

MOBILE-BASED INTERVENTION
BASED ON ACCEPTANCE AND COMMITMENT THERAPY
-The effectiveness on work ability and perceived stress for individuals
with symptoms of metabolic syndrome and psychological stress

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LUODELAHTI, MARJO: Mobile-based intervention based on Acceptance and Commitment Therapy - The effectiveness on work ability and perceived stress for individuals with symptoms of metabolic syndrome and psychological stress

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The present study explored whether mobile-based intervention, called Oiva, based on Acceptance and Commitment Therapy effects on work ability among obese participants struggling with stress. The eight-week intervention in an RCT study was examining the effectiveness of mobile-based intervention including mindfulness, acceptance and value-based exercises (Mobile). Another subject of interest was whether psychological flexibility related to work ability and perceived stress mediate the effects of the mobile intervention. The study comprehended pre-measurements before the 8-week interventions and follow-up measurements 36 weeks after the pre-measurements. The control group (Control, n=66) participated in the same measurements than the intervention group (Mobile, n=73) without any treatment. Data were analysed with the Mann-Whitney t-test and further using a single-step multiple mediator model.

Although the improvements of different measurements in Mobile group were better than in Control group throughout the study, mobile-based intervention not received a scientific confirmation in comparison with the control group. Despite the failure in the main study hypothesis, the results in the more specific level indicated that Oiva could be used as an effective tool for slight overweight persons improving their work ability. The study proved also that psychological flexibility related to work ability and perceived stress mediated the effects of the mobile intervention. Further research is needed to study whether Oiva could be used as an effective tool for workers in risk groups to improve their wellbeing at work.

Keywords: obesity, psychological stress, work ability, Acceptance and Commitment Therapy, psychological flexibility, mindfulness, Mobile Intervention, RCT study.

JYVÄSKYLÄN YLIOPISTO

Psykologian laitos

LUODELAHTI, MARJO: Hyväksymis- ja omistautumisterapiaan perustuvan, älypuhelinsovelluksen tehokkuus työkykyyn ja koettuun stressiin yksilöille, jotka kärsivät metabolisenoireyhtymän oireista ja psykologisesta stressistä.

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Tässä tutkimuksessa tutkittiin hyväksymis- ja omistautumisterapiaan perustuvan hyvinvointiohjelman Oivan älypuhelinsovelluksen tehokkuutta työkykyyn ja koettuun stressiin yksilöillä, jotka kärsivät metabolisenoireyhtymän oireista ja psykologisesta stressistä. Satunnaistetussa vertailukokeessa tutkittiin 8-viikon intervention avulla älypuhelimien sovelletun ohjelman tehokkuutta tietoisuustaitojen (mindfulness) ja hyväksymis- ja arvopohjaisten harjoitusten pohjalta. Lisäksi oltiin kiinnostuneita välittääkö psykologinen joustavuus suhteessa työkykyyn ja koettuun stressiin intervention vaikutuksia. Tutkimus sisälsi alkumittaukset ennen 8-viikon interventiota ja seurantamittaukset 36 viikkoa alkumittauksen jälkeen. Kontrolliryhmä (Kontrolli, n=66) osallistui samoihin mittauksiin kuin interventioryhmä (Mobiili, n=73) ilman osallistumista älypuhelinsovelluksen käyttöön. Aineisto analysoitiin käyttäen Mann-Whitneyn t-testiä ja edelleen välittäjäanalyysiä.

Vaikka interventioryhmän tulokset eri mittareissa paranivat kauttaaltaan enemmän kuin kontrolliryhmässä tutkimuksen aikana, älypuhelinintervention saavutukset eivät saaneet tieteellistä vahvistusta suhteessa kontrolliryhmään. Huolimatta epäonnistumisesta tutkimuksen ydinhypoteesien suhteen, tarkemmat tulokset osoittivat, että Oiva saattaa olla tehokas työkalu parantamaan kevyesti ylipainoisten työkykyä. Tutkimus osoitti myös, että psykologinen joustavuus suhteessa työkykyyn ja koettuun stressiin välittää älypuhelinintervention vaikutuksia mitattaessa psykologista joustavuutta yleisimmällä mittarilla (AAQ-II). Lisätutkimusta tarvitaan voisiko Oiva toimia tehokkaana työkaluna riskiryhmään kuuluvilla työntekijöillä parantamaan heidän työhyvinvointiaan.

Avainsanat: liikalihavuus, psykologinen stressi, työkyky, hyväksymis- ja omistautumisterapia, psykologinen joustavuus, tietoisuustaidot, Mobiili interventio, satunnaistettu vertailukoe.

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INTRODUCTION

The population structure has changed from the pyramid to the tower during the last decades and the development will continue in the same direction: the population over 65 years will increase more rapidly than the rest of the population during the following decades (Preston & Martin, 1994; Rau, Muszyńska, & Vaupel, 2013). At the same time, overweight and obesity together with psychological stress are part of the major public health burdens (Lappalainen et al., 2014). These facts are not only causing heavy public costs but are challenging how to uphold adult's work ability because of decreasing labour (Gould, Ilmarinen, Järvisalo, & Koskinen, 2008a) and rising age dependency ratio (Ilmarinen, Tuomi, & Seitsamo, 2005). There is a rising need to develop cost-effective technology-aided interventions for persons of the high-risk group for metabolic syndrome and psychological stress at the working age (Lappalainen et al., 2014).

Both weight problems and psychological stress have studied desperately during last decades. Although a flow of information, the negative development has not been able to stop yet (Lappalainen et al., 2014). In Europe including Finland over half of the adults are overweight or obese (OECD, 2013), and 68 % of Americans has overweight or obesity (Corsica & Perri, 2003; Flegal, Carroll, Kit, & Ogden, 2012). At the same time, stress has increased among working adults becoming one of the prime threats to health (Taris, van der Wal, & Kompier, 2010). The report of Eurofound and EU-OSHA (2014) reveals that one in four workers in Europa struggles with work-related stress and the same amount of workers experience that work has negative health influences on them. In 2002, the economic cost of work-related stress within the EU15 Members States was measured at €20,000 million on an annual basis (Milczarek, Schneider, & Conzález, 2009), but according European Commission (2013) the cost of work-related illness including stress has tripled at the same time while the member states has increased from 15 to 27 members states since 2002 to 2013. Although work ability is still perceived rather acceptable among working population (Gould et al., 2008b) work-related sick leaves (Milczarek, 2014) as well as sick leaves because of obesity (Neovius, Johnsson, Kark, & Neovius, 2009) raise the need to find new ways to improve work ability. Stress and obesity are two of the main reasons transiting to the pension before the age of retirement (Statistics Canada, 2010). From working-age population, 7% are receiving disability pension in Finland (Pensola, Gould, & Polvinen, 2010).

Obesity and overweight

According to WHO (2014) obesity has almost doubled globally during the last 30 years. Obesity is a pandemic which no country has yet managed to master: in 2010 were measured that 3.4 million deaths were due to obesity (Ng et al., 2014). Overweight and obesity is “abnormal and excessive fat accumulation that may impair health” (WHO, 2014). The risk weight is usually measured by a general index called Body mass index (BMI) which calculates “a person’s weight in kilograms divided by the square of his height in meters (kg/m²)” (WHO, 2014) (Table 1).

Table 1 The categories of BMI for adults (WHO, 2015).

Category	BMI range - kg/m ²
Underweight	< 18,5
Normal	18,5 - 25
Overweight	25 - 30
Obese Class I	30 – 35
Obese Class II	35 – 40
Obese Class III	> 40

Finland among the first countries has received promising results from the latest national FINRISK studies demonstrating that increased obesity has come to halt (Männistö et al., 2015). The increase of BMI has been a concern since 1970s among men and since 1980s among women (Working Group for the National Obesity Programme 2012–2015, 2013). In 2012, the average body mass index for the Finnish working-age men was 26,9 kg/m² and for the women 25,9 kg/m² (Männistö et al., 2015). Every fifth working-age person is obese BMI >30,00 kg/m² (Männistö et al., 2015). One-third of both in men and women have waist fat (waist fat: men ≥100cm, women ≥90cm) (Working Group for the National Obesity Programme, 2013).

The living environment has changed to an obesogenic environment where the passive and sedentary lifestyle without sufficient physical activity and continuously available excessive or unhealthy nutrition increase the risk of gaining weight (Ng et al., 2014; Working Group for the National Obesity Programme, 2013). Raised BMI is one of the main causes for several diseases

such as cardiovascular diseases (primarily heart disease and stroke), diabetes, musculoskeletal disorders and some cancers (WHO, 2014). Overweight and obesity increase also risk to fall ill to asthma, dementia, depression, sleep apnea, gout, gall and pancreatic diseases (Working Group for the National Obesity Programme, 2013). The metabolic syndrome is the umbrella term for following medical conditions: diabetes or insulin resistance, obesity (BMI over >30), blood pressure ($>140/90$ mm Hg), low high-density cholesterol (HDL) levels and urinary albumin excretion (WHO, 1999). The premature mortality risk is starting to rise when BMI is ≥ 25 kg/m² (Fleck, 2013).

Obesity is a significant expenditure of public health cost worldwide (WHO, 2014). A conservative estimation of obesity's cost is about 1,4-7% of totally Finnish health expenditure (Pekurinen, 2011). The cost can be divided to direct (like prevention and care), productivity (like sick leave) or psychosocial costs (like depression) (Working Group for the National Obesity Programme, 2013). Beside high public health cost, obesity causes social (e.g. reduce the opportunities for marriage especially for obese women), psychological (e.g. problem with self-esteem) and socioeconomically (discrimination, e.g. working obese women earn significantly lower salaries than normal-weight women) suffering to individuals struggling with weight-problems (Stroebe, 2011). Although the latest results indicate that obesity is not more growing, the problem demands continuous prevention (Männistö et al., 2015) and modern methods to deal with it (Lappalainen et al., 2014).

Psychological stress

Stress theories classify stress mainly in three different ways: response based, stimulus based, and transactional based (Lyon, 2012). According to Selye's (1956, as cited in Lyon, 2012) in response-based theory physiologic stress is defined as the non-specific process of adaptation of the body including three different stages: alarm, resistance and exhaustion. Selye's theory is based on physiology and medicine and is also known as General Adaptation Syndrome (GAS theory) (Lyon, 2012). Stress as a stimulus simply means that the changes of life act like the stressor responded by a person. Both The Social Readjustment Rating Scale (SRRS) and Schedule of Recent Experiences (SRE) developed by Holmes and Rahe are used as stress rating instruments based on stimulus (Lyon, 2012). The main focus of psychological stress research has laid on the cognitive theory of stress (Lyon, 2012). According the theory appraisals (primary as assessment of situation, secondary

as choosing coping strategy, reappraisal as continuous assessment of situation) are the fundamental advocates in a transaction between a person and his or her environment (Lyon, 2012). Figure 1 demonstrates the core of the transactional model of stress. In brief, if possibly stressful events are gauged stressful in relation to one's own values, beliefs, experiences, and coping resources, they can cause reversal both in cognitive and physical levels laying one at hazard for disorder. In other words: "Psychological stress is a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, p.19).

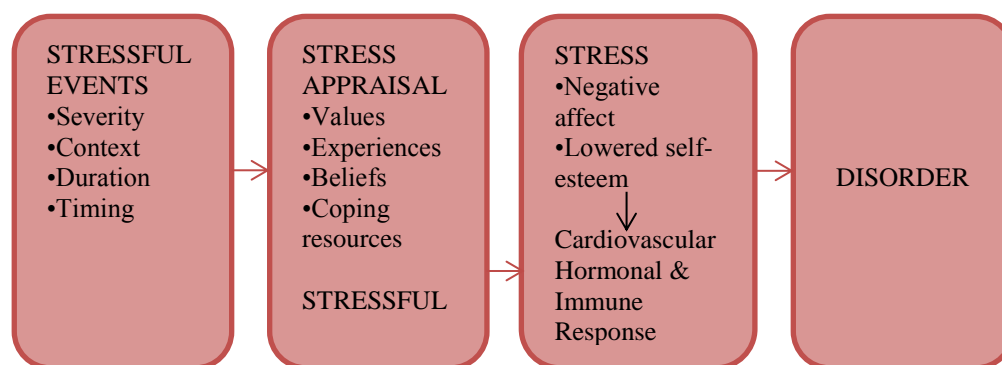


Figure 1 The Transactional Model of Stress and Disorder according to Cohen (Cohen, 1992, p.110).

The main significant sources of stress in everyday life after death are finances (75%) and work (70%) (Stress in America, 2012). Next stress breeders are relationships, family obligations, health issues and job stability (Stress in America, 2012). Stress may be linked 60-80% of outpatient visits (Nerurkan, Bitton, Davis, Phillips, & Yeh, 2013). Illness linked to stress is covered from the everyday cold to tumour (Christian & Glaser, 2012). Stress is affecting to immunity systems. Acute stress, major depressive disorder, schizophrenia, bipolar disorder, anxiety disorder, heart and circulatory diseases, asthma, fatness, depression, fibromyalgia, fatigue syndrome, autoimmune disease and childhood trauma are all linked with stress (Christian & Glaser, 2012; Korkeila, 2008). Stress is not just a psychological suffering for persons but as well burden to on the society's economy (European Commission, 2013). Perceived stress symptoms at working age predict disabilities later at the retirement age (Kulmala et al., 2013).

The link between overweight/obesity and stress

There is a link between psychological stress and obesity (de Vriendt, Moreno, & De Henauw, 2009). If stress is a cause of obesity or a consequence of obesity is not self-evident. Stress as a cause of obesity is justified e.g. that cortisol levels are escalated in the expansion of obesity and the stress system seems to have impact on food intake control (Foss & Dyrstad, 2011). “Stress in America” -survey (2012) found that one of the main groups which stress is particularly dangerous is people who are exceed 50 years and have diagnosed with obesity. Stress worsens obesity because stress cripples to capacity to boost people’s health. Thus, obesity can be seen as “a psychological adaption to stress” (Foss & Dyrstad, 2011, p. 8). Respectively, study results for stress as a consequence of obesity have been limited. The focus has been how cortisol release raises weight gain and gender dependence, but results are not unanimous (Foss & Dyrstad, 2011). The most essential is to focus on the link between stress and obesity. Figure 2 shows how prolonged stress can harm the metabolic homeostasis.

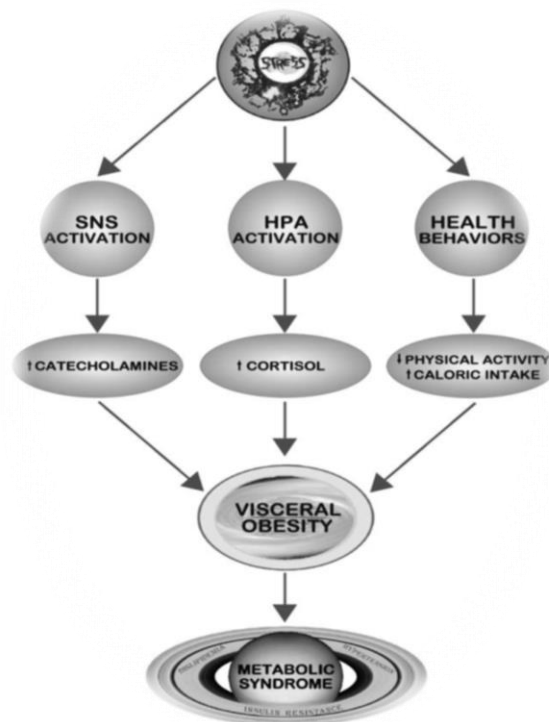


Figure 2

Stress and derangement of metabolic homeostasis. Chronic stress, with the resultant activation of both the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS), together with significant changes in health behaviours, can progressively contribute to the development of visceral obesity and metabolic syndrome. (Kyrou & Tsigos 2009, p. 790)

Work ability

The Finnish Institute of Occupational Health (FIOH) with the interdisciplinary research team has done pioneering work concerning work ability creating the Work Ability Index (WAI) in the beginning of 1980' (Ilmarinen, 2009). Maintaining work ability was understood already then to become one of the cornerstones of public health (Ilmarinen, 2009). Finland has been the leading country in demographic aging in the Europe (Kunz, 2007). The longer life expectancy and reduced fertility have strengthened that age dependency ratio is rising (Ilmarinen, 2005). WAI-Follow-up studies started 1981 focusing the question, “how long workers and employees are able to work and to what extent being able to work depends on the work content and job demands” (Ilmarinen, 2009, p.1). Shortly, the idea of work ability is balance ratio between one’s resources and work and its demands (Ilmarinen, 2009, p.2). Later, the work ability has been understood more complicated system including as well other elements than the individual and his work (Figure 3) (Ilmarinen, Tuomi, & Seitsamo, 2005).

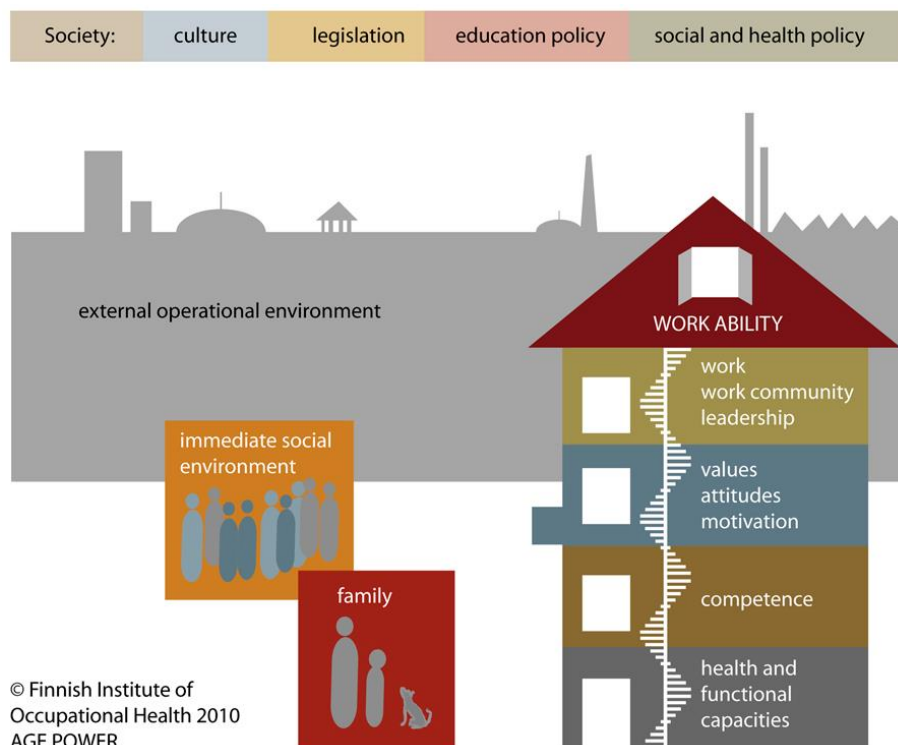


Figure 3 The Work ability model (Ilmarinen, 2013).

According to the model, the three lowest floors of the house consist of individual's resources. On the first floor, the more solid health and functional capacities, the more stable will work ability be all through work life (Figure 3) (Ilmarinen, Gould, Järvikoski, & Järvisalo, 2008). On the second floor, competence and its frequently renewing is the key to maintaining work ability (Figure 3) (Ilmarinen et al., 2008). Values, attitudes and motivation are placed on the third floor and they are near to the fourth (work) floor. Involvement from work influences employee's values, attitudes and motivation (Figure 3) (Ilmarinen, et al., 2008). The fourth floor, work with the entire aspects establishes the basis for the lower floors. The prognosis of work ability is confident when the harmony between the individual and work is guaranteed (Figure 3) (Ilmarinen et al., 2008). The environments around the house of the work ability from legislation to the family can either improve or impair the work ability of individuals (Figure 3) (Ilmarinen et al., 2008).

The Working Life Barometer (Työolobarometri) has been published since 1992 in Finland (Lyly-Yrjänäinen, 2014). One of the main issues in the Barometer is work ability based on WAI. The Barometer reveals that throughout the 2000's work ability is seen to remain unchanged (Lyly-Yrjänäinen, 2014). Almost all workers (92%) reported that their work ability was good or excellent (Lyly-Yrjänäinen, 2014). However, the latest studies from 2013 reveal that 27% of working people experience that their work ability has impaired (Kaikkonen et al., 2014). The younger working age groups (22-54-years) report higher scores than the older ones (55-74-years) in their work ability and coping skills at work (Saarsalmi et al., 2014). The greatest challenge to improve work ability include those who are living in rural areas, has lower socio-economic status, less education and are nearing retirement (Kaikkonen et al., 2014; Saarsalmi et al., 2014). Women have some lower work ability than men: 10% of women had poor or moderate work ability vs. 6% of men (Lyly-Yrjänäinen, 2014). Diagnostic medical illnesses have increased in the number during last ten years (Lyly-Yrjänäinen, 2014). 13% of workers have to lighten the tempo of work or change the practise of work (Lyly-Yrjänäinen, 2014). The continuous changes are reflected in coping at work and to take responsibility for work ability is the prerequisite for longer working lives (Ilmarinen, 2005). The main intervention areas are preventing chronic disease among older workers, preventing obese and increase functional capacity among young people and immigrants and maintaining work ability among working-age people (Alasoini, Järvensivu, & Mäkitalo, 2012). Improving the employment rate of working-age population (from 15 years to 64 years) in all working groups have also be taken account (OECD, 2006). The pressure of the workplace as health promotion arenas will be centred (Alasoini et al., 2012).

Acceptance and Commitment therapy

Today the increasing number of people need more supportive methods than e.g. listen to favourite music or to spend time in good company to handle their “psychological quicksand” (Hayes & Spencer, 2005, p.3) (Stress in America, 2012). The aim of Acceptance and Commitment Therapy (ACT) is to support individuals to use the resources of human mind to conquer the obstacles of surroundings (Hayes & Spencer, 2005) and as well to support individuals to become aware of his or her values and start to live according those values (Strosahl, Hayes, Wilson, & Gifford, 2004). ACT is one of the third generations’ behaviour therapies and has its origins in the United States, but it has spread during the three decades universally and ACT materials (text and practises) are now accessible in numerous languages (Batten, 2011). ACT is still seen as a new therapy form because therapists have given ACT therapies only the last fifteen years (Batten, 2011). One of the pioneers of ACT has defined the therapy:

ACT is a functional contextual therapy approach based on Relational Frame Theory which views human psychological problems dominantly as problems of psychological inflexibility fostered by cognitive fusion and experiential avoidance. In the context of a therapeutic relationship, ACT brings direct contingencies and indirect verbal processes to bear on the experiential establishment of greater psychological flexibility primarily through acceptance, defusion, establishment of a transcendent sense of self, contact with the present moment, values, and building larger and larger patterns of committed action linked to those values. Said more simply, ACT uses acceptance and mindfulness processes, and commitment and behavior change processes, to produce greater psychological flexibility. (Hayes, 2015)

Experiential avoidance and psychological inflexibility have been found as a source for psychological and physiological complications (Lillis & Hayes, 2008). ACT offers a model how to get rid with psychological inflexibility and develop psychological flexibility through six core processes (Figure 4) (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Psychological flexibility means “the ability to contact the present moment more fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends” (Hayes et al., 2006, p.7). For example, acceptance is the opposite of avoidance. Instead of struggling with negative feelings, ACT offers methods to accept those feelings and guide acting more value-based (Hayes et al., 2006). Techniques in cognitive defusion help to weaken the effect of private events (e.g. negative thoughts) instead of their appearance. The consequence of defusion is often that private events become more powerless or even disappear (Hayes et al., 2006).

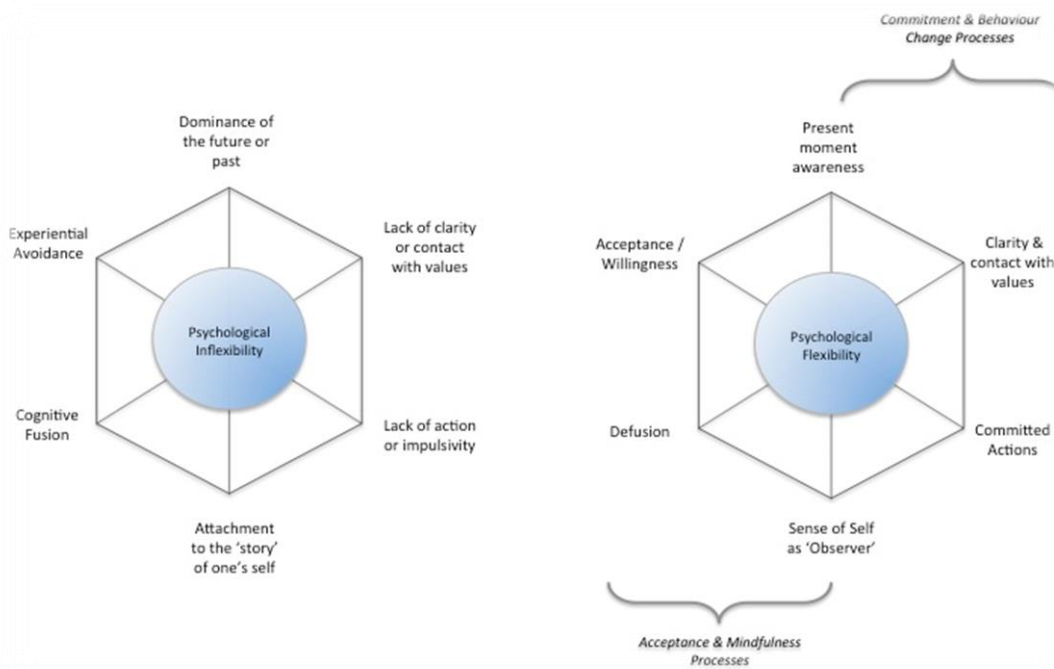


Figure 4 The Acceptance and Commitment Therapy Model according to Hayes et al. (2006, p.6, p.8).

Acceptance and Commitment Therapy (ACT) has demonstrated to affect positively for several psychological difficulties as depression, work-related stress, anxiety disorders (Strosahl et al., 2004; Hayes et al., 2006) and even perceived stress (Brinkborg, Michanek, Hesser, & Berglund, 2011). ACT has also produced hopeful results for public health containing several behavioural medicine areas such as self-help for obesity and diabetes (Strosahl et al., 2004; Hayes et al., 2006).

Mobile-based intervention

E-Health with alternative therapies has arisen during the last decade parallel to face to face treatments. Different kind of network managements programs have been offered during the last few years for several health problems as weight control and eating disorders (Carrard et al., 2011; Doyle et al., 2008; Pretorius et al., 2009). Network programs have shown to be effective in especially treatment of depression and anxiety (Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010; Green & Iverson, 2009).

Especially mHealth (mobile health) has reached the central role of the eHealth since they were launched for seven years ago (Fiordelli, Diviani, & Schulz, 2013). The strengths of mHealth compared with face to face therapies are its flexibility (independent from time and place and self-supporting usage) and cost-effectiveness (Andersson et al., 2005; Lappalainen et al., 2014). These advantages ensure the use of smartphones as a therapy tool increasingly in the future for modern people (Fiordelli, et al., 2013). The facilities of smartphones are still in their development (Fiordelli, et. al., 2013). Up to this day, smartphones have basically applications for chronic conditions, but in the future there is a need also to develop applications for acute conditions (Fiordelli et al., 2013). New technology challenges therapists to learn how to use apparatus productively and trustworthy (Eonta et al., 2011), i.e. guiding persons to improve their well-being using self-help programmes (Andersson et al., 2005). Recently, several RCT-studies have evaluated ACT with promising results in the context of different kind of network programs, i.e. web and mobile intervention (Ahtinen et al., 2013; Buhrman et al., 2013; Hesser et al., 2012; Lappalainen et al., 2013; Lin et al., 2014; Ly, Asplund, & Andersson, 2014).

Purpose and main hypotheses

The general purpose of the current study was to explore whether the mobile intervention had an effect on work ability among obese participants struggling with stress. The goal was to examine mobile-based intervention including mindfulness, acceptance and value-based exercises (Mobile) in a randomized controlled trial (RCT), where the control group (Control) participated in the same measurements than the intervention group (Mobile) without any treatment (Lappalainen et al., 2014). It was hypothesized that work ability increase more (primary dependent variable) and stress (secondary dependent variable) decrease more in the mobile group as compared to the control group. It was further expected that psychological flexibility related to weight and mindfulness skills mediate the effects of the mobile intervention.

METHODS

Study design

This study was part of the SalWe Research Programme for Mind and Body which were enlisted participants by announcing in regional newspapers in Jyväskylä, Kuopio and Helsinki (Lappalainen et al., 2014.) A number of welfare agencies participated in the study. The ethics committee of the Central Finland Health Care District accepted the study and it registered with ClinicalTrials.gov with the identifier NCT01738256 (Lappalainen et al., 2014).

The first stage of the study was initiated in September 2012 and the second in January 2013. The study comprehended pre-measurements before the 8-week interventions, post-measurements 10 weeks after the pre-measurements, and follow-up measurements six months after the post measurements (36 weeks from pre-measurements). The final measurements were gathered in December 2013. The main research topics were to find out “the effect of three novel low intensity psychological interventions for metabolic syndrome risk factors, psychological flexibility and general well-being among obese individual experiencing stress” (Lappalainen et al., 2014, p. 3). Interventions were carried out with web-based CBT, mobile-based and Face-to-Face interventions. The control group was involved in the measurements without participation to different interventions (Lappalainen et al., 2014). This RCT-study is based on the same data as in the original programme (Figure 5).

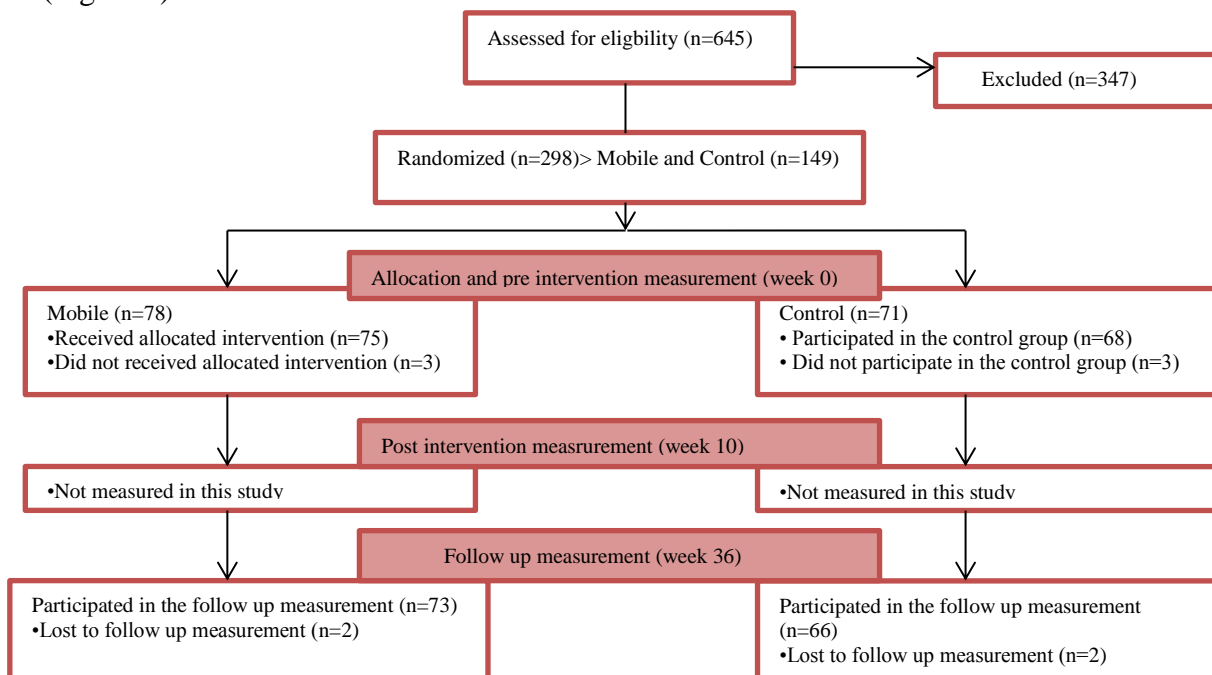


Figure 5 Flow chart of this study design based on the original programme by Lappalainen et al. (2014, p.4).

Study population

In this study 139 participants were filled inclusion criteria: Mobile (n=73; 17 males, 56 females) and Control (n=66; 7 males, 59 females). Participants were recruited based on two criteria: they were overweight/obese (Body Mass Index (BMI) 25-40 kg/m²) and expressed psychological stress symptoms (at least 3/12 points in General Health Questionnaire) (Lappalainen et al., 2014). Additionally, participants were required to use the computer with internet connection (Lappalainen et al., 2014). There were several precise exclusion criteria, as diagnosed severe chronic disease, severe psychiatric conditions or substance abuse (Lappalainen et al., 2014). Even shift work or night work and participation in other intervention studies at the same time were not allowed (Lappalainen et al., 2014). In this study, one of the main inclusion criteria was participating in both pre-intervention and follow-up measurement. Missing data (n=10-13) depending on the measurement at issue was mainly caused by dropouts: Mobile (n=5) and Control (n=4).

The participants in the Mobile-intervention were received a short review of Acceptance and Commitment Therapy (ACT) in a group meet (Lappalainen et al., 2014). At the same time, they also received pre-installed Android smartphones with a self-help application for mental well-being training called Oiva (Lappalainen et al., 2014). The participants were guided for usage of Oiva independently during following 8 weeks including brief activities that helped participants to implement ACT skills in everyday life (Lappalainen et al., 2014). Table 2 demonstrates more specific the main background information of the participants.

Table 2 Research participants' background information.

	Control		Mobile		Total	
	n=66	%	n=73	%	N=139	%
Gender						
Man	7	10,6	17	23,3	24	17,3
Woman	59	89,4	56	76,7	115	82,7
Age (classified)						
≤ 45 years	19	28,8	15	20,5	34	24,5
> 45- ≤ 55	30	45,4	42	57,5	72	51,8
> 55 years	17	25,8	16	22,0	33	23,7
Marital status						
Single	5	7,6	8	11,0	13	9,4
Married/Cohabiting	46	69,7	59	80,8	105	75,5
Separated/Divorced	14	21,2	6	8,2	20	14,4
Widow	1	1,5	-	-	1	0,7
Highest level of education						
College-level	26	39,4	25	34,2	51	36,7
Bachelor's degree	12	18,2	17	23,3	29	20,9
Master's degree	17	25,8	17	23,3	34	24,5
Other	11	16,6	14	19,2	25	17,9
Workmanship						
Desk job/service	49	74,2	57	78,1	106	76,3
Other	17	25,8	16	21,9	33	23,7
Research place						
Jyväskylä	13	19,7	16	21,9	29	20,9
Kuopio	21	31,8	27	37,0	48	34,5
Helsinki	32	48,5	30	41,1	62	44,6
BMI						
(BMI 25,00-29,99)	25	37,9	20	27,4	45	32,4
(BMI ≥ 30,00)	41	62,1	53	72,6	94	67,6

Oiva

Oiva-application was subdivided into four intervention paths: Mindful Mind, Wise Mind, Values, and Healthy Body (Table 3) (Lappalainen et al., 2014). Three previous determinate basic procedures of ACT and the last one connect ACT on physical welfare. Totally 46 training activities in a different form were included in Oiva. A healthy diet or physical activity was not current, but a link to a public nutritional website was added. Figure 6 demonstrates illustrations how to enter the main screen by (Figure 6a) flower-shaped menu to particular routes to use the application. Further, the main screen afforded to entry to a diary (Figure 6b), file to favoured practises and presentation to the application in text and audio formats (Figure 6c). Training was simple to accomplish anywhere. They lasted about 1 to 3 minutes to be performed (Figure 6e-h) and participants could decide to training by listening (Figure 6f) or by reading (Figure 6h). A reflection screen summed up the abilities adopted (Figure 6d) and diary (Figure 6b) provided for notes and reflections. The application recommended the next training (Figure 6a and d), but participants could decide themselves the order or even go back to earlier training (Lappalainen et al., 2014).

Table 3 Oiva-mobile intervention based on the original table (Lappalainen et al., 2014, p.8)

The path	The main idea	Practical application
1. Mindful mind	Practising awareness and attention by concentrating on internal and external knowledge.	Five mindfulness practises related to breathing, sitting, contact with sounds, everyday life and scanner
2. Wise mind	Recognizing patterns of thinking and allowing thoughts to go without hindering them.	Six observation practises: observer, bird's nest, leaves on the stream, terrier thoughts, the little man on the shoulders, thoughts about yourself
	Giving space for undesirable internal acquaintances and letting them arrive and leave	Four acceptance practises: jam donuts, tug of war, stone on the beach, broken automaton

	without fighting against them.	
3. Values	Reflecting own values to the present moment.	Seven values practises: life right now, obituary, the most important in the life, value ranges, half years to live, joys in your life
	Acting according to own values.	Seven acts practises: set a goal, your values according to the award, do it now, aware listening, important neighbour, the passengers on the buss, I can't do
4. Healthy body	Feel the serenity and peace of body and mind.	Six relaxation practises: warm-down breathing, loosen your grip, mountain, good halves of your body, rub the pain away, long relaxation
	Nourishment for the body, mind and heart.	Six mindful eating practises: conscious eating, who is hungry, unique food rhythm, eating value, bracketing challenges, conscious shopping
	Do good deeds for yourself.	Five physical activity: exercise value, steeplechase, brighten-up-stairs, joy of dance, force of nature



Figure 6 Screenshots of the mobile application. (a) main screen, (b) diary, (c) introduction video, (d) top menu of Mindful Mind, (e) exercise introduction screen, (f) audio exercise, (g) text exercise, (h) exercise reflection screen. (Lappalainen et al., 2014, p.9).

Measurements

In this study the interest laid on the pre-intervention measurement and follow-up measurement (Figure 5). The question was if the participants received progress during the intervention in the work ability (measured by the Work Ability Index; WAI and the Work Ability Score; WAS), the perceived stress (measured by The Perceived Stress Scale; PSS), mindfulness skills according to and Five Facet Mindfulness Questionnaire (FFMQ), psychological flexibility based on Acceptance and Action Questionnaire (AAQ-II) and the Acceptance and Action Questionnaire for Weight (AAQW), and in The Body Mass Index (BMI).

The primary measure was work ability measures by WAI and WAS. Work Ability Index (WAI; Rautio & Torsten, 2013; Tuomi & Oja, 1998) is a lifestyle-related questionnaire which estimates the work ability of individuals. WAI is the sum of the variable for the following areas: one's work ability related to one's lifetime best and to requirements of the work; identified by the number of medical illnesses which an individual suffers; self-evaluation how diseases and injuries worsen the current work; the number of sick leave days during last 12 months; own assessment of work ability in the next two years; and psychological resources. The score of work ability are 7-28 points (poor); 28-36 (moderate); 37-43 (good) and 44-49 points (excellent). Cronbach's alpha for WAI in this study was .80. The purpose for estimating work ability is to find what is required to maintain it. The Finnish Institute of Occupational Health (FIOH) developed WAI in the 1980' and since then WAI has used more frequently to measure work ability both at health inspections and at workplace studies in nearly 30 countries (Ilmarinen, 2013). Beside WAI the first item ("an individual's current work ability compared with their lifetime best") called Work Ability Score (WAS; El Fassi et al., 2013; Gould et al., 2008) is measured separately. The use of the WAS as the instrument is justified by the results of the Spearman correlation between WAS and WAI levels which was statistically significant ($r_s=0.677$, $p < 0.001$ at the week 0; $r_s=0.780$, $p<0.001$ at the week 36). The correlation level express more than satisfactory validity (van Saane, Sluiter, Verbeek, & Frings-Dresen, 2003) between WAI and WAS.

The following two measurements are psychological implemented with questionnaires. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) measures stressful situations in a person's life. The scale contains 14 questions about feelings and thoughts during the last month. The response alternatives are 0-4. Questions 4-7, 9-10 and 13 are scored in the reverse direction. The total score is ranging from 0 to 56. PSS is broadly extended method measuring psychological distress and it is available with 14- 10 -4 items (Carnegie Mellon University, 2015).

Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) is derived from a factor analytic study. The five facets of analysis are observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. These facets are the cornerstone of mindfulness as it is recognised. Questionnaire consists of 39 questions (for example, "I perceive my feelings and emotions without having to react to them", "I find it difficult to stay focused on what's happening in the present"). The scale for items varies from never or very rarely true to very often or always true including five scales. Cronbach's alpha for the sum of the variable for FFMQ was .70. FFMQ has been approved measurement, in particular, the case of adults with depression and anxiety (Bohlmeijer, ten Klooster, Fladderus, Veehof, & Baer, 2011).

Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011) and the Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW; Lillis & Hayes, 2008) have been developed to measure avoidance and inflexibility. Updated AAQ-II is a one-factor measure of psychological flexibility and acceptance including seven items ranging the total score from 7 to 49. Lower scores equal greater levels of psychological flexibility. AAQ-II is the most common used measure judging experiential avoidance (Lillis & Hayes, 2008). AAQ-W is constructed to measure acceptance of feelings (for example, "It's OK to feel fat"), defusion from thoughts (for example, "I try hard to avoid feeling bad about my weight or how I look") and the intensity which thoughts and feelings inhibit valued action concerning weight (for example, "When I have negative feelings, I use food to make myself feel better") (Lillis & Hayes, 2008, 32). 22 items enable the response alternatives 1-7. Questions 1, 6, 7, 14 and 18 are scored in the reverse direction. The range of scores is varied from 22 to 154. AAQ-W is the first measure constructed to estimate acceptance and flexibility in relation to weight-related thoughts and feelings (Lillis & Hayes, 2008).

The Body Mass Index (BMI) is a broadly spread clinical and biochemical measure which is counted based on the mass and height (WHO, 2015).

Statistical analysis

Data was analysed applying the IBM SPSS statistics version 20.0. The Mann-Whitney test, the non-parametric equivalent of the independent samples t-test, was conducted to measure the effects of the intervention of the Work Ability Index, the Work Ability Score and the Perceived Stress Scale for Control and Mobile groups. The effect size of intervention was estimated with Cohen's d : "small, $d = .2$," "medium, $d = .5$," and "large, $d = .8$ " (Cohen, 1988). The test was sought from <http://www.uccs.edu/~lbecker/>. Further, we were interested in whether psychological flexibility related to weight and mindfulness skills mediate the effects of the mobile intervention and these were analysed using a single-step multiple mediator model.

RESULTS

Effects of the Mobile intervention

Table 4 presents the pre-measurement and the follow-up measurement including means, standard deviations and confidence intervals for all the measurements which were under reviewing in this study. The changes during the intervention were calculated for all participants who participated both in pre- and follow-up measurement.

Table 4 Pre-measurements and follow-up measurements for the groups with the indicators including M = mean; SD = standard deviation; CI = Confidence Interval.

	Pre-measurement		Follow-up measurement	
	Control <i>n</i> =66-64**	Mobile <i>n</i> =73-72*	Control <i>n</i> =66-64**	Mobile <i>n</i> =73-72*
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
	<i>CI</i>	<i>CI</i>	<i>CI</i>	<i>CI</i>
WAI (n=139)	33.60 (6.7)	33.8 (5.6)	35.30 (7.2)	36.20 (6.7)

	32.0;35.2	32.5;35.2	33.5;37.1	34.7;37.8
•WAS =	6.5 (1.6)	6.6 (1.5)	6.9 (2.0)	7.3 (1.8)
Current work ability	6.1;6.9	6.3;6.9	6.4;7.3	6.9;7.7
•"Demands"	6.5 (1.4) 6.1;6.8	6.7 (1.3) 6.4;7.0	7.2 (1.5) 6.8;7.5	7.5 (1.7) 7.1;7.8
•"Illnesses"	4.6 (2.9) 4.2;5.0	4.4 (1.7) 4.1;4.8	4.6 (2.9) 4.2;5.0	4.4 (1.7) 4.1;4.8
•"Estimated impairment"	4.7 (1.4) 4.4;5.0	5.0 (1.1) 4.7;5.2	4.8 (1.3) 4.5;5.1	5.0 (1.2) 4.8;5.3
•"Sick-leave"	3.8 (1.2) 3.5;4.0	3.6 (1.0) 3.4;3.9	3.8 (1.1) 3.6;4.1	3.7 (1.0) 3.5;4.0
•"Own prognosis"	6.1 (1.6) 5.8;6.5	6.1 (1.6) 5.7;6.4	6.2 (1.6) 5.8;6.6	6.3(1.6) 5.9;6.7
•"Mental resources"	1.4 (.61) 1.3;1.6	1.5 (.58) 1.3;1.6	1.8(.74) 1.6;2.0	2.0 (.70) 1.9;2.2
PSS (n=137**)	26.80 (7.8) 24.8;28.8	26.60 (7.9) 24.8;28.5	23.60 (9.4) 21.3;26.0	21.90 (8.8) 19.9;23.9
FFMQ (n=137**)	130.6 (21.2) 124.9;135.4	132.2 (19.8) 127.8;136.7	133.9 (19.7) 129.0;138.8	139.8 (21.9) 134.7;145.0
•Observing	25.9 (5.3) 24.6;27.2	26.1 (6.5) 24.9;27.3	26.5 (5.3) 25.2;27.2	27.3 (6.5) 25.8;28.9
•Describing	30.0 (6.5) 28.3;31.7	29.8 (7.0) 28.2;31.4	30.3 (6.5) 28.7;32.0	30.3 (7.0) 28.7;31.9
•Awareness	25.1 (6.0) 23.6;26.6	25.6 (7.0) 24.3;26.9	25.4 (6.0) 23.9;26.9	27.2 (6.7) 25.6;28.7
•Non-judging	27.7 (7.4) 25.8;29.5	28.6 (5.5) 27.1;30.0	29.1 (7.4) 27.2;30.9	31.6 (5.5) 30.3;32.9
•Non- reactivity	21.5 (5.0) 20.1;22.9	22.1 (5.3) 20.9;23.3	22.6 (5.0) 21.3;23.8	23.5 (5.3) 22.2;24.7
AAQ-II (n=137**)	21.7 (9.1) 19.4;24.0	20.00 (9.1) 17.9;22.2	19.4 (9.1) 17.1;21.7	16.1 (8.6) 14.1;18.1

AAQW	88.1 (20.8)	87.9 (21.2)	83.9 (23.0)	80.4 (22.8)
(n=136*)	82.9;93.3	83.0;92.9	78.2;89.7	75.0;85.7
BMI (n=138)*	31.2 (2.9)	31.5 (2.7)	30.9 (3.1)	31.1 (3.0)
	30.5;31.9	30.9;32.2	30.2;31.7	30.4;31.8
• BMI 25,00-29,99 (n=26; n=29)	28.5(1.2)	29.2 (2.0)	27.9 (1.3)	28.2 (1.2)
	28.0;29.0	28.5;30.0	27.4;28.4	27.7;28.6
•BMI ≥30,00 (n=40; n=43)	32.8 (2.3)	33.1 (2.0)	32.8 (2.2)	33.1 (2.0)
	32.1;33.6	32.5;33.7	32.1;33.5	32.5;33.7

Due to the normality assumption was disrupted, we continued viewing work ability and perceived stress with Mann-Whitney –test. In the Mobile group both WAI and WAS increased on the average slightly more than in the Control group (Figures 7 and 8) (changes in WAI: $Md= 2.5$ score, $n=72$ vs. $Md=1.8$, $n=66$ and changes in WAS: $Md=1.0$ score, $n=72$ vs. $Md=0.00$, $n=66$). However, in Mann-Whitney –test differences were not statistically significant, WAI: $Z =-.908$, $p =.364$ and WAS: $Z =-1.294$, $p =.196$. PSS scores decreased more in the Mobile than in the Control group (Figure 9) (changes in PSS $Md=4.0$ score, $n=73$ vs. $Md=3.0$, $n=64$; $Z=-1.235$, $p=.217$), but differences were neither statistically significant. Therefore, we fail to reject the hypothesis that work ability increase more and stress decrease more in the mobile group as compared to the control group. Further, Cohen’s effect size in The Work Ability Index ($d=.13$), The Work Ability Score ($d=.16$) and in The Perceived Stress Scale ($d=.29$) suggested small difference between the groups as measured by ES (suggesting low practical significance).

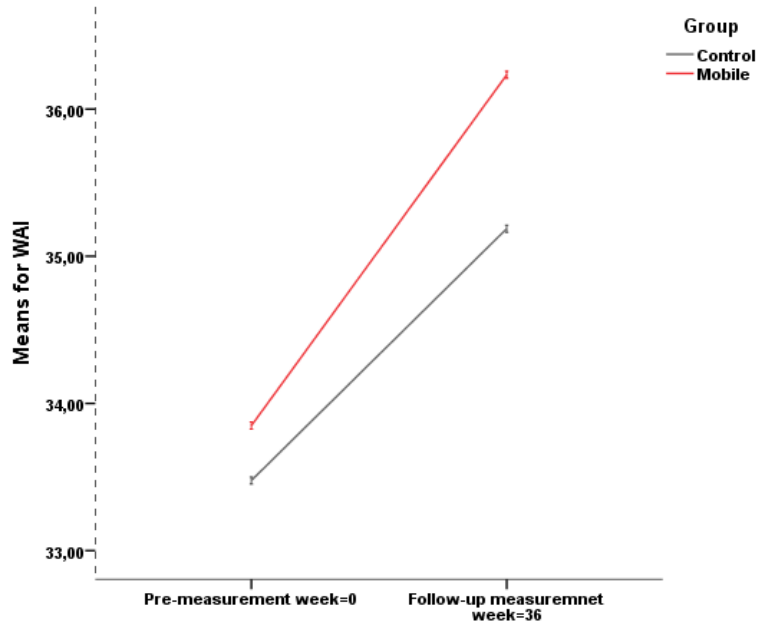


Figure 7 The overall score of Work Ability Index (WAI) for Control and Mobile groups.

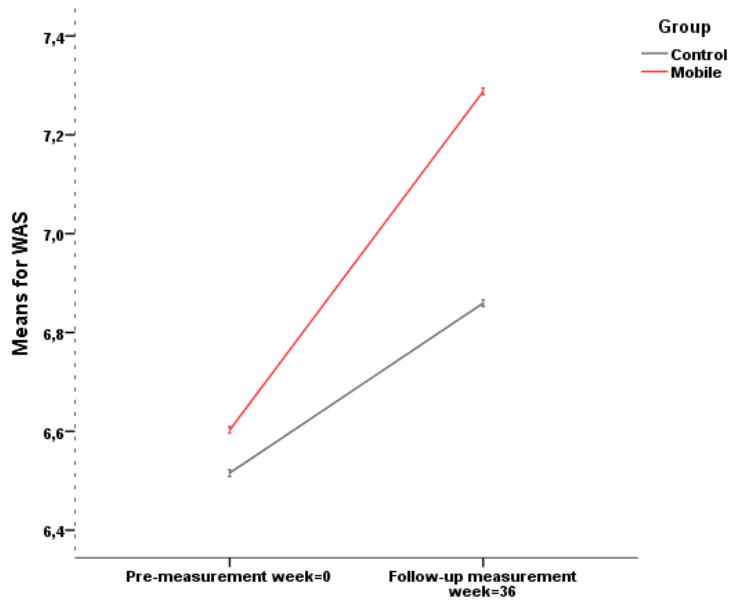


Figure 8 The overall score of Work Ability Score (WAS) for Control and Mobile groups.

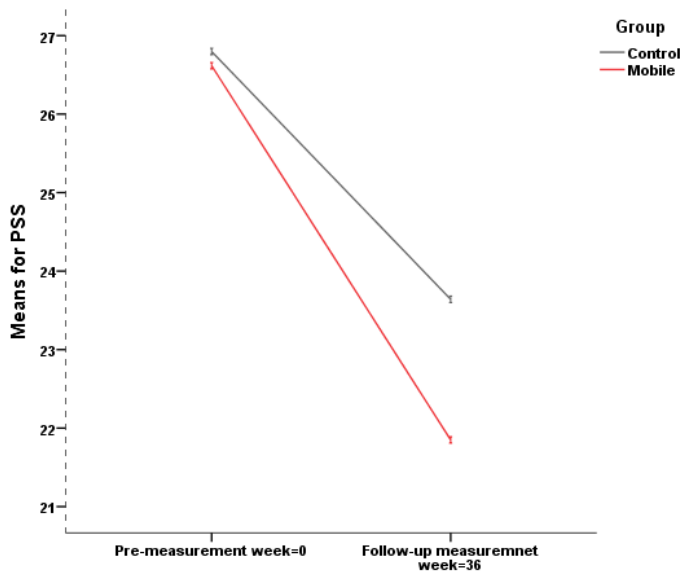


Figure 9 The overall score of Perceived Stress Scale (PSS) for Control and Mobile groups.

Looking groups more detailed based on background information it was found some significant differences for the groups “Slight overweight” (BMI 25,00-29,99 kg/m²) with WAI and WAS, but not with PSS. Thus, further analyses for the groups “Slight overweight” were carried out only with the primary measure, work ability, measured by WAI and WAS. Table 5 presents the pre-measurement and the follow-up measurement including means, standard deviations and confidence intervals for the “Slight overweight” groups. The changes during the intervention were calculated for all participants who participated both in pre- and follow-up measurement.

Table 5 Pre-measurements and follow-up measurements of The Work Ability Index (WAI) and The Work Ability Score (WAS) for the “Slight Overweight” groups with the indicators including M = mean; SD = standard deviation; CI = Confidence Interval.

Pre-measurement		Follow-up measurement	
Control	Mobile	Control	Mobile
n=25	n=21	n=26	n=29

	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
	<i>CI</i>	<i>CI</i>	<i>CI</i>	<i>CI</i>
WAI	34.5 (5.5)	32.3 (6.4)	35.8 (6.5)	37.4 (5.4)
	32.2;36.8	29.4;35.2	33.1;38.4	35.3;39.4
WAS	6.5 (1.6)	6.1 (2.0)	6.7 (2.1)	7.7 (1.1)
	5.9;7.2	5.2;6.9	5.9;7.6	7.3;8.1

When investigating the changes in the “Slight Overweight” group it was observed that The Work Ability Index (WAI; Mobile, $Md=3.5$, $n=29$; Control, $Md=1.8$, $n=26$, $Z=-2.143$, $p=.032$) and the Work Ability Score (WAS; Mobile, $Md=1.0$, $n=29$, Control, $Md=0.0$, $n=26$, $Z=-2.725$, $p=.006$) changed significantly more in the Mobile intervention than in the control group. The effect for the group “Slight overweight” both in WAI and WAS were moderate: Cohen’s effect size was for The Work Ability Index ($d=.71$) and The Work Ability Score ($d=0.79$). Figures 10-11 reveal the trend in the groups “Slight overweight” (based on the sample sizes on the follow-up measurement, Control, $n=26$; Mobile $n=29$).

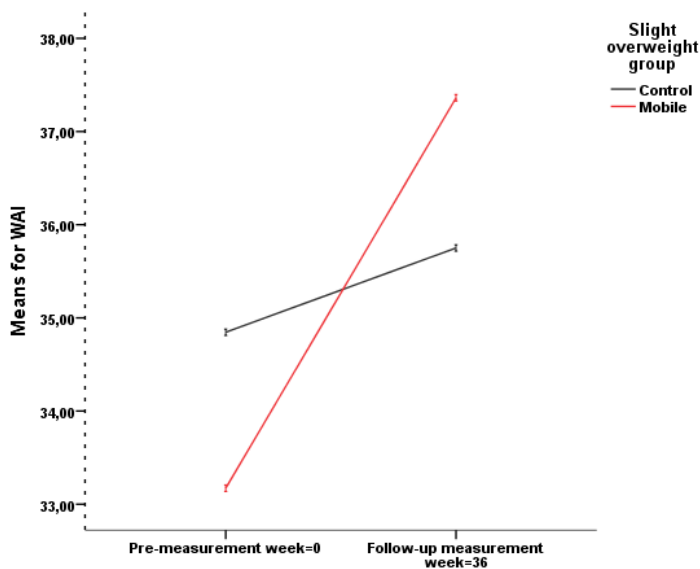


Figure 10 The overall score of Work Ability Index (WAI) for Control and Mobile groups in slight overweight

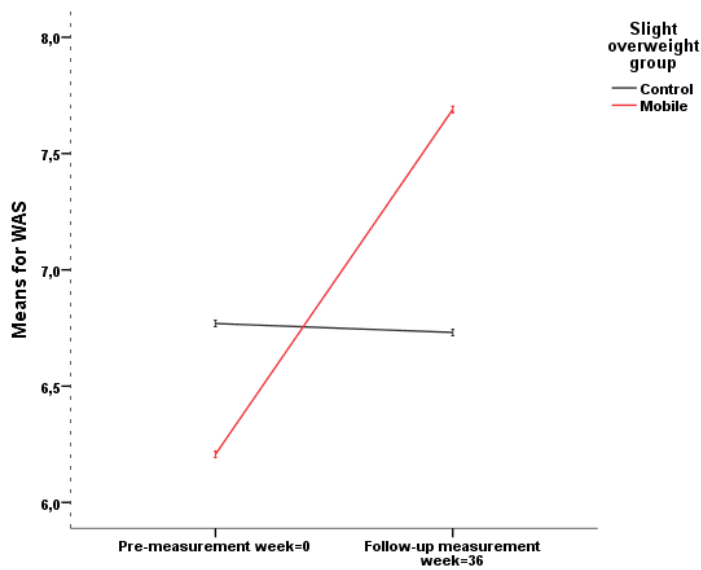
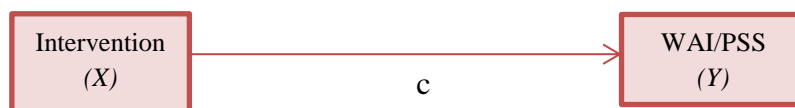


Figure 11 The overall score of Work Ability Score (WAS) for Control and Mobile groups in slight overweight

Meditational analyses

Further, it was studied whether psychological flexibility related to WAI and PSS mediate the effects of the mobile intervention. Psychological flexibility was measured with the AAQ-II and the AAQW. The measures correlated significantly with each other ($rs=.0.549$, $p<.001$ at the week 0; $rs=0.546$, $p<.001$ at the week 36). Therefore, the AAQ-II and the AAQW were both tested as a mediator of work ability and perceived stress using a single-step multiple mediator model with one proposed mediator at once (AAQ-II or AAQW) (Figure 12). This model is used for estimating total indirect and specific indirect effects, and bootstrap confidence intervals (Hayes, Preacher, & Myers, 2011).



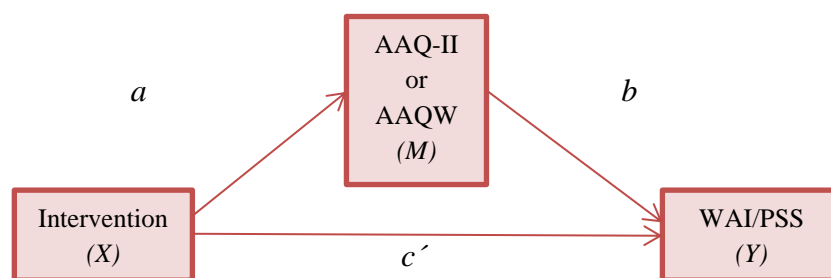


Figure 12 A single-step multiple mediator model with one proposed mediator (Hayes et al., 2011, p.442).

The indirect effects of intervention group on Work Ability Index (WAI) and Perceived Stress Scale (PSS) were estimated as the effect of intervention group on the change of psychological flexibility (AAQ-II or AAQW) (a) and the change of psychological flexibility on WAI/PSS (b). The effect of intervention group on psychological flexibility (a) was significant only with AAQ-II as the mediator, whereas the effect of psychological flexibility (b) on WAI/PSS was found to be significant with both AAQ-II and AAQW as the mediator (see Figure 12 and Tables 6 and 7). The path ab for WAI and PSS were significant for AAQ-II (but not for AAQW). When the path ab was taken into account, the c' path was no longer significant for AAQ-II. The results of bootstrap confidence intervals revealed that we fail to reject the hypothesis that psychological flexibility (AAQW) related to work ability and perceived stress mediates the effects of the mobile intervention. However, the hypothesis was confirmed that psychological flexibility measuring with AAQ-II related to work ability and perceived stress mediates the effects of the mobile intervention.

In further analyses the effect of the intervention group of “Slight Overweight” on psychological flexibility (a) was significant both with AAQ-II and AAQW as the mediator as well as the effect of psychological flexibility (b) on work ability was found to be significant with both AAQ-II and AAQW as the mediator. Among the slight overweight participants, both AAQ-II and AAQW mediated the effect of the intervention since when the ab path was included in the analyses, the effect of intervention was no longer significant (path c'). One way to interpret how psychological flexibility (AAQ-II or AAQW) related to work ability mediates the effects of the mobile intervention is to count the ratio of the indirect effect to the total effect, i.e., ab/c (Hayes et al., 2011, p.441). E.g. psychological flexibility (AAQ-II) related to work ability was $1.48567/2.0396=0.72841$. Thus, 73% of the total effect of intervention group on work ability (WAI)

is caused by its indirect effect through psychological flexibility (Table 8). More detailed results in Tables 6-8.

Table 6 Path coefficients from the models (with WAI as the dependent variable) estimated using INDIRECT (Hayes et al., 2011). Standard errors can be read in parentheses.

Dependent	WAI week 36	
Independent	Intervention	
Mediator	AAQ week 36	
Sample size	137	136
a	-3.3515* (1.5109)	-3.5315 (3.9365)
b	-.3448*** (.0614)	-.1173*** (.0241)
c'	-.1101 (1.0965)	.4679 (1.1023)
c	1.0454 (1.1928)	.8819 (1.1882)
ab	Boot (95% BCA bootstrap confidence interval)	Boot (95% BCA bootstrap confidence interval)
AAQ	1.1326 (.1898;2.5545)	AAQW .4094 (-.4268;1.5039)

+ $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

Table 7 Path coefficients from the models (with PSS as the dependent variable) estimated using INDIRECT (Hayes et al., 2011). Standard errors can be read in parentheses.

Dependent	PSS week 36	PSS week 36
Independent	Intervention	Intervention
Mediator	AAQ week 36	AAQW week 36
Sample size	137	136
a	-3.3515* (1.5109)	-3.5315 (3.9365)
b	-.7354*** (.0620)	.1981*** (.0298)
c'	.6735 (1.1077)	-1.0523 (1.3633)
c	-1.7913 (1.5523)	-1.7517 (1.5626)
ab	Boot (95% BCA bootstrap confidence interval)	Boot (95% BCA bootstrap confidence interval)
AAQ	-2.4480 (-4.7620;-.3288)	AAQW -0.7127 (-2.4016; .7667)

+ $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

Table 8 Path coefficients from the models (with WAI as the dependent variable, “Slight overweight” as the independent) estimated using INDIRECT (Hayes et al., 2011). Standard errors can be read in parentheses.

Dependent	WAI week 36	WAI week 36
Independent	Intervention	Intervention
Mediator	AAQ week 36	AAQW week 36
Sample size	136	135
a	-4.3568* (1.8457)	-11.7602* (4.7244)
b	-.3410*** (.0617)	-.1149*** (.0247)

c'	.5539 (1.3460)		.8078 (1.3756)
c	2.0356 (1.4569)		2.1592 (1.4454)
ab	Boot (95% BCA bootstrap confidence interval)		Boot (95% BCA bootstrap confidence interval)
AAQ	1.4839 (.4701;2.9150)	AAQW	1.3486 (.4320;2.8032)

+ $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

DISCUSSION

The aim of the study

The aim of this study was to explore whether the mobile intervention had the effect on work ability among obese or overweight participants struggling with stress examining mobile-based intervention including mindfulness, acceptance and value-based exercises (Mobile) in a randomized controlled trial (RCT), where the control group (Control, $n=66$) participated in the same measurements than the intervention group (Mobile, $n=73$) without any treatment. There was a tendency that work ability increased more and stress decreased more in the mobile group as compared to the control group, but the difference in change was not statistically significant. AAQ-II related to work ability and perceived stress mediated the effects of the mobile intervention, but AAQW did not mediate the effects of the mobile intervention. The further analysis showed in the mobile group of “Slight overweight” (BMI 25, 00-29, 99) that work ability increased more in the mobile group compared with the control group and the difference in change was statistically significant. In the mobile group of “Slight overweight”, even the effect of mobile intervention for the Work Ability (WAI) was mediated by psychological flexibility (AAQ and AAQW).

The primary measure was work ability measured by WAI and WAS. In this study, WAS turned out to be the more useful measurement of these two. The results of the primary measure (WAI and

WAS) are ground-breaking in connection with Acceptance and Commitment Therapy, because neither WAI or WAS has hardly been studied in the past in relation to self-help e-Health including mHealth.

Previous RCT-studies with ACT has already confirmed that self-help programmes are effective forms in psychotherapy (Brinkborg et al., 2011; Buhrman et al., 2013; Hesser et al., 2012; Lappalainen et al., 2013; Lin et al., 2014; Ly et al., 2014). Clients who have used ACT show relief in many chronic conditions (Fiordelli et al., 2013) and stress symptoms including perceived stress (Brinkborg, 2011). Even Oiva has received successful study results for stress management among working-age population in earlier studies (Ahtinen et al., 2013). In this study, especially mobile intervention group of “Slight overweight” improved even their work ability. This is a new discovery. Although work ability has studied fluently since 1980’s (Ilmarinen, 2009) there has not been found sufficient cost-effective and effective method promoting work ability. On the contrary, the latest studies revealed that more than one of the four of working age experienced that their work ability has impaired (Kaikkonen et al., 2014). In this study, the mobile group of “Slight overweight” respectively improved their work ability from moderate to good. Comparing previous studies and this study is not unambiguous. In this study, the study population differed measurably in their BMI (the most of the study population had significant overweight ($BMI \geq 30,00$) compared to the average Finnish working-age people (men 26,9 kg/m²; women 25,9 kg/m²)) (Männistö et al., 2015). Even in the mobile group of “Slight overweight” BMI was clearly higher (28,2 kg/m² in the follow-up measurement) (Table 4) compared with the average Finnish working-age people (Männistö et al., 2015). However, this fact strengthens the study results in the mobile group of “Slight overweight” and reveals that Oiva made the grade in this study. Although the study was not able to confirm earlier studies (Brinkborg et al., 2011) concerning the secondary measure, the changes observed in the Perceived Stress Scale (PSS) were encouraging.

Limitations and strengths

This study has several deficiencies that need to be acknowledged. First, the study was enlisted participants by announcing in regional newspapers enhancing potentiality that the motivation of participants was higher than choosing participants in the other way (Lappalainen et al., 2014). Second, the control group, as well as the intervention group, may have benefited from the broad

amount of measurements and repeated assessment processes (Lappalainen et al., 2014). The results in the follow-up measurement were not improved only in the intervention group, but also in the Control group. Moreover, demographic variables were not evenly distributed in between nor in within groups weakening possibilities to compare several demographic variables (Table 2) (Kendall, 2003). For the same reason, the study results impair the generalizability of the study (Kendall, 2003). The facts that the study ignored the post-intervention measurement and did not reveal how often the participants of the mobile group used Oiva should also be taken into account. In addition, work ability was measured only by a questionnaire.

Alongside deficiencies, this study has several strengths. An RCT-study designed including follow-up measurement was used (Lappalainen et al., 2014). The randomised controlled trial is evaluated as the most uncompromising method of deciding whether an intervention has an effect on its outcome (Kendall, 2003). The study was able to conclude with low missing data (Dong & Peng, 2013) which was only 7-9%; 10-13/149) and it was mainly caused by dropouts (Mobile, n=5; Control, n=4). Therefore, it was justified to use the listwise in spite of its bad reputation (Dong & Pang, 2013). One of the strengths of the study was the measurements. All the measurements used in this study are reliable and widely used. This study presents also the advanced expertise of the psychological adjustment mechanisms linked with self-help, brief-therapy programs and their results (Lappalainen et al., 2014).

Future research

We need further research if Oiva could empower wellbeing and work ability at the workplaces and especially working-age people in risk groups (low-paid workers, workers before retirement and workers who are living outside growth centres) (Kaikkonen et al., 2014; Saarsalmi et al., 2014). In addition, other work-related measurements alongside WAI and WAS should be included to investigate the effects of Oiva among working people.

Clinical implications

Oiva appeared to be an effective tool to increase work ability among the risk group developing obesity (BMI under 30,00kg/m²) and with psychological stress. When it is known that the average BMI for the Finnish person at the working age is at the risk zone (BMI 25-30kg/m²) (Männistö et al., 2014) and at least every fourth of them struggles with stress (EU-OSHA, 2014), it can be inferred that many workers would benefit from the use of Oiva. It needs to be emphasized that although perceived stress did not decrease significantly, stress reduction (PSS) from almost 27, 00 to fewer than 22, 00 scores is not worthless. One of the main ideas in ACT is that small steps toward the desired direction lead to the improved outcome (Strosahl, Robinson, & Gustavsson, 2012).

The intervention could be further developed to improve work ability among workers, by implementing the intervention as part of well-being program for the occupational health care agencies and at the workplaces. Especially the risk groups concerning work ability should be offered the opportunity to use Oiva. Oiva is user-friendly, cost-effective, anonym and deliver specialized therapy available to anybody at any time. In addition, regular personal contact and support could promote to maintain and improve work ability among the working-age with obesity.

Main conclusions

We can conclude that Mobile intervention based on Acceptance and Commitment Therapy (ACT) had an effect on work ability and psychological flexibility mediated the effects of the intervention in the group of "Slight Overweight". We hope that future research will reveal if Oiva could provide the missing piece to strengthen work ability among workers.

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