	5
<b>50</b> Koska havaitsin liikunnan olevan hauskaa, etenkin kilpaillessani	0	1	2	3	4	5
<b>51</b> Arvioidaksen itseäni omien periaatteideni mukaan	0	1	2	3	4	5

## Appendix 3: Barriers Self-Efficacy Scale (finnish version)

## Liikuntaesteiden arviointikysely BARSE

Jotkin seuraavista tilanteista saattaa estää liikunnan tai jopa aiheuttaa liikunnan lopettamisen kokonaan.

Kerro oma suhtautumisesi esitetyistä tilanteista tai tunteista, kuinka luottavaisesti voit sitoutua liikuntaharrastukseen tai kykenet pitämään kiinni liikuntatottumuksestasi.

Numerolla nolla (0) et missään tapauksessa lähtisi harjoittelemaan ja Numerolla kymmenen (10) ilman muuta lähtisit harjoittelemaan.

**Uskoisin harrastavani liikuntaa ainakin 3 kertaa viikossa seuraavan 3 kuukauden aikana, jos tai kun:**

		En lähtisi				Ehkä				Lähtisin			
1	Sää on huono (kylmä, kostea, sateinen, helteinen)	0	1	2	3	4	5	6	7	8	9	10	
2	Kyllästyn suunnitelmasta tai harjoituksesta	0	1	2	3	4	5	6	7	8	9	10	
3	Olen lomalla	0	1	2	3	4	5	6	7	8	9	10	
4	Harjoitus ei kiinnosta	0	1	2	3	4	5	6	7	8	9	10	
5	Tunnen kipua tai epämukavuutta harjoittelun aikana	0	1	2	3	4	5	6	7	8	9	10	
6	Joudun harjoittelemaan yksin	0	1	2	3	4	5	6	7	8	9	10	
7	Harjoitus ei ollut hauskaa tai nautittavaa	0	1	2	3	4	5	6	7	8	9	10	
8	On hankala päästä harjoituspaikalle	0	1	2	3	4	5	6	7	8	9	10	
9	En pidä harjoitusohjelmasta, jossa olen mukana	0	1	2	3	4	5	6	7	8	9	10	
10	Jokin muu aikatalu sekoittaa harjoitus session	0	1	2	3	4	5	6	7	8	9	10	
11	Tunnistan ulkomuotoni harjoittellessani	0	1	2	3	4	5	6	7	8	9	10	
12	Ohjaajani ei kannusta minua	0	1	2	3	4	5	6	7	8	9	10	
13	Olen henkilökohtaisen stressin kuormittamana	0	1	2	3	4	5	6	7	8	9	10	

## Appendix 4: Additionally health behavior questions

**Kirjallinen alkuhaastattelulomake elintapojen ja liikuntatottumusten sekä mieltymysten selvittämiseksi**

1. Käytätkö alkoholia a) säännöllisesti b) harvoin c) en koskaan  
 2. Tupakoitko a) säännöllisesti b) harvoin c) en koskaan  
 3. Kuinka monta tuntia keskimäärin nuket yössä \_\_\_\_\_

Vastaa seuraaviin kysymyksiin vain yhdellä valintavaihtoehdolla, joka parhaiten kuvaa nykyistä liikuntaaktiivisuuttasi.

Huomaa, että normaali, keskimääräinen liikuntamäärä ihmisellä on noin 3 kertaa viikossa aina 20 minuuttia joka kerta

- |   |   |                          |
|---|---|--------------------------|
| 1 | Nyt en harrasta liikuntaa, enkä mahdollisesti ryhdy harrastamaan liikuntaa seuraavan kuuden (6) kuukauden aikana    | <input type="checkbox"/> |
| 2 | Nyt en harrasta liikuntaa, mutta olen ajatellut ryhtyä harrastamaan liikuntaa seuraavan kuuden (6) kuukauden aikana | <input type="checkbox"/> |
| 3 | Harrastan jonkin verran liikuntaa, mutta en säännöllisesti  | <input type="checkbox"/> |
| 4 | Harrastan säännöllisesti liikuntaa, mutta olen vasta vain viimeisen kuuden (6) kuukauden aikana                     | <input type="checkbox"/> |
| 5 | Harrastan säännöllisesti liikuntaa, ja olen liikkunut jo kauemmin kuin kuusi (6) kuukautta                          | <input type="checkbox"/> |

**Jos valitsit edellä kohdan yksi (1) tai kaksi (2) niin vastaa kysymyksiin siitä mikä mahdollisesti estää (kyllä "K" tai Ei "E") sinua liikkumasta säännöllisesti:**

1. Kova työkiire \_\_\_\_\_, Väsymys iltaisin \_\_\_\_\_, Jokin (fyysinen) este \_\_\_\_\_  
 2. Muu harrastus vie aikani \_\_\_\_\_ Lasten harrastukset vievät aikani \_\_\_\_\_  
 3. En katso liikuntaa tarpeelliseksi \_\_\_\_\_ Saan paljon liikuntaa työssäni \_\_\_\_\_  
 4. Elämän tilanteeni on sellainen etten ehdi harrastamaan liikuntaa \_\_\_\_\_

**Jos valitsit edellä kohdan neljä (4) tai viisi (5) niin vastaa myös seuraaviin kysymyksiin:**

5. Montako kertaa viikossa käyt liikkumassa \_\_\_\_\_  
 6. Kuinka paljon käytät keskimäärin aikaa liikkumiseen kerralla \_\_\_\_\_

**Tahtoisin kokeilla seuraavia liikuntamuotoja:**

Juoksua		Kahvakuulailua	
Sauvakävelyä		Tennistä	
Pyöräilyä		Pilatesta ja keppijumppaa	
Uintia		Salibandyä tai jalkapalloa	
Kuntosaliharjoittelua		Karatea	

## Appendix 5: The Exercise Motivations Inventory - 2 (english version)

## The Exercise Motivations Inventory - 2 (EMI-2)

On the following pages are a number of statements concerning the reasons people often give when asked why they exercise. *Whether you currently exercise regularly or not*, please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement *is true* for you personally, *or would be true* for you personally if you did exercise. If you do not consider a statement to be true for you at all, circle the '0'. If you think that a statement is very true for you indeed, circle the '5'. If you think that a statement is partly true for you, then circle the '1', '2', '3' or '4', according to how strongly you feel that it reflects why you exercise or might exercise.

Remember, we want to know *why you personally* choose to exercise or might choose to exercise, not whether you think the statements are good reasons for *anybody* to exercise.

It helps us to have basic personal information about those who complete this questionnaire. We would be grateful for the following information:

Your age ..... years

Your gender .....

male/female

Not at  
all true  
for me

Very  
true  
for me

### Personally, I exercise (or might exercise) ...

1	To stay slim	0	1	2	3	4	5
2	To avoid ill-health	0	1	2	3	4	5
3	Because it makes me feel good	0	1	2	3	4	5
4	To help me look younger	0	1	2	3	4	5
5	To show my worth to others	0	1	2	3	4	5
6	To give me space to think	0	1	2	3	4	5

### Personally, I exercise (or might exercise) ...

7	To have a healthy body	0	1	2	3	4	5
8	To build up my strength	0	1	2	3	4	5
9	Because I enjoy the feeling of exerting myself	0	1	2	3	4	5
10	To spend time with friends	0	1	2	3	4	5
11	Because my doctor advised me to exercise	0	1	2	3	4	5
12	Because I like trying to win in physical activities	0	1	2	3	4	5
13	To stay/become more agile	0	1	2	3	4	5

14	To give me goals to work towards	0	1	2	3	4	5
15	To lose weight	0	1	2	3	4	5
16	To prevent health problems	0	1	2	3	4	5
17	Because I find exercise invigorating	0	1	2	3	4	5
18	To have a good body	0	1	2	3	4	5
19	To compare my abilities with other peoples'	0	1	2	3	4	5
20	Because it helps to reduce tension	0	1	2	3	4	5
21	Because I want to maintain good health	0	1	2	3	4	5
22	To increase my endurance	0	1	2	3	4	5
23	Because I find exercising satisfying in and of itself	0	1	2	3	4	5

**Personally, I exercise (or might exercise) ...**

24	To enjoy the social aspects of exercising	0	1	2	3	4	5
25	To help prevent an illness that runs in my family	0	1	2	3	4	5
26	Because I enjoy competing	0	1	2	3	4	5
27	To maintain flexibility	0	1	2	3	4	5
28	To give me personal challenges to face	0	1	2	3	4	5
29	To help control my weight	0	1	2	3	4	5
30	To avoid heart disease	0	1	2	3	4	5
31	To recharge my batteries	0	1	2	3	4	5
32	To improve my appearance	0	1	2	3	4	5
33	To gain recognition for my accomplishments	0	1	2	3	4	5
34	To help manage stress	0	1	2	3	4	5
35	To feel more healthy	0	1	2	3	4	5
36	To get stronger	0	1	2	3	4	5
37	For enjoyment of the experience of exercising	0	1	2	3	4	5
38	To have fun being active with other people	0	1	2	3	4	5

**Personally, I exercise (or might exercise) ...**

39	To help recover from an illness/injury	0	1	2	3	4	5
40	Because I enjoy physical competition	0	1	2	3	4	5
41	To stay/become flexible	0	1	2	3	4	5
42	To develop personal skills	0	1	2	3	4	5
43	Because exercise helps me to burn calories	0	1	2	3	4	5
44	To look more attractive	0	1	2	3	4	5
45	To accomplish things that others are incapable of	0	1	2	3	4	5
46	To release tension	0	1	2	3	4	5
47	To develop my muscles	0	1	2	3	4	5
48	Because I feel at my best when exercising	0	1	2	3	4	5
49	To make new friends	0	1	2	3	4	5
50	Because I find physical activities fun, especially when competition is involved	0	1	2	3	4	5
51	To measure myself against personal standards	0	1	2	3	4	5

**Thank you for completing this questionnaire**

David Markland  
SSHES, University of Wales, Bangor  
Email: d.a.markland@bangor.ac.uk  
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