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**MOBILE GUIDED RELAXATION INTERVENTION IN REDUCING  
YOUNG ADULTS' PERCEIVED MENTAL AND BODILY  
STRESS, AND USER-EVALUATED EFFICACY OF THE  
DIGITAL MENTAL HEALTH TOOL**

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Abstract Background: Studies report that young adults are riddled with stress caused by the modern world. Trying to balance work and home life is increasingly stressful due to the "online-ness" of the current times. New cost and resource effective, scalable solutions must be researched in order to stop the stress becoming an epidemic and affecting the young generation of workforce. The possible effects of a large-scale burn-out or stress crisis can have significant repercussions on the economy, even on a global scale. Method: Young adults (N=7) were recruited to participate in a seven-day mobile mental health (Oiva-application) intervention including a guided relaxation for 15minutes per day. The participant perceived mental (PSS-10) and perceived bodily stress levels were observed before and after the intervention (N=5) and analyzed for any statistical differences in perceived levels of stress (bodily or mental). The experiment was conducted as a quasi-experiment.; sample size was small and no control group was not used, instead the participants acted as their own baseline (repeated measures). A user experience questionnaire was also used to evaluate the perceived viability and effectiveness of the intervention and method by the participants. Results: The research found a strongly significant stress-reducing effect of the Oiva mobile intervention for two of the participants in both the PSS-10 (perceived stress scale) survey and within the perceived bodily stress survey results. These participants had elevated stress-levels prior to participating to the intervention and managed to significantly lower their levels due to the intervention. However, it was observed that for those participants whose starting levels of perceived mental and bodily stress were low, the intervention increased stress, or stress remained at starting level. User feedback was also analyzed. Conclusion: It was demonstrated that digital tools for mental health, and in this case, stress, can be influential scalable tools that have the potential to save in resources if used, for example, in public health. Still, more studies are needed to evaluate which groups would benefit from these types of interventions. The results indicate that using mobile applications just for the sake of it, can work against the participants' mental health and induce unwanted stress rather than reduce it. For these persons, to upkeep the lower levels of stress, it would be advantageous to study whether they would benefit more from non-technological interventions, such as silent retreats, or a different type of a digital mental health application approach, such as Virtual Reality.		
Key words mobile mental health intervention, digital health care tools, guided relaxation, user experience, Oiva mobile application, mental health, stress		

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# 1 INTRODUCTION

## 1.1 What is stress and why are stress levels on an upward trend?

Stress and anxiety are on the rise as the world seems to be aware and awake around the clock. A lot of work, services and goods are within an effortless reach of a phone call away, or available on internet, at any time. Therefore, so are also endless distractions, including social media and entertainment that can have detrimental effects on especially younger people (Bharucha 2018, Kim 2017). Consequently, many workplaces suffer from blurred lines between work and leisure time due to the easy reachability of others, and the constant connectedness that follows (Mellner 2016). This digitalization, among other things, has led to a huge rise in stress and anxiety levels of the general population (Coldwell 2019).

Hans Selye, in 1963, first described stress as “the non-specific response of the body to any demand for change”. Selye was involved in multiple laboratory animal tests and concluded that a small and intermittent amount of stress causes a good arousal in the body, but if exposed to constant high-level stress, quite the contrary to the smaller intermittent doses, that is much more detrimental. He went on to connect the linkage between these results to those of humans, citing stress causing animals and humans alike heart disease and other chronic conditions. Selye had to subsequently clarify that not all stress is bad in humans either, but that good stress can be a good platform for productivity – until the stress reaches a certain, more detrimental, level. See further on Figure 1. to illustrate this. (The American Institute of Stress 2019, Selye 1979).

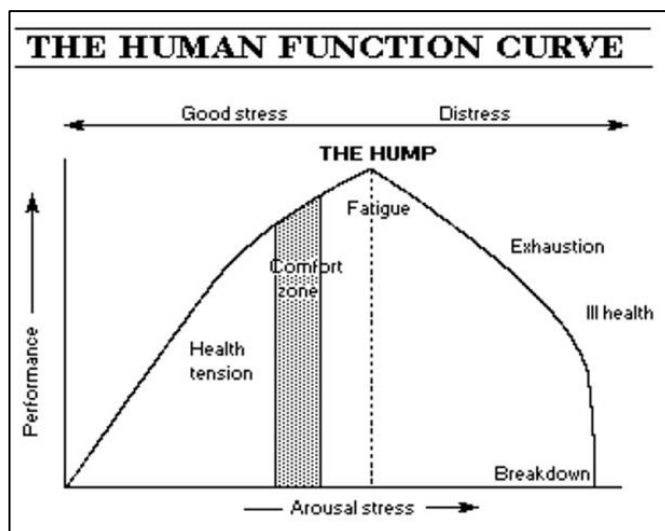


Figure 1. The human function curve (Nixon, 1979).

But why do the stress levels seem to be going up in the current time? To think about this, it is helpful to turn slightly back in time. Our predecessors lived their lives in a very different way from humans today. They followed their circadian rhythms; they were active when it was light and calmed down, relaxed and slept when it got dark. But since the Industrial Revolution(s), this has all slowly changed, and is changing still (Obschonka, 2018, Coldwell 2019, Pathak et al. 2019). Even worse, in the last few decades, the constant blue light of modern-day devices and distractions from technology carry their own burden on human bodies (Hatori 2017). The circadian rhythm of people suffers, and so do the signals in the bodies which leads them to feeling unwell, crippled with sleep problems, stress, anxiety and depression to name a few (Hatori 2017). This has been partly blamed also for the “chronic illness crisis” in the current age (Rook 2013).

Whatever the causes for this era’s stress really are, the levels are factually going up. For example, the (UK) Mental Health Foundation reports of a poll conducted in the United Kingdom, with a sample size of 4619, which is the largest known study to investigate stress levels within the population of the United Kingdom. The results were staggering; “In the past year, 74% of people have felt so stressed they have been overwhelmed or unable to cope.” within the adolescents and young adults. The distribution of the causes of the stressors varied, but main players were high levels of stress (49%) with adolescents comparing themselves with others (18-24 year olds), 36-44% of high stress due to health related worries and high levels of stress (60%) due to pressure to

succeed within adolescents and young adults (18-34 year olds). (Mental Health Foundation, 2018).

## 1.2 Millennials generation especially struck by stress

Reports especially on young adults, Millennials, those born in the 1980s, 1990s or early 2000s (Cambridge Dictionary, 2019), suggest that the mental (and physical) health crisis in them may be so drastic, that a noteworthy (40%) part of the Millennials are more likely to die earlier than their preceding generation, the population born before 1980s (the Generation X), unless measures are taken to concentrate on the issues that are causing the Millennials' mental, and other, health problems (Blue Cross Blue Shield, 2019). Blue Cross Blue Shield Association (The Health of America), concluded, based on information from 25 studies conducted within Millennials in 2017 and therefore data gathered from 55 million health insurance claims of Millennials, that a significant increase in the top health affecting conditions within their generation are mental health and drug linked, such as hyperactivity (29%), major depression (31%) other endocrine conditions (22%) and substance abuse (10%) (Blue Cross Blue Shield, 2019). This is significant as these changes in the Millennials are occurring in such speed that it is considered abnormal and has been quoted as a "health shock" of the current time. The study, however, is unable to pinpoint the exact cause of this change but speculate less assets and increased debt as possible reasons that are a cause of stress in Millennials.

The above is significant, and the findings are not unique. There are also several other studies to reconfirm the Millennials more fragile state of mind to their predecessors. Multiple studies such as Twenge et al (2019), where results were based on 600 000 survey results, have drawn conclusions that millennials suffer from anxiety, stress and other mental health issues at a much higher rate than those who have preceded them. Twenge et al (2019) concluded that mental health disorders have been on a significant rise within young adults in the last decade, and the similar upward trend is not visible in the older generations - if anything the feelings of psychological distress even lowered in adults aged 65 and over, suggesting there is something specific affecting only the younger generations' mental health (this includes a rise in suicide attempts in the

younger generation). Twenge et al (2019) go on further to say that digital advancements, and social media, are behind this change and that young adults communicate and see the world differently to their preceding generations due to digital connectedness (Twenge et al. 2019). Also, Millennial global mobility and moving further away from family, for example, to study, may be instilling too much independence in young people who would need more mental health support to create better high stress tolerance while trying to navigate life when growing up and in high change circumstances, such as moving away to attend school away from their regular friends and family (Bland et al., 2012).

The constant “online-ness”, or digital connectedness, as described above too, has been shown to cause mental health problems. Social media stress was highlighted, for example, by the Tarafdar et al. (2019) research. They conducted a study that found Facebook users experiencing both distraction from stress as well as induction of stress by the same social media platform (i.e. Facebook) due to its various features, practically meaning that the Facebook platform was the root of some of the users’ problems as well as the answer to those same problems, likely causing the user to ultimately getting addicted to the platform. In addition, cyber-bullying and online harassment are also relatively new topics affecting social media users’ mental health with at least four out of ten American’s reporting to have personally experienced it and 62% consider it a large-scale problem causing wide-ranging emotional stress (Pew Research Center, 2019).

Due to the above reasons, and others not even listed here, there have been calls to increase mental health support within the Millennials (as well as other younger generations), or otherwise Millennials’ health care costs and overall effect on the global economy could be drastic and some have even labelled the current situation as a pre-crisis state (Welltok, 2019). This is further underlined by the Millennials’ own requests of workplaces providing more well-being and health services for them in order to cope with the pressures of work and the modern-day, perhaps quite mentally consuming and demanding, lifestyle (Kuehner-Hebert 2019, Welltok 2019).

Though the image painted above seems bleak, there is also some positive news emerging. And parts of the digitalization, technology and “online-ness” have also been harvested in the use for good. If Millennials are not able to turn off the mobile world to reduce their stress and anxiety, why not use it to their advantage and create digital tools for safeguarding mental health? Looking after the mental health of millions of people is costly, and with digital applications the scalability potential in reference to its costs is a strong advantage point to digital tools. Many companies have already done exactly this and benefited from the gap in the market to help people navigate the hustle and bustle of the modern world. For example, pedometers, personalized health applications summarizing data, and so on, have all been developed based on the perceived need by various users (Higgings 2016). Recognizing the growing want for; mobile mental health, anxiety reduction, better focus and enjoying the moment, the current market has been awake. It has clearly identified the need for multiple types of digital applications in recent years and services around mental health, overall calming, reducing anxiety, de-stressing, meditation and mindfulness, to name a few, and it seems to be there is a definite need for it, as overviewed above.

### 1.3 Could digital mental health tools be a part of the solution to tackle stress amongst young adults?

For the purpose of the current research, the focus was given on digital self-help for stress and anxiety relief in Millennials. And why Millennials? For example, in the US alone, the share of Millennials in the work force is 35% which equals to one in three people (Welltok 2019) and it is the largest generation to currently live in the United States. These are working aged people who need to be carefully considered so that their workplace and/or personal life stress, or other mental health affecting issues, do not have a larger than necessary impact on public health or economy. Also, for example in Finland, young adult non-employment is related to mental health and behavioural issues in almost 80% of the time (SUPPORT! Project, 2019).

Should the digital self-help methods and tools be categorized as effective, then perhaps there is a potential opportunity to reach a wider group of people with scalable (i.e. digital mobile) mental health services, even on a preventative basis, for mental health



management, not to mention a cost reduction potential as the digitalization reduces the “real hands on deck” -need in times when resources are scarce or widely limited. The likely positive sides of such revolution could be far reaching and most certainly fitting with the age we live in.

One example of a ‘free for all’ -application for improving one’s mental health, especially relieving anxiety and stress, is a Finnish invention: the ‘Oiva’ -application. Oiva provides free of charge services to anyone via its web pages and its ‘Oiva’-mobile application. Oiva is also associated with the Finnish Mental Health Association (Suomen Mielenterveys Ry Mieli) and Veikkaus, and it was created in association and collaboration with VTT Technical Research Centre of Finland Ltd, Headsted and University of Jyväskylä (Finland). (Oiva, 2019).

In this research, the purpose of including the Oiva-mobile application is to offer the participants a daily “time out”, a moment in time where they can leave their worries and thoughts behind, and in the stillness reflect on their feelings (bodily or mental) and sensations through a guided relaxation via the Oiva-application – effectively attempting shutting the outside world and its stressors out of mind for the time of the task. The expectation is that in doing so, the participants would be able to decrease their stress and anxiety levels. The purpose of the current research is also to investigate the efficacy of digital tools in managing the millennials’ stress and anxiety from the users’ perspective.

## 2 THEORETICAL BASIS AND FRAMEWORK

### 2.1 Millennial stress and anxiety

By some, modern living could be described as freeing with its digital revolution and by default, the whole world seeming smaller, more reachable and connected. However, modern living can also be very consuming and contributes to many external stressors as outlined earlier. This change has been radically felt by a large share of the young

adults, Millennials, who grew up with the digitalization of their surroundings. A poll conducted by the Priory Group in the UK, summarized that the young adults are the ones feeling most of the modern-day stress, and as a consequence even suggested the idea of a quarter life crisis usually manifesting sometime between the ages of 25-35 years, but often clustering at around 30 (Priory Group 2019). In particular, the Millennials find it hard to switch off after the workday, feel lack of control and inability to control stress that rise due to their work (Priory Group 2019).

### 2.1.1 Millennial life management

Due to the increasing demand on stretching the Millennials' resources, especially those of working mothers, there is an effect on stress induced by general life management of them. Wheatley's (2012) study found that the increased demands of fitting in working life with a young family had vast effects on stress-levels, especially in working mothers. The same paper concluded that often issues that are thought as miniscule in scale, such as available parking for time management purposes, could in fact have a major impact on the levels of stress that are felt. Also, the stress(ors) of the parent(s) can also manifest in their children. A study conducted by Allen et al (2018) found out that children are negatively affected by their parents' chronic adversities and can even play a role in consequent mental health disorders.

Further to the above, Kuehner-Hebert (2019) surveyed 330 United States working Millennials and reported that 8 out of 10, that is 78%, believed it was the responsibility of their workplace to provide support for their well-being, which is a significant percentage of the generational work force that the employers cannot turn their backs against. This is further supported by the Welltok research, where they discovered that 73% of the Millennials thought it to be the employer's responsibility to help employees effectively manage and also relieve workplace stress (Welltok 2019). Perhaps self-help mobile mental health tools could be added to the corporate policies as one of the benefits they offer to upkeep their workforces general well-being?

### 2.1.2 Coping strategies of the Millennial and their perceptions on digital tools

Unlike the more mature adults, Millennials are considered to adapt new technologies and tools more acceptingly and faster compared to their more mature counterparts. Though not related specifically to mental or physical well-being, Hur, Lee and Choo (2017) set on a research to compare Millennial and mature consumer user experiences about a mobile application service (related to fashion). Hur, Lee and Choo (2017) found that Millennials were more accepting of the mobile tool than their mature counterparts and were more likely to find the usage easy and enjoyable. Based on this, a conclusion could be drawn that Millennials may also be more open to using a mental health application to further their own well-being and could quite easily adapt these applications being highly “technology literate” (Marks 2009).

In an era where people’s attention spans are stretched to the maximum due to the various attention-demanding effects fighting for everyone’s interest - this also must be considered when thinking about Millennials stress relief via a digital tool. Millennials are a generation that increasingly mix personal life with work life, and often use technology in both overlappingly. They demand more flexibility in their workplace and also to a large extent associate the possibility of these two overlapping to a more positive working environment and job satisfaction. (Philip 2017).

As mentioned above, the availability and options for digital tools for stress and anxiety management, and others, have exploded in the recent years and there are certain applications (such as the personal coaching digital tools) that people can employ to safeguard their mental health and overall well-being. In addition, there are many self-help-based tools that can be used for preventative or rehabilitative mental health, but there are also digital tools that are used by the professionals in order to reach a wider audience with lesser resources. As such, scalability seems to be an immense bonus of the digital therapies and applications no matter what the context is. Below, a few of these already existing mobile digital tools will be introduced.

## 2.2 Digital tools

### 2.2.1 Digital therapies; already available professional digital mental health tools

Though a relatively new field, digital therapies have, only in a recent few years, been flagged as a viable method in reaching adolescents, young people and adults alike in a mental health care setting, especially in relieving stress and anxiety (Orlowski et al 2016). Some of the therapies that used to be accessible only by means of in-session, often expensive, physical meetings can now be found online and digital thus bringing clinical mental health care services closer to the user-base for an easier, less expensive, access and follow-up care.

For example, Cognitive Behavioural Therapy (CBT) has had a very successful succession of research around it through an online platform, which subsequently started to be called e-CBT (Ebert 2018). These internet-based therapies have gained relevant popularity in recent years and have been proven to be effective at least in stress and anxiety settings (Nordh et al 2017). It can almost be said, that the use of eCBT has already reached a level of acceptance as a working mental health tool within the professionals and has been proven to be a very cost-effective way to provide far reaching mental health care services (Carroll et al 2014). As such, e-CBT is perhaps one of the most studied e-mental health approaches of our time, with very promising results in scalable mental health care, but not by any means the only one as can be seen below.

Acceptance and commitment therapy (ACT) is also a type of behavioural therapy, but it has been noted to work through different processes than, for example the previously mentioned Cognitive Behavioural Therapy (Hayes, 2006). Similar to guided relaxation or mindfulness, Acceptance and Commitment Therapy is commonly used to combat negative thoughts and feelings such as depression or stress. A study by Pierce (2016) was conducted to observe practitioner and participant perceptions on using an Acceptance and Commitment therapy based mobile application in mental health care. The general enthusiasm towards ACT-applications was relatively high among practitioners as well as participants, but it was separately noted that the selection of the tool and the lack of guidance on how to use the said tools was hindering their positive perceptions.

Interestingly, a meta-study by Brown (2016) concluded that administering ACT in an online setting to a group suffering of depression was effective and the study concluded that web-based ACT is a valid method to promoting mental well-being. Also, a stress-based study was conducted by Puolakanaho (2019) to test whether a five-week web-based ACT-therapy would positively influence adolescent stress-levels. What Puolakanaho (2019) found was that indeed the intervention was effective, and even more so in highly stressed participants, giving further positive boost for the online and mobile scalable tools in combatting young adult mental health problems.

The benefits of the internet-based applications on mental health in rural areas have also been reported by Horgan and Sweeney (2010) in a study conducted in Australia. They reported that depressive symptoms were alleviated by internet-based tools and were also able to reduce the stigma around caring for mental health. The study also noted that rural populations often have a “preference for self-managing health problems”, a view in which the mental health internet applications sit well in. This also encourages further studies towards measuring user experience and researching general attitudes towards online care.

### 2.2.2 Available to all ”self-help” digital mental health improving tools

Also, many non-clinical digital tools have reached a solid-standing status in alleviating sleep problems, stress and anxiety, such as the free for all (with parts of the content locked for subscription based users) ‘Calm’ -application that has won multiple awards for its effects and has over 700 000 five star ratings derived from its user-base (Calm, 2019).

Much like Calm, Headspace provides monthly subscription to a mindfulness meditation mobile application (Puddicome et al 2016). It has been scientifically proven to alleviate stress and anxiety. For example, Yang et al (2018) found Headspace effective in reducing work- and school related stress in medical school students, and went even further to suggest that having an audio-guided meditation as part of the medical students curriculum should be considered and the results were significant even more

widely to healthcare providers in the field of mental health in “improving quality of healing and patient care”.

Many of these free for all (with most having at least partially content locked for subscribers) mobile applications are based in mindfulness practices, or acceptance and commitment therapy. Mindfulness meditation is a simple intervention that can be implemented in order to offer a moment of calmness and order in sometimes otherwise disorderly and stressful world. Mindfulness meditation is strongly linked to Martin Seligman’s “movement” of positive psychology (Eberth and Sedlmeier 2012), but it is also considered as a standalone intervention in mental health practises. Research has shown that simple mindful meditation can reduce depression, stress, anxiety and decrease negative thinking while inducing better general life enjoyment, to name a few effects (Ali et al 2017, Kingston et al 2007, Hofmann et al 2010). Mindfulness therapy has been significantly beneficial with groups of older and younger adults in emotion regulation and cognitive control (Prakash, Hussain and Schirda 2015), in relieving study (Warnecke et al 2011) and work induced stress (Manocha 2011). Moreover, the beneficial effects have been shown as significant in face to face setting, but also via digital and mobile technology (Tunney 2017).

The Oiva-application adapts and encompasses two of the earlier-listed approaches: Mindfulness therapy and Acceptance and Commitment therapy (Oiva, 2019).

### 2.3 Oiva-application as the current study’s digital intervention tool

Oiva-application is a free for all application (no content locked for subscribers) created in collaboration by Jyväskylä University, VTT Technical Research Centre of Finland Ltd and Headsted (Oiva 2019). As briefly touched upon above, Oiva-application is based on a mixture of acceptance and commitment therapy, mindfulness meditation and guided relaxation and imagery sessions that are based on both former-mentioned methods, mindfulness therapy and acceptance and commitment therapy (Oiva 2019). However, one large limitation of wider application of Oiva is that it is in the Finnish language only, though in the instance of the current study, that was a necessity and one

of the prerequisites for the selection of the tool due to the Finnish speaking participant pool.

Some previous studies have been conducted on the Oiva-application, but not many. Ahtinen et al (2013) studied the effects of a 30-day Oiva-based mobile intervention on 15 working-aged participants. They found a scientifically significant effect of the Oiva-application in reducing the participant stress scores and their life satisfaction ratings but failed to provide a significant effect in psychological flexibility. Overall, the use of the application was generally perceived positively, and their findings provided valuable insights into what features are considered appreciated in stress-related mobile digital tools (Ahtinen et al 2013). Other larger scale studies were not found in the literature search, which indicates that the Oiva-application and its effects have not yet been very widely studied in an academic experimental setting.

In the current research, the Oiva-application's 15-minute single guided relaxation was used for a seven-day intervention. Single guided relaxation interventions have been shown to be effective in research settings before. Unger (2017) compared a control group with a cohort who were using a 35-minute guided relaxation intervention to reduce the levels of stress. They concluded that the intervention was the most effective (i.e. improved positive affect) with the high-level stress participants. Howland et al (2017) also found that using guided relaxation had cortisol lowering effects and reduced physiological and mental stress in mother's who had pre-term infants admitted to a hospital ward. Guided meditation has also been shown to reduce physiological responses in participants and not only to provide psychological alleviation (Carlson 2012), hence the element of tracking perceived bodily stress symptoms was included in the current research.

### 3 PURPOSE AND OBJECTIVES OF THE RESEARCH

It was hypothesized, firstly, that the mobile Oiva-based 15 min. daily guided audio relaxation would have a disproportionate effect on performance (stress and physical symptoms). Meaning that the participants would have lower perceived stress levels

(lower PSS-10 scores) after using the relaxation daily for seven consecutive days versus prior to the intervention starting. Secondly, it was hypothesized that a response advantage for lower levels of physical symptoms would be found post the intervention, i.e. showing a significant interaction between the Oiva guided relaxation and lowered levels of participant physical symptoms at the end of the intervention. Thirdly, it was hypothesized that perceived mental stress and perceived bodily stress symptoms, in varying levels (low and high), would differentially influence the subjects' results following the intervention.

As this combination of research is a relatively novel approach, a user experience focused questionnaire was also decided to be offered to the participants at the end of the study's intervention period in order to learn more about the influence and efficacy of digital tool and intervention use in general mental health, life management and everyday coping in the light of the selected Oiva-digital tool as previous studies around similar topics have suggested that the mobile application use in self-management; such as stress-management, and other health related illnesses is not yet very well understood and therefore the design and usability aspects should be taken into consideration more (Harjumaa et al 2015, Kaipainen 2014, Ahtinen 2013).

The current research focused on finding answers to the following research questions:

- ❖ Is guided audio relaxation therapy intervention via the 'Oiva' -application effective in lowering participants' perceived stress (measured through a PSS-10 questionnaire)?
- ❖ Is guided audio relaxation therapy intervention via the 'Oiva' -application effective in lowering participants' perceived bodily symptoms (measured through a perceived bodily symptoms question battery)?
- ❖ Is the guided audio relaxation therapy more effective within the higher versus the lower stressed participants?
- ❖ Is the Oiva-intervention an acceptable method for assisting with mental health management (i.e. lowering perceived stress levels and physical stress sensations) according to the participants? (measuring user experience through a post-intervention user experience questionnaire)



## 4 METHODS

### 4.1 Experimental design of the research

In order to find answers to these above-mentioned questions, the following research design (experimental design) was established (See table 1.):

Table 1. Experiment set-up.

Variables	Experimental set-up
Independent variables	Condition 1: daily mobile relaxation/ACT for 1 week/7 days, N=5
Dependent variable	Respondents' PSS-10 results difference between scores after 1 week of intervention (PSS-10 completed at the beginning and end of the intervention)
Dependent variable	Respondents' 'extra set of questions' results difference between scores after 1 week of intervention (physical symptoms survey completed at the beginning and end of the intervention)
Dependent variable	Respondents' user feedback (i.e. user experience) questionnaire at the end of the intervention

### 4.2 Participants

The original aim was to conduct the study in collaboration with a public health provider in a clinical setting, where the staff would have approached their own clinically diagnosed service-users and then use virtual reality exposure therapy (VRET) intervention to study the possible symptom reducing effects. This plan changed due to the limits of the public services and therefore the lack of time and recruitment effort from their part due to increased workload. Then, the recruitment was meant to be conducted via the University's own project, but they also struggled to recruit the necessary participants. Hence, in the end, the participants were recruited from the social network of the researcher instead.

Seven participants (6 female and 1 male) took part in beginning phase of the intervention (i.e. first set of questions, see appendix 1.). The researcher ensured that the possible participants were informed of the nature of the study and the effort and time required from their part. Two participants were excluded from the results of the research for failing to participate in the seven-day personal daily intervention through to the end and therefore not being able to fill in the subsequent follow-up surveys at the end of the intervention. This meant that 5 participants completed the study (all female) and all of its phases. The mean age of the remaining participants was 35.8 (minimum age 34; maximum age 38). All these participants were naïve to the experiment and had not used the Oiva-application previously. An institutional ethical committee board reviewed and approved the original research (though the research was later amended to suit the new intervention set-up and recruitment needs). No further participants were excluded from the final analysis, which therefore meant 5 set of final samples, one from each participant before and after the study.

### 4.3 Procedure

Participants participated in the intervention research separate from others by completing individual daily 15 minute -long mobile relaxation remotely in the privacy of their own home, or similar calm, environment.

Participation in the experiment started with a brief explanation of the study, and any valid participants were required to sign two sets of fully informed consent forms (see appendix 5), then followed by the task of completing the Perceived Stress Scale (PSS-10) plus the added perceived bodily symptoms form via Survey Monkey (see appendix 1). All questionnaires were handled anonymously for the participants' data security and the participants were given a secure number code to use (e.g. 1001, 1002 etc) so that no actual participant names were used while conducting the study in order to preserve the participants' privacy and data rights. Before the experiment begun, the subjects were advised that they could stop their participation in the research at any stage by merely informing the researcher of their will to finish their participation in the study. At the end, participants completed a user experience survey which questions were based on the work of Garrett (2010) and Nielsen (2003).

Step by step progress of the intervention, for a single participant:

1. Prior the intervention:
  - a. Duration: approx. 30 minutes
    - i. Reading the participant information leaflet (appendix. 6)
    - ii. Reading and signing the consent form (appendix. 5)
    - iii. Reading the Oiva-information (appendix. 4)
    - iv. Filling in the before-intervention questionnaire including the PSS-10 form and the perceived bodily stress questions (via Survey Monkey) (appendix. 1)
2. Daily guided relaxation therapy 15-minute session via the Oiva-mobile application for seven consecutive days (for narrative of the guided relaxation session see appendix. 7)
3. Post intervention:
  - a. Duration: approximately 30 minutes
    - i. Filling in the post-intervention questionnaire including the PSS-10 form and the perceived bodily stress questions (via Survey Monkey) (appendix. 2)
    - ii. Filling in the user experience questionnaire (via Survey Monkey) (appendix. 3)
    - iii. General discussion, Q&A if needed

As explained earlier, all experiments were conducted utilizing a mobile “free for all” application, Oiva (Oiva, 2019). All five participants took part via their own mobile phone either via the Oiva-application or via the internet browser’s web-version, with the www-link directing the user directly to the long Oiva relaxation exercise (the same as the mobile application one is). The participants were encouraged to conduct the experiment in a peaceful and calm environment without any external stressors present (such as other family members etc.). Each participant completed the same tasks (i.e. 7-day mobile Oiva-application long relaxation, one time per day, duration approximately 15 minutes) of the experiment. All participants were asked to be as accurate as possible during the research and intervention, and to follow the instructions carefully.

#### 4.4 Methodological approach & data analysis

The research was performed as quasi-experiment. It was recognised that there may be other variables affecting the experiment that cannot necessarily be controlled by the current experiment, such as the way that the participants were selected or where they performed the intervention (as the set-up was a remote intervention and not a clinical laboratory intervention). The sample size was also very small, and no control group was used. Yet, as there has not been a care model equal to the one suggested in this intervention before, the aim of the research was to test a new model that has not been implemented previously. Therefore, no control group was used and the experimental set up of quasi-experiment was agreed upon. It was decided that should the experiment results be encouraging, then further studies would build on the results for a more sophisticated and controlled (including a control group) experimental research. Also, a cross-over study within this research would be a possibility in order to rule out any suspected confounding effects arising from the participants.

Due to the reason that it is impossible to standardise and match the individual interventions with other person's individual results, which may bring a small variation to the results, the participants acted as their own base lines and were observed and analysed by their own scores before and after the intervention (repeated measures, within subjects design).

This research used quantitative research methods and results were analysed using IBM SPSS Statistics 26 (IBM Developer 2019).

- Mobile technology used within the research:

- Oiva mieli application (Oiva, 2019)
- Survey Monkey tool (Survey Monkey 2019)

It was of paramount importance that the participants were able to receive an appropriate briefing to the intervention before joining hence they signed a consent form with informed consent (an information leaflet was provided to ensure participants were fully in the knowledge of the nature of the study, what is included and what the aim is, this can be found in the appendix 6), with knowledge that they could choose to finish

their participation at any point. It was ensured that participants' anonymity will be preserved during the study, and all the study material would be handled confidentially and stored and/or disposed of with care. Further on these also below.

#### 4.4.1 Materials

Pre-experiment forms included a fully informed consent form (see appendix 5.), and pre- and post-experiment stress and physical symptom questionnaires; one for perceived stress (PSS-10) (Cohen, 1983) and another for a battery of physical stress symptoms (see appendix 1 & 2.), these questions were measured on a scale from 0 to 4 (Cohen 1983, Wyatt and Meyers 1987). The pre-experiment forms also included a fact sheet of the intervention for the recruitment phase of the research (appendix 6) and instructions on how to download and use the Oiva-application and where to find the appropriate Oiva-task section to complete that is required in the intervention phase (appendix 4).

#### 4.4.2 Storing data

The research materials were stored on the researcher's laptop without any identifying features of the participants and were appropriately and securely locked away for the whole duration of the research. Only the researcher saved any intervention-related materials and were able to access the data and the participant coding.

#### 4.4.3 Reporting the results of the intervention

The results of the research are intended to be reported as a Master's thesis (published in Theseus) in which the individuals will not be identifiable on a personal level, even by themselves.

## 4.5 Validity and reliability

As this was a quasi-empirical experiment, it is hard to know for sure whether any extraneous variables played part in the results or if some interfered with the cause and effect and with the researcher's reliability (i.e. is the research repeatable?) or validity (i.e. is the study and its tools measuring the correct things?) etc.

PSS-10 has been validated multiple times by separate research looking onto the reliability of the scoring. Previous research has almost unanimously concluded that the usage of PSS-10 scale in proving an accurate scale of the person's own perceived stress is warranted and reliable (Cohen, Kamarck and Mermelstein 1983, Andreou 2011, Nielsen 2016, Schlotz 2011, Smith 2014, Maroufizadeh 2018). Besides the mental stress research, Andreou (2011) also found a strong correlation between the PSS-10 score and self-reported stress symptoms; hence the current study also included a questionnaire of a list of bodily stress-related symptoms that the participants were asked to evaluate. There is no scientific background to using this particular combination of perceived bodily symptom questions, but the questionnaire content and questions in themselves have been widely used in stress-related research and have been acknowledged and recognised as stress-related symptoms (Lefebvre and Sandford, 1985). It was important to also capture the possible physical stress-related symptoms in concurrence with the perceived stress scale that focuses more in mental stress.

### 4.5.1 Effects of the researcher

The intervention had only one researcher conducting the study though the researcher was known to all of the condition group participants before the study began. Therefore, though the use of one researcher, in theory, should minimise any possible changes between the research process, recruitment and participants hence alleviating any possible confounding effects that the researcher may involuntarily bring to the research, still, the familiarity of the researcher may bring an effect to the results on its own.

## 5 RESULTS

It was hypothesized, firstly, that the mobile Oiva-task (15 min. daily guided audio relaxation) has a disproportionate effect on performance (mental stress and physical symptoms). In particular, participants would have lower perceived stress levels (lower PSS-10 scores) after using the relaxation daily for seven consecutive days versus prior to the intervention starting. Secondly, it was hypothesized that a response advantage for lower levels of physical symptoms would be found post the intervention, i.e. showing a significant interaction between the Oiva guided relaxation and lowered levels of participant physical symptoms at the end of the intervention. Thirdly, it was hypothesized that perceived mental stress and perceived bodily stress symptoms, in varying levels (low and high), would differentially influence the subjects' results following the intervention. Also, user experience of the Oiva-application was evaluated.

Exploring the descriptive statistics and analysing the data via statistical tests (excluding the user experience in statistical testing) were carried out to investigate whether there were significant statistical results to give evidence to the above-mentioned hypotheses.

### 5.1 Descriptive statistics - PSS-10 and perceived bodily stress

Table 2. and Table 3. below provide the descriptive statistics for all the PSS-10 and bodily stress symptom survey results, including mean survey results and standard deviations. Upon closer observation of the table, it can be noted that the stress level reduction within the participants were higher among the individuals that initially reported higher perceived mental stress or perceived bodily stress symptom levels to begin with. In contrast, it would appear that those who reported "regular" (i.e. no stress) to only slightly increased stress levels to begin the research with, could actually have detrimental effects on conducting the intervention, the intervention seemingly inducing further stress rather than reducing it, or keeping the levels the same at a minimum (meaning no benefit from the intervention). Further, all beginning higher stress level participants felt like the user experience was good and that they agreed the Oiva-application being a suitable intervention for relaxation and stress and anxiety relief,

whereas the beginning lower stress participants reported opposing views (i.e. the intervention was not beneficial, or they did not see it as beneficial to others either). Inspecting the table, it can be noted that the overall mean results of different participants before and after the intervention did seem further away from each other as to consider a slight divide in the participant group to begin with; those who benefited significantly from the intervention, and those who did not.

The descriptive statistics were further inspected and explored in Figure 2. and Figure 3. In Figure 2. the mean reaction times for the PSS-10 perceived stress condition results per participant are portrayed. By observing the graph, it can be seen, as noted also above, that the participants whose stress levels were up prior to the intervention had a seemingly bigger stress reduction effect post-intervention when compared to their lower level stress peers. Similar trend can be seen in the Figure 3. Where higher beginning bodily stress score participants seem more significantly reduced than the lower bodily stress level peers. The descriptive statistics were also further investigated by arranging the statistics into visual figures based on the survey questions, versus participants, as can be seen in Figure 4. and Figure 5.

As stated before, initially there were seven participants. However, due to being unable to finish the latter part of the intervention (intervention to completion and/or completing survey sets at the end of the intervention), two participants had to be excluded from the main analysis as this would have artificially inflated the significance values when conducting data analysis (i.e. missing the second set of survey replies).



Table 2. PSS-10 questions pairwise comparisons descriptive statistics.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Subject1BefPSS10	.60	10	.516	.163
	Subject1AftPSS10	.80	10	.422	.133
Pair 2	Subject2BefPSS10	1.10	10	.568	.180
	Subject2AftPSS10	1.10	10	.738	.233
Pair 3	Subject3BefPSS10	2.10	10	.876	.277
	Subject3AftPSS10	1.40	10	.516	.163
Pair 4	Subject4BefPSS10	1.80	10	.632	.200
	Subject4AftPSS10	1.60	10	.966	.306
Pair 5	Subject5BefPSS10	2.30	10	.675	.213
	Subject5AftPSS10	1.80	10	.632	.200
Pair 6	SubjectTOTALBefPSS10	7.90	10	2.025	.640
	SubjectTOTALAftPSS10	6.70	10	2.627	.831

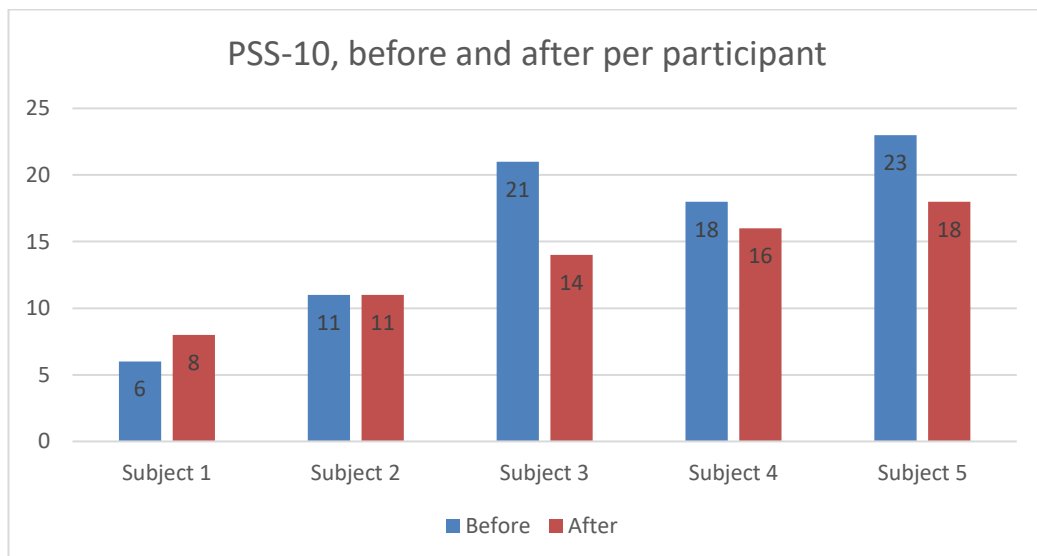


Figure 2. PSS-10 survey results before and after the intervention, per participant.

Table 3. Perceived bodily stress questions pairwise comparisons descriptive statistics.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Subject1Bef	.27	11	.467	.141
	Subject1Aft	.36	11	.505	.152
Pair 2	Subject2Bef	.73	11	.905	.273
	Subject2Aft	1.09	11	1.136	.343
Pair 3	Subject3Bef	1.91	11	1.375	.415
	Subject3Aft	1.45	11	.522	.157
Pair 4	Subject4Bef	1.82	11	1.079	.325
	Subject4Aft	1.09	11	.701	.211
Pair 5	Subject5Bef	2.18	11	.982	.296
	Subject5Aft	1.45	11	.688	.207
Pair 6	SubjectTOTALBef	6.91	11	3.807	1.148
	SubjectTOTALAft	5.45	11	2.841	.857

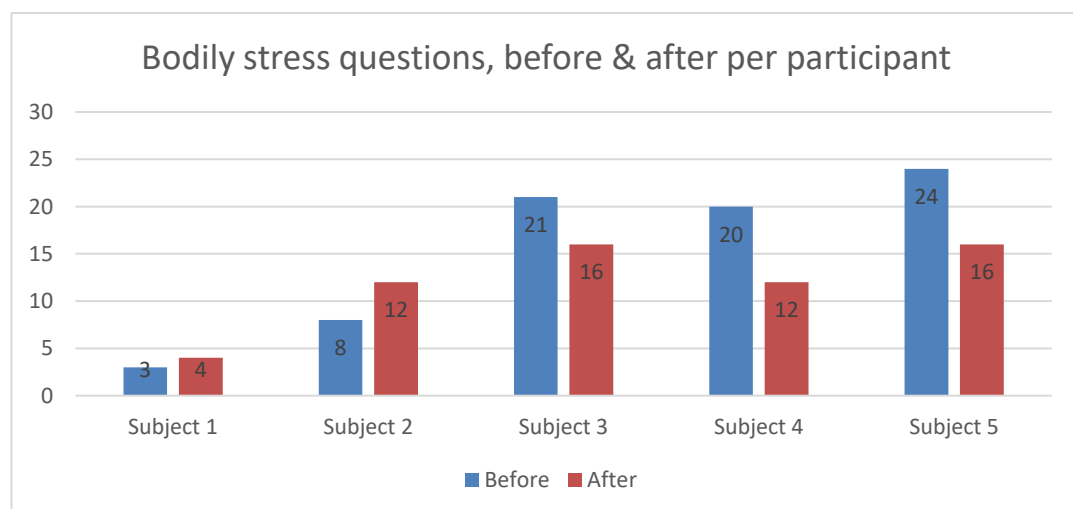


Figure 3. perceived bodily stress survey results before and after the intervention, per participant.

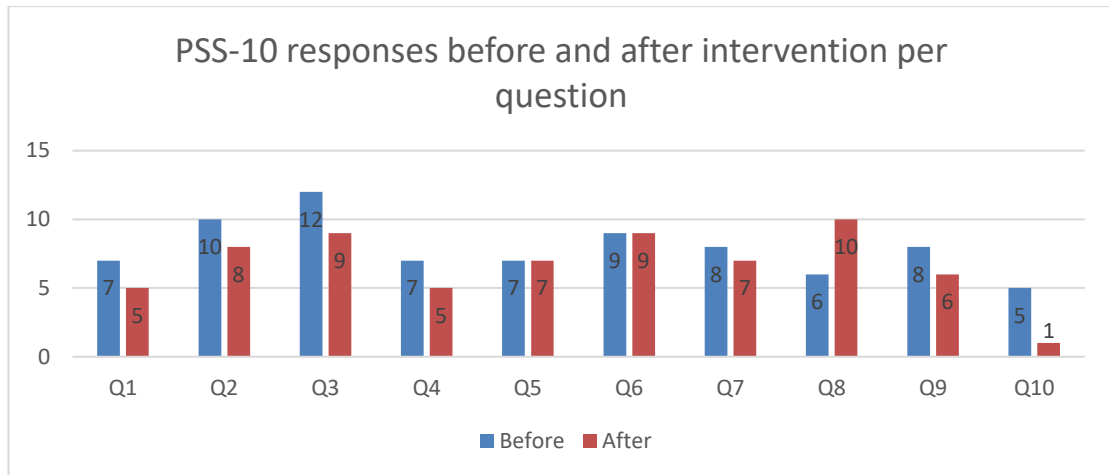


Figure 4. PSS-10 before and after responses per question.

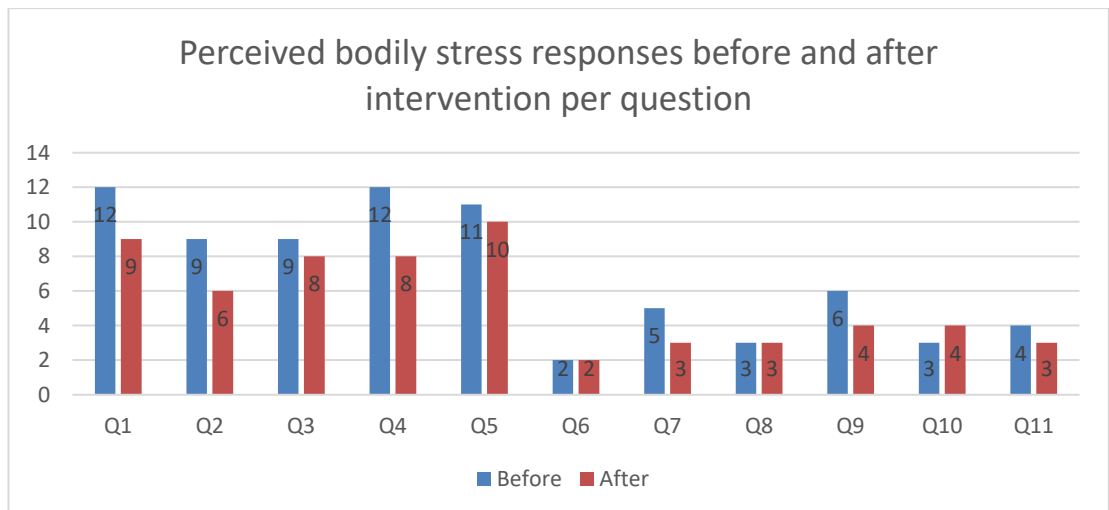


Figure 5. Perceived bodily stress questions before and after the intervention.

## 5.2 Statistical analysis - PSS-10 and perceived bodily stress

After the inspection of the descriptive statistics, further statistical analysis was completed via paired-samples t-tests on both (PSS-10 and perceived bodily stress) survey groups to compare the participant survey results before and after the intervention. One pairwise t-test was conducted for the PSS-10 survey results, with each of the subjects' ratings, before and after the intervention acted as the pairwise independent variables. A significant main effect of pairwise comparison was discovered for two participants. There was a strong difference in the scores for Subject 3 before PSS-10 results ( $M=2.10$ ,  $S=.876$ ) and Subject 3 after PSS-10 results ( $M=1.40$ ,  $S=.516$ );  $t(9)=3.280$ ,

$p=0.010$  and also Subject 5 before PSS-10 results ( $M=2.30$ ,  $S=.675$ ) and Subject 5 after PSS-10 results ( $M=1.80$ ,  $S=.632$ );  $t(9)=3.000$ ,  $p=0.015$ . Combined group effect for the PSS-10 before ( $M=7.90$ ,  $S=2.025$ ) and after intervention results was not found ( $M=6.70$ ,  $S=2.627$ );  $t(9)=1.742$ ,  $p=.119$ . Table 4. illustrates the results further.

The same statistical testing as above for PSS-10 was performed on the perceived bodily stress results, where before and after survey results by each participant individually ( $N=5$ ) were compared by conducting a paired-samples t-test using IBM SPSS Statistics 26 statistical analysis software. A significant difference was found in the scores of two participants when comparing their results before and after the intervention: Subject 4 bodily stress before results ( $M=1.82$ ,  $S=1.079$ ) and Subject 4 bodily stress after results ( $M=1.09$ ,  $S=.701$ );  $t(10)=3.730$ ,  $p=0.004$  and Subject 5 bodily stress before results ( $M=2.18$ ,  $S=.982$ ) and Subject 5 bodily stress after ( $M=1.45$ ,  $S=.688$ );  $t(10)=5.164$ ,  $p=0.000$ . Total group effect for the perceived bodily symptoms before ( $M=6.91$ ,  $S=3.807$ ) and after intervention results was also found ( $M=5.45$ ,  $S=2.841$ );  $t(10)=3.200$ ,  $p=0.009$  (see Table 5. for the statistical analysis results in full).

Table 4. T-test results for PSS-10 survey, 2 people had significant changes before-after intervention

		Paired Samples Test								
				Paired Differences						
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)	
					Lower	Upper				
Pair 1	Subject1BefPSS10 - Subject1AftPSS10	-.200	.422	.133	-.502	.102	-1.500	9	.168	
Pair 2	Subject2BefPSS10 - Subject2AftPSS10	.000	.667	.211	-.477	.477	.000	9	1.000	
Pair 3	Subject3BefPSS10 - Subject3AftPSS10	.700	.675	.213	.217	1.183	3.280	9	.010	
Pair 4	Subject4BefPSS10 - Subject4AftPSS10	.200	1.135	.359	-.612	1.012	.557	9	.591	
Pair 5	Subject5BefPSS10 - Subject5AftPSS10	.500	.527	.167	.123	.877	3.000	9	.015	
Pair 6	SubjectTOTALBefPSS10 - SubjectTOTALAftPSS10	1.200	2.201	.696	-.375	2.775	1.724	9	.119	

Table 5. T-test results for perceived bodily symptom's survey, 2 people had significant changes before-after intervention

		Paired Samples Test							
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Subject1Bef - Subject1Aft	-.091	.302	.091	-.293	.112	-1.000	10	.341
Pair 2	Subject2Bef - Subject2Aft	-.364	.674	.203	-.817	.089	-1.789	10	.104
Pair 3	Subject3Bef - Subject3Aft	.455	.934	.282	-.173	1.082	1.614	10	.138
Pair 4	Subject4Bef - Subject4Aft	.727	.647	.195	.293	1.162	3.730	10	.004
Pair 5	Subject5Bef - Subject5Aft	.727	.467	.141	.413	1.041	5.164	10	.000
Pair 6	SubjectTOTALBef - SubjectTOTALAft	1.455	1.508	.455	.442	2.467	3.200	10	.009

Next, PSS-10 scores and the bodily stress symptom questions were grouped as either high or low depending on whether it was above or below the grouping factor: low stress; 0-13 and moderate stress (grouped as “high” for the purpose of this research) 14-26 for perceived stress scale (Cohen, 1983), and median; 20 for perceived bodily stress, were acting as between-subjects independent variables. Below Table 6. shows the descriptive statistics of these groupings.

Table 6. Descriptive statistics of high and low symptom groups.

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	BeforePSS10low	8.50	2	3.536	2.500
	AfterPSS10low	9.50	2	2.121	1.500
Pair 2	BeforePSS10high	20.67	3	2.517	1.453
	AfterPSS10high	16.00	3	2.000	1.155
Pair 3	BeforePhysicalLow	5.50	2	3.536	2.500
	AfterPhysicalLow	8.00	2	5.657	4.000
Pair 4	BeforePhysicalHigh	21.67	3	2.082	1.202
	AfterPhysicalHigh	14.67	3	2.309	1.333

Further pairwise t-tests were conducted to investigate the possible differences between the low and higher stress groups mental and bodily stress levels, before and after the intervention. Between the low mental and physical stress results in group-level (before and after the intervention) could be found. In fact, when looking at descriptive statistics (Table 6.) the ‘low stress’ -group’s stress increased post the intervention both mentally (before M=8.50, S=3.536 vs. post M=9.50, S=2.121) and physically (before M=5.50,

S=3.536 vs. post M=8, S=5.657) instead of going down. However, the results between the high mental stress before (M=20.67, S=2.517) and after (M=16, S=2) were close to significant  $t(2)=3.212, p=.085$ , and between the high bodily stress before (M=21.67, S=2.082) and after (M=14.67, S=2,309) intervention groups were highly significant,  $t(2)=7.000, p=.020$ . The statistical analysis results are outlined further in Table 7.

Table 7. T-test results for low and high symptom groups, before and after the intervention.

		Paired Samples Test							
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BeforePSS10low - AfterPSS10low	-1.000	1.414	1.000	-13.706	11.706	-1.000	1	.500
Pair 2	BeforePSS10high - AfterPSS10high	4.667	2.517	1.453	-1.585	10.918	3.212	2	.085
Pair 3	BeforePhysicalLow - AfterPhysicalLow	-2.500	2.121	1.500	-21.559	16.559	-1.667	1	.344
Pair 4	BeforePhysicalHigh - AfterPhysicalHigh	7.000	1.732	1.000	2.697	11.303	7.000	2	.020

### 5.3 User experience feedback descriptive statistics and statistical analysis

The user feedback survey results were analyzed separately from the above and contrasted to the earlier results to see if the ones who found stress relief during the intervention would also be the promoters of such interventions and mental health digital tools versus seeing if the ones who found no relief from the intervention (or even negative effects and could have resulted in elevated stress scores post-intervention) would still be promoters of such interventions or digital tools in general or whether they would think that the application does not have potential for anyone else either in stress relief as that is what they experienced themselves. Interestingly, based on the user experience questions, the participant who had the lowest scores in stress levels, had the highest markings on promoting the usability of the mobile Oiva-application and the guided relaxation session itself even though they received no statistically relevant stress relief from the 7-day intervention (questions 3 and 4 as listed below, and can also be seen in appendix 1 & 2). These same questions also received the highest support from the all participants combined, question 3 (M=3.20) and question 4 (M=3.40) on a scale of 0-4.

3. The usability of the Oiva guided relaxation session was clear and easy (mobile application and www-pages)? (replies in scale 0-4)
4. The instructions within the Oiva guided relaxation session were clear and easy (the sessions's female voice and the voice instructions/session) (replies in scale 0-4)

However, overall user scoring for the participants who did not have stress relieving effects following the use of the application were generally lower than those who had significant alleviating results prompted by the intervention. The higher user experience and actual usefulness (versus usability) scores were given by those who benefited from the intervention and had stress reducing effects from the application use after the seven days. The descriptive statistics for the user experience questions are further illustrated as in Table 8. below, and also in a visual format per question in Figure 6.

Table 8. Descriptive statistics on user experience questions 1-8.

<b>Descriptive Statistics</b>					
	N	Minimum	Maximum	Mean	Std. Deviation
Q1	5	1	3	2.20	1.095
Q2	5	1	4	2.80	1.095
Q3	5	3	4	3.20	.447
Q4	5	3	4	3.40	.548
Q5	5	0	3	1.60	1.140
Q6	5	0	3	1.60	1.140
Q7	5	0	3	2.00	1.225
Q8	5	0	3	2.40	1.342
Valid N (listwise)	5				

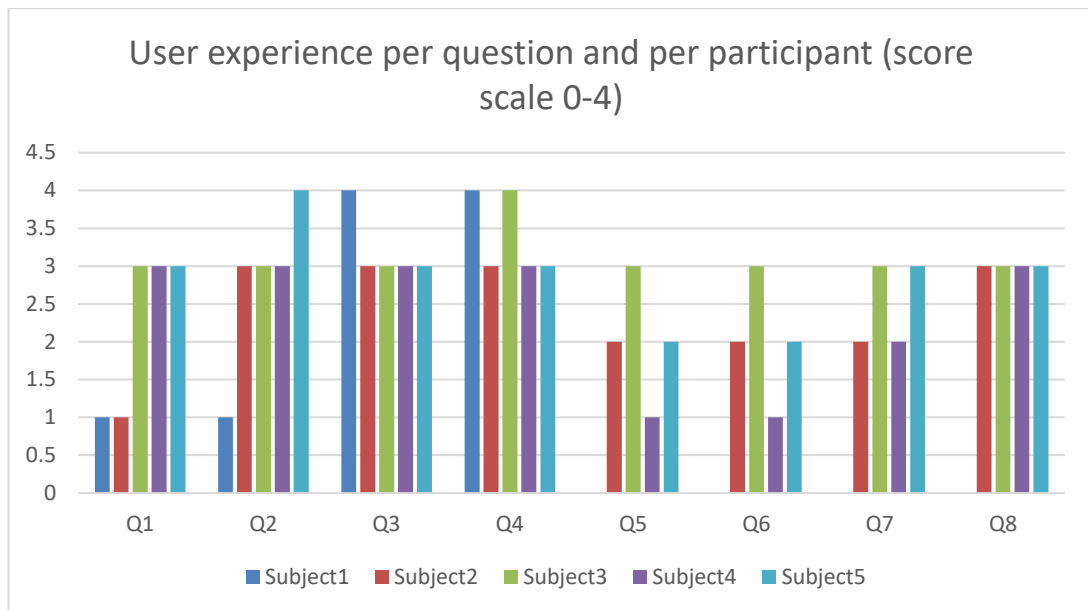


Figure 6. User experience scoring per question and per participant (score scale 0-4)

The users were also asked a question about whether they would recommend the Oiva-guided relaxation session to others on a scale of 0-10. The descriptive statistics of this are illustrated in Table 9. Perhaps not surprisingly, those who did not have significant positive stress-reducing effects following the intervention rated the Oiva-application guided relaxation lower than those who did not benefit from it. Overall, the participants' Oiva guided relaxation recommendation rating was  $M=6.60$ .

Table 9. Descriptive statistics of the “would you recommend to others” question.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
NPS	5	2	10	6.60	2.881
Valid N (listwise)	5				



## 6 CONCLUSIONS

### 6.1 Interpreting the results

As the results indicate, there are conflicting reports in this research on whether the benefits from a mobile digital mental health application work for young adults, or against them. Based on the results, it seems obvious that some people find significant value in such mobile mental health intervention, whereas some find that it is an added strain to their daily lives and considered more of a chore. Further, the outcome of the intervention suggests that those who are stressed to begin with, seem to reap greater benefits from using the intervention – which seems a viable idea; if you have high levels of stress and take on an intervention to alleviate the stress, it will reduce it, but if you do not have higher stress levels and take part in the intervention, it will only create stress as using the digital tool for the intervention could be considered somewhat an added strain to the person's regular daily life and therefore perceived as a stress inducing tool as there is no recognised stress to reduce to begin with. The intervention in these cases could add stress, rather than reduce lower levels of stress to even lower levels from the starting point.

Also, it is important to note that not everyone is comfortable with the notion of guided relaxation or meditation. There is, for example, a study where a certain type of relaxation was the prompt for anxiety with panic disordered participants (Wells 1990). While in the current research there may have not been any panic disorders involved, the underlying thought about the relaxation bringing to surface negative thoughts for some is worthy of a notion.

#### 6.1.1 Discussion of reliability

This research was conducted as a quasi-experiment, which means that the results should be interpreted with natural skepticism. Also, as the participants conducted the daily interventions by themselves at a time suitable to them, the results of the study may have been interfered by this set-up. In a possible linked future non-quasi experiment it is necessary to set the time of the day of the intervention to the same for all

participants and keep them accountable in conducting the interventions in an agreed manner and order as a way to avoid any confounding effects of the way that the interventions were conducted and therefore perhaps having an effect on the results.

In this research, the previous research referred to include multiple cultures and various sets of different demographics of people. In order to reliably study a group, or groups, it would be vital to investigate whether demographics have any effects on the results of the online and digital therapies and interventions, and how these digital tools are welcomed and perceived by different user groups. One previous research, for example, has indicated that individual differences do play a role in job stress and related ill health that may follow (Petkovska 2014).

Further, it would have been very valuable to collect open qualitative feedback to complement the quantitative study as the open questions would have perhaps guided conclusions much better into what worked in the intervention and what may not have worked. If the scale of the user feedback is only from 0-4 and the replies restricted to those due to the quantitative nature of the research, then some information may get lost in translation or cannot be expressed at all, or can be but with limitations. Some previous research seem to indicate that the Likert scales, especially 5-point scales, which the 0-4 scale used is, can cause response interpolation and scale sensitivity, i.e. participants may start avoiding the “extreme” answers and stay more neutral in the middle and therefore unnecessarily skewing the results, usually subconsciously (Finstad 2010, Wyatt and Meyers 1987). By using open ended qualitative questions, the research could have gained more insight into what was good about the intervention and that way it could have collected constructive criticism as well. The research included open fields, but if those are a voluntary question (like the set-up was in the research), most people will skip them and only reply to the compulsory questions.

However, despite the current research being a quasi-experiment where the reliability of the study must be critically evaluated before jumping into any confirmative conclusions, what can be done instead, is to draw certain types of hypothesis in preparation for future studies, and what those should keep in mind.

## 6.2 Ideas for further studies

What seemed to be lacking in the responses to the survey questions before and after the intervention was the perception of the user themselves while conducting the intervention. Therefore, these feelings could also be followed up, recorded and (later) analysed in a similar study including a daily mobile journal to further bury into the user experience and what may happen between the low and higher stress-level participants.

Interesting addition to any future studies would be to include individual differences in perceiving different types of situations. In any given situation, one person may feel stressed and another may strive. Perhaps this would be a personality test or similar, to include in the overall study as a variable. It would be beneficial to know, if a certain type of person, or personality, would respond to such digital interventions with more significance than some other types of persons or personalities. The profile that could be used may be that of, for example Meyers Briggs Type Indicator MBTI (Myers 1962), or a similar personality profile survey.

The above links to also personal views on hearing instructions from a stranger, much like Harjunen (2017) found that there are individual differences in how people perceive affective touch, for example it is very different to promote emotional well-being by a spouse touching their partner than a stranger doing the same to someone. Perhaps it is the same for guided relaxation voices as well? Could it be that for some people the voice of a stranger does not allow the guided relaxation to work as it prompts the same awkwardness as the strangers' touch does in Harjunen (2017) study? This would be an interesting topic to look into further as it would interfere with the validity of the current study if significant.

Also, based on the previous research and the insights into what is causing the stress for the Millennials and young adults in the first place, it may be that young adults would benefit from a digital detox, a silent retreat where (outside social media and digital) healthy life values will be educated, or similar, rather than introducing a new digital tool to help with the stress that the social media and digital world is already seemingly creating for some them? This would be a note-worthy comparison study for

the future; to check the effects of a group who have a digital mental health tool intervention to manage and reduce stress compared with a non-digital “detox” group where focusing on reducing the stress without any sort of technology is included and then analyzing the results on the effectiveness, probably in reference to a control group of no intervention. The young adults feel such need to be constantly online - monitoring work emails, replying to texts instantly, and following social media that they may have forgotten how it feels like to live offline, as also suggested by Floros, McKenna and Ajeeb (2019) in their study of investigating Millennial perceptions of switching off also digitally when going on holiday and how it can have beneficial psychological repercussions.

Furthermore, forests have been the focus of much stress relief research in the recent years. For example, a previous study suggested that even as little time as a twenty-minutes in the forest/nature can significantly calm people’s minds and reduce their stress levels (Hunter, Gillespie and Chen 2019). It would be interesting to see whether this same effect can be replicated indoors using VRET tactics, instead of going out to the real forest as well as research other stress reducing possibilities Virtual Reality approaches could offer (Okere, Bakar and Mat 2018). Could an approach such as this be one alternative to the lower stress level participants, as well as the high stress level ones?

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Kysely ennen Oiva-mobiilisovelluksen käytön aloitusta.

Alkuteksti:

“Tervehdys!

Kiitos suostumuksestasi osallistua tähän tutkimukseen ja Oiva-mobiilisovelluksen käyttöön päivittäin 7 päivän ajan. Tämä kysely täytetään ennen Oiva-sovelluksen käytön alkua ja saat sen täytettyä arviolta noin 5 minuutissa. Saat myös kaksi muuta kyselyä sovelluksen käytön loputtua (niiden täyttämiseen menee myös vain muutama minuutti). Yksi niistä on samankaltainen tämän kyselyn kanssa ja toisessa kysytään tarkempia sovellukseen, sen käyttöön ja käyttökokemukseen liittyviä kysymyksiä.

Tutkimuksen tarkoituksena on selvittää Oiva-mobiilisovelluksen käytön vaikutuksia mahdolliseen stressi- ja/tai ahdistushallintaan, ja/tai yleiseen kehon rauhoittumiseen ja lepoon, kuin myös tutkia sovelluksen käytettävyyksivaikutuksia ja siitä nousevia mielipiteitä.

Vastauksesi käsitellään täysin luottamuksellisina vain opinnäytetyön tutkijan toimesta, eikä kyselytietoja käytetä muuhun kuin opinnäytetyön tutkimukseen. Vastaukset kirjataan tunnustekoodien avulla, joten henkilökohtaisia tietojasi ei kirjata minnekään. Vastaamalla tähän kyselyyn, annat suostumuksesi vastausten tutkimuskäyttöön.

Kiitos paljon osallistumisestasi vielä kerran!”

Q1. Kirjoita oma tunnustekoodisi tähän (tunnustekoodin avulla voidaan luottamuksellisesti kirjata vastauksesi)

Q2. Ikäsi (vastaus kokonaislukuina 1-100)

Q3. Sukupuolesi?

- Nainen
- Mies
- Muu
- En tahdo sanoa

Q4. Vastaa seuraaviin väittämiin (PSS-10).

1. Kuinka usein olet viimeisen kuukauden aikana ollut poissa tolaltasi jostain asiasta, joka tapahtui odottamatta?
2. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, ettet pysty kontrolloimaan elämäsi tärkeitä asioita?
3. Kuinka usein olet viimeisen kuukauden aikana ollut hermostunut tai stressaantunut?
4. Kuinka usein olet viimeisen kuukauden aikana olet ollut luottavainen kykyysi käsitellä henkilökohtaisia ongelmiasi?
5. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että asiasi sujuvat kannaltasi hyvin?

6. Kuinka usein viimeisen kuukauden aikana olet huomannut, ettet pystynyt selviytymään kaikista asioista, jotka sinun olisi täytynyt tehdä?
7. Kuinka usein viimeksi kuluneen kuukauden aikana olet pystynyt pitämään ärsyyntymisesi tietyistä asioista kurissa?
8. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että hallitset asiasi?
9. Kuinka usein olet viimeisen kuukauden aikana suuttunut asioista, joihin et voi vaikuttaa?
10. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että sinulle on kasaantunut niin paljon vaikeuksia, ettet enää selviä niistä?

Q5. Vastaa seuraaviin väittämiin.

1. Oloni on kireä, hermostunut ja pingottunut.
2. Minulla on univaikeuksia.
3. Olen ärtyisä ja huonotuulinen.
4. Minun on vaikea keskittyä, muistaa asioita tai tehdä päätöksiä.
5. Tunnen oloni uupuneeksi ja väsyneeksi.
6. Henkeäni ahdistaa silloinkin kun lepään.
7. Minulla on kiristävä tunne rinnassa, niskassa tai päässä.
8. Minulla on sydämentykytystä tai lepattava tunne vatsassa tai rinnassa.
9. Minulla on päänsärkyä tai migreenikohtauksia.
10. Minulla on kipuja ja särkyjä, joista olen huolissani.
11. Minua huimaa ja/tai pyörryttää.

Q6. Avoin kenttä. Onko mielelläsi jotain muuta?

Q7. Milloin aloitit sovelluksen käytön (lisää kenttään tarkka päivämäärä muodossa pp/kk/vv)? Sovellusta käytetään 7 päivää, jonka jälkeen saat täytettäväksi uuden kyselyn.

Lopputervehdys: ”Kiitos!”

”Kiitos kyselyn täyttamisestä. Voit nyt ladata Oiva-mobiiliapplikaation puhelimeesi ja tehdä rentoutumisharjoituksen päivittäin 7 päivän ajan (kesto n 15min). Muistathan ilmoittaa tutkijalle aloituspäivän. Seuraa vielä sinulle erikseen lähetettyjä ohjeita.

Viikon sovelluksen käytön jälkeen sinulle lähetetään myös kaksi loppukyselyä.”

Kysely Oiva-mobiilisovelluksen käytön jälkeen.

”Tervehdys!

Olet nyt käyttänyt Oiva-mobiilisovellusta päivittäin 7 päivän ajan. Tämä kysely täytetään Oiva-sovelluksen käytön jälkeen ja saat sen täytettyä arviolta noin 5 minuutissa. Saat vielä myös toisen kyselyn, jossa kysytään tarkempia sovellukseen, sen käyttöön ja käyttökokemukseen liittyviä kysymyksiä.

Tutkimuksen tarkoituksena on selvittää Oiva-mobiilisovelluksen käytön vaikutuksia mahdolliseen stressi- ja/tai ahdistushallintaan, ja/tai yleiseen kehon rauhoittumiseen ja lepoon, kuin myös tutkia sovelluksen käytettävyyksivaikutuksia ja siitä nousevia mielipiteitä.

Vastauksesi käsitellään täysin luottamuksellisina vain opinnäytetyön tutkijan toimesta, eikä kyselytietoja käytetä muuhun kuin opinnäytetyön tutkimukseen. Vastaukset kirjataan tunnistekoodien avulla, joten henkilökohtaisia tietojasi ei kirjata minnekään (voit käyttää ensimmäiseen kyselyyn saamaasi tunnistetta). Vastaamalla tähän kyselyyn, annat suostumuksesi vastausten tutkimuskäyttöön.

Kiitos paljon osallistumisestasi vielä kerran!”

Q1. Kirjoita oma tunnistekoodisi tähän (tunnistekoodin avulla voidaan luottamuksellisesti kirjata vastauksesi)

Q2. Vastaa seuraaviin väittämiin. (PSS-10)

1. Kuinka usein olet viimeisen kuukauden aikana ollut poissa tolaltasi jostain asiasta, joka tapahtui odottamatta?
2. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, ettet pysty kontrolloimaan elämäsi tärkeitä asioita?
3. Kuinka usein olet viimeisen kuukauden aikana ollut hermostunut tai stressaantunut?
4. Kuinka usein olet viimeisen kuukauden aikana olet ollut luottavainen kykyysi käsitellä henkilökohtaisia ongelmiasi?
5. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että asiasi sujuvat kannaltasi hyvin?
6. Kuinka usein viimeisen kuukauden aikana olet huomannut, ettet pystynyt selviytymään kaikista asioista, jotka sinun olisi täytynyt tehdä?
7. Kuinka usein viimeksi kuluneen kuukauden aikana olet pystynyt pitämään ärsyyntymisesi tietyistä asioista kurissa?
8. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että hallitset asiasi?
9. Kuinka usein olet viimeisen kuukauden aikana suuttunut asioista, joihin et voi vaikuttaa?

10. Kuinka usein sinusta on viimeisen kuukauden aikana tuntunut, että sinulle on kasaantunut niin paljon vaikeuksia, ettet enää selviä niistä?

Q3. Vastaa seuraaviin väittämiin.

1. Oloni on kireä, hermostunut ja pingottunut.
2. Minulla on univaikeuksia.
3. Olen ärtyisä ja huonotuulinen.
4. Minun on vaikea keskittyä, muistaa asioita tai tehdä päätöksiä.
5. Tunnen oloni uupuneeksi ja väsyneeksi.
6. Henkeäni ahdistaa silloinkin kun lepään.
7. Minulla on kiristävä tunne rinnassa, niskassa tai päässä.
8. Minulla on sydämentykytystä tai lepattava tunne vatsassa tai rinnassa.
9. Minulla on päänsärkyä tai migreenikohtauksia.
10. Minulla on kipuja ja särkyjä, joista olen huolissani.
11. Minua huimaa ja/tai pyörryttää.

Q4. Avoin kenttä. Onko mielelläsi jotain muuta?

”Kiitos paljon kyselyn täyttamisestä ja osallistumisestasi tutkimukseen!

Sinulle lähetään vielä yksi käyttökokeuskysely, jonka jälkeen tutkimus on päättynyt.”

Oiva-sovelluksen/harjoituksen käyttäjäkysely.

”Tässä viimeisessä tutkimuksen kyselyssä on tarkoitus kartoittaa tarkempia Oiva-harjoituksen, sen käyttöön ja käyttökokemukseen liittyviä mielipiteitä.

Tutkimuksen tarkoituksena oli selvittää Oiva-mobiilisovelluksen/harjoituksen käytön vaikutuksia mahdolliseen stressi- ja/tai ahdistushallintaan, ja/tai yleiseen kehon rauhoittumiseen ja lepoon, kuin myös tutkia sovelluksen käytettävyyksivaikutuksia ja siitä nousevia mielipiteitä.

Vastauksesi käsitellään täysin luottamuksellisina vain opinnäytetyön tutkijan toimesta, eikä kyselytietoja käytetä muuhun kuin opinnäytetyön tutkimukseen. Vastaukset kirjataan tunnistekoodien avulla, joten henkilökohtaisia tietojasi ei kirjata minnekään (voit käyttää ensimmäiseen kyselyyn saamaasi tunnistetta). Vastaamalla tähän kyselyyn, annat suostumuksesi vastausten tutkimuskäyttöön.

Tämä on kolmas ja viimeinen kysely, jonka jälkeen tutkimus päättyy. Kiitos paljon osallistumisestasi vielä kerran!”

Q1. Kirjoita oma tunnistekoodisi tähän (tunnistekoodin avulla voidaan luottamuksellisesti kirjata vastauksesi)

Q2 Vastaa seuraaviin väittämiin:

1. Mielestäni Oiva-harjoituksen käyttö auttoi minua rentoutumaan.
2. Mielestäni harjoitetta voi käyttää lievittämään ahdistusta ja/tai stressiä.
3. Oiva-harjoituksen käyttö oli selkeää ja helppoa (mobiilisovellus tai www-sivut)
4. Oiva-harjoituksen ohjeistus oli selkeä ja helppo (harjoituksen naisääni + kuulemasi ohjeet/harjoitus)
5. Tulen jatkamaan harjoituksen käyttöä myöhemminkin.
6. Tulen tutustumaan myös muihin Oiva-sovelluksen harjoitteisiin.
7. Vastasiko sovellus tarpeitasi?
8. Harjoituksen käyttö oli mielekästä.

Q3. Suosittelisitko harjoitusta muille? (0-10)

Q4. Avoin kenttä. Voit kirjoittaa tähän yleistä palautetta (esimerkiksi: Mitä kehitysideoita sinulla on Oiva-harjoituksen luojalle?, Miten harjoituksen tekeminen vaikutti sinuun, jos ollenkaan? tms)

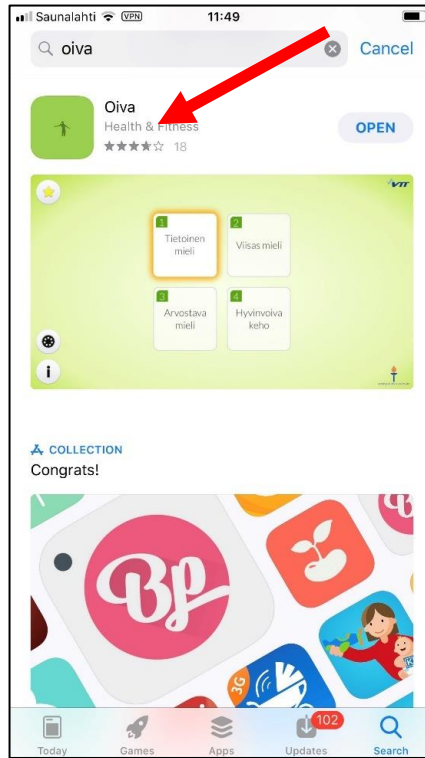
Lopputeksti:

”Kiitos paljon tämän ja muiden kyselyjen täyttamisestä ja osallistumisestasi tutkimukseen!

Tutkimus on nyt päättynyt.”

**OHJEET OIVA-SOVELLUKSEN KÄYTTÖÖN MOBIILISSA**

**Lataa Oiva-sovellus mobiilikaupasta:**

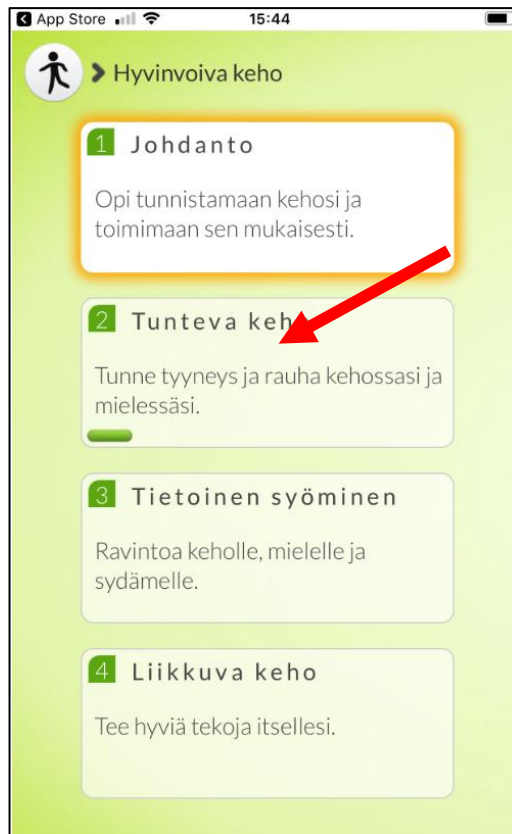


- Avaa Oiva-sovellus.
- Valitse/näpäytä: **"Hyvinvoiva keho"**:

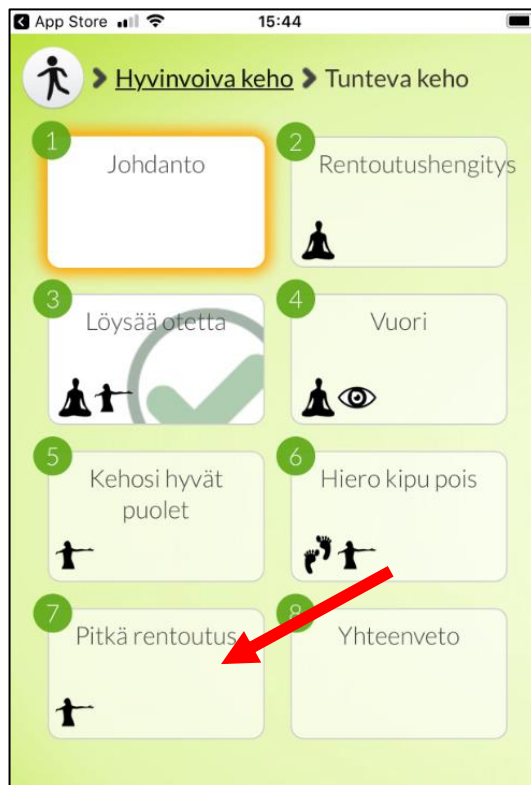




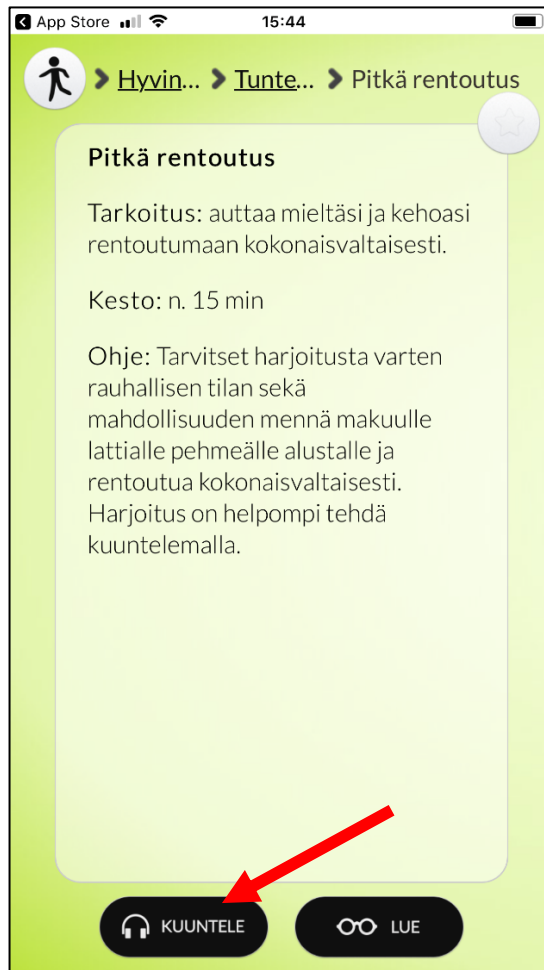
- Valitse/näpäytä: **“Tunteva keho”**:



- Valitse/näpäytä: **“Pitkä rentoutus”**:



- Lue sivun ohjeet
- Valitse/näpäytä: **“Kuuntele”**



**Tutkittavan tunniste:****Suostumus tutkimukseen osallistumisesta**

Minua on pyydetty osallistumaan ”**Hyvinvointia kehoon ja mieleen mobiiliteknologian avulla**” -tutkimusprojektiin. Olen vastaanottanut, lukenut ja ymmärtänyt tutkimuksesta kertovan tiedotteen.

Ymmärrän, että osallistumiseni tähän tutkimukseen on täysin vapaaehtoista ja suostun itseäni koskevien, tutkimuksen kannalta tarpeellisten tietojen keräämiseen tutkimusrekisteriin. Tutkimusrekisteriin kerätään tietoja kyselylomakkeilla. Tutkimusrekisterin tietoja ei luovuteta ulkopuolisille eikä niitä siirretä Suomen ulkopuolelle. Minulla on oikeus milloin tahansa tutkimuksen aikana ja syytä ilmoittamatta keskeyttää tutkimukseen osallistuminen. Minulla on oikeus peruuttaa suostumukseni, mutta tällöin suostumuksen peruuttamiseen saakka kerättyjä aineistoja voidaan käyttää tutkimuksessa. Kaikki minusta kerättävät tiedot käsitellään luottamuksellisesti, niitä käytetään ainoastaan tutkimustarkoitukseen ja tietoni koodataan siten, että henkilöllisyyteni selvittäminen ei ulkopuolisen toimesta ole mahdollista. Myös tulokset raportoidaan siten, ettei henkilöllisyyteni tule missään vaiheessa esille.

Minulla on ollut riittävästi aikaa harkita osallistumistani tutkimukseen, minulla on ollut mahdollisuus esittää kysymyksiä tutkimusta koskien ja olen saanut riittävän vastauksen kaikkiin kysymyksiini.

Tiedot antoi: Kaisa Keogh, Päiväys: 15/04 2019

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**Allekirjoituksellani vahvistan vapaaehtoisen osallistumiseni tähän tutkimukseen**

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Allekirjoitus

Päiväys

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Nimen selvennys

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**TIEDOTE:**

**”Hyvinvointia kehoon ja mieleen mobiiliteknologian avulla” -tutkimusprojekti”**

Hyvä mahdollinen tutkimukseen osallistuja,

Kutsumme sinut tutkimusprojektiin! Tutkimuksen avulla yritämme parantaa kehon ja mielen hyvinvointia ja samalla lievittää mahdollista stressiä, ahdistuneisuutta, masentuneisuutta tai uniongelmiä ohjatulla päivittäisellä rentoutumisella. Käytämme tässä apuna mobiiliteknologiaa. Samalla selvitämme teknologisten apukeinojen käytettävyyttä ja niistä saatavaa apua kyselylomakkeen avulla tutkimuksen lopussa. Tutkimus tehdään osana Satakunnan ammattikorkeakoulun hyvinvointiteknologian (YAMK) opintoja.

Tutkimuksessa on vain yksi ryhmä. Ryhmä käyttää Oiva -nimistä mobiiliapplikaatiota, joka on VTT:n ja Jyväskylän yliopiston kehittämä sovellus ja pohjautuu tietoisien läsnäolon (mindfulness) ja hyväksymis- ja omistautumisterapian menetelmiin.

Tutkimuksen kesto on osallistujille yksi viikko. Tänä aikana osallistujat suorittavat ryhmän päivittäisen tehtävän; Oiva-mobiiliapplikaation kautta tehtävä ”Pitkä rentoutus” -osio (15min). Tutkimuksen tavoitteena on selvittää, voisiko Oiva-mobiilisovellus tukea, ja mahdollisesti jopa parantaa, päivittäistä hyvinvointia ja jaksamista. Jos menetelmä on toimiva, näitä mobiilipalveluja voitaisiin mahdollisesti ottaa laaja-alaisemmin käyttöön ja tarjota avuksi sitä tarvitseville ja niistä hyötyville.

Tutkimus on suunnattu yli 18-vuotiaille nuorille. Jos haluat osallistua tutkimukseen, täytä oheinen suostumuslomake ja palauta se Kaisa Keoghille. Pyrimme saamaan tutkimukseen mukaan vähintään 10 henkilöä. Tutkimukseen osallistuminen on täysin vapaaehtoista.

Kaikki tietosi koodataan tunnistekoodilla siten, että henkilötietosi eivät käy esille. Kaikkia osallistujien tietoja käsitellään täysin luottamuksellisesti ja ne ovat ainoastaan tutkimuksen tekijän tiedossa, ja hän on salassapitovelvollinen. Tutkimustietoja tietoja ei luovuteta ulkopuolisille eikä niitä siirretä Suomen ulkopuolelle. Tutkimustuloksia raportoidessa kenenkään henkilöllisyys ei tule missään vaiheessa esille. Sinulla on oikeus peruuttaa suostumuksesi, mutta tällöin suostumuksen peruuttamiseen saakka kerättyjä aineistoja voidaan käyttää tutkimuksessa. Tutkimuksessa kerättyjä tietoja voidaan luovuttaa tutkimuskäyttöön viranomaispäätöksellä voimassaolevien lakien mukaisesti. Suostumuksen kattamien käsittelytoimien tarkoitus on tieteellinen tutkimus ja henkilötietojen käsittelyn oikeusperuste on suostumus.

Pyydän ystävällisesti, että harkitset osallistumista tutkimukseen. Kiitos paljon jo etukäteen!

Jos sinulla on mitä tahansa kysyttävää tutkimukseen liittyen, voit ottaa yhteyttä opiskelijatutkijaan Kaisa Keoghiin

Pori *10.04.2019*

Kaisa Keogh, Opiskelijatutkija, YAMK  
Satakunnan ammattikorkeakoulu

**Narrative of the Oiva-application guided relaxation:**

Hakeudu paikkaan, jossa voit rentoutua hetkeksi ilman häiriötekijöitä. Ota mukava makuuasento ja sulje silmäsi. Keskity kuuntelemaan hengitystäsi. Sinun ei tarvitse muuttaa sitä, huomaa vain hengityksesi rytmi. Tarkastele miltä kehossasi tuntuu, kun hengität sisään ja ulos omaan luonnolliseen tahtiisi.

Syvennä hengitystäsi hetkeksi ja huomaa, kuinka rintakehäsi laajenee ja vatsasi kohoaa sisäänhengityksellä, ja uloshengityksellä koko kehosi vähitellen rentoutuu ja painautuu alustaa vasten. Jatka näin hetken aikaa ja palaa vähitellen luonnolliseen kevyeen hengitykseen. Kuuntele, miltä kehossasi tuntuu juuri nyt. Jos jossain osassa kehoasi tunnet kylmyyttä tai lämpöä, jännitystä tai rentoutta, niin vain huomioi se, arvostelematta ja yrittämättä muuttaa tuntemuksiasi. Anna itsesi rauhoittua tähän hetkeen.

Siirrä ajatuksesi siihen, miten kehosi lepää alustalla koko painollaan. Tunne, kuinka painavat jalkateräsi ja nilkkasi ovat. Anna niiden painon laskeutua alustaan, pohkeita myöten. Polvesi pehmenevät, reites ja pakarasi rentoutuvat raskaina alustaa vasten. Tunne lantiosi paino.

Vatsasi ja rintakehäsi muuttuvat rennommiksi ja raskaammiksi jokaisella uloshengityksellä. Myös koko selkäsi painautuu alustaa vasten pehmeänä ja painavana. Niskasi ja hartiasi sulavat kohti alustaa. Tunne olkavarsiesi paino ja anna painon levitä alemmas käsivarsiisi. Ranteesi pehmenevät ja kämmenesi ja sormesi lepäävät alustaa vasten.

Tunne, kuinka niskasi ja kaulasi pehmenevät. Pääsi painautuu alustaan koko painollaan. Anna otsasi ja leukasi rentoutua täysin. Luovu myös kielesi jännityksestä, anna sen vain rentoutua suusi sisällä. Anna kasvojesi levätä. Painon myötä kehosi voi päästää irti kaikesta jännityksestä.

Kiinnitä nyt huomiota niihin osiin kehostasi, jotka koskettavat alustaa. Mitkä kohdat ovat täysin ilmassa? Kuinka erilaisilta nämä kohdat tuntuvat? Ala hiljalleen liikutella sormiasi ja varpaitasi. Anna liikkeen kasvaa ja levitä käsiisi ja jalkoihin. Voit myös keinutella lantiotasi kevyesti puolelta toiselle.

Hetken päästä voit alkaa avalla silmiäsi ja herätellä kehoasi kevyin ojennuksin ja haukotuksin. Hakeudu rauhassa istuma-asentoon ja siitä takaisin seisomaan. Huomaa olosi kehossasi nyt ja kiitä itseäsi tästä harjoituksesta.