

Päivi Lappalainen

# Act, Accept and Be Mindful

Evaluation of Three Technology- and  
Internet-delivered Psychological  
Interventions for Mood and Well-being



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## ABSTRACT

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The aims of this research were, first, to evaluate three brief technology- and Internet-delivered psychological interventions based on acceptance and commitment therapy (ACT), and their impact on mood and stress-related distress, and, second, to evaluate the feasibility and acceptability of these interventions. The research comprised three randomized controlled trials in which technology was combined with methods of acceptance and commitment therapy. Study I evaluated the feasibility of the P4Well intervention in the treatment of mood and stress-related psychological problems. The P4Well intervention combined personal health technologies including web portal, mobile phone applications, and personal monitoring devices with an ACT-based group intervention. 23 male participants experiencing mood and stress-related problems were randomly assigned to an intervention group (n = 11) and a wait list control group (n = 12). Studies II and III assessed the use of a guided six-week ACT-based Internet-delivered program, *Good Life Compass*, for depressive symptoms and general well-being. Study II comprised 38 participants who were randomly assigned to guided Internet-based ACT (iACT, n = 19) including two face-to-face sessions, and to face-to-face ACT (ACT, n = 19). In Study III, Internet-based ACT (iACT, n = 19) without any face-to-face support was compared to a waitlist control (n = 20). In both studies, Master's level students in psychology acted as coaches/therapists. In all three studies, depressive symptoms decreased and general well-being improved as a result of the interventions. Most importantly, the treatment effects lasted over the follow-ups, indicating both short- and long-term positive effects in depressive symptoms and various other constructs including ACT-related process measures. In addition, all three interventions were well-received and recommended for use with others by the participants. In sum, the results of the three studies demonstrated that brief guided technology- and Internet-delivered interventions based on acceptance and commitment therapy were effective in alleviating depressive symptoms and enhancing well-being.

Keywords: technology- and Internet-based psychological interventions, mood disorders, acceptance and commitment therapy

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## TIIVISTELMÄ (FINNISH ABSTRACT)

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Teknologia- ja internet-pohjaiset psykologiset interventiot mielialan ja hyvinvoinnin edistämiseksi: Hyväksymis- ja omistautumisterapiaan pohjautuvien interventiomenetelmien arviointi

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Tämän tutkimuksen tavoitteena oli tutkia kolmea teknologia- ja internetpohjaista psykologista interventiota ja niiden vaikuttavuutta mielialaongelmiin ja yleiseen hyvinvointiin. Lisäksi kartoitettiin sitä, miten tutkimuksiin osallistuneet henkilöt hyväksyivät kyseiset interventiot. Tutkimuksen tarkoituksena oli selvittää erityisesti, voidaanko teknologia- ja verkkopohjaisten, hyväksymis- ja omistautumisterapiaan perustuvien psykologisten interventioiden avulla vähentää masennusoireita ja parantaa yleistä hyvinvointia. Tutkimus koostui kolmesta satunnaistetusta vertailevasta osatutkimuksesta, joissa yhdistettiin teknologiaa sekä hyväksymis- ja omistautumisterapian menetelmiä. Osatutkimukset toteutettiin kolmessa eri vaiheessa, kolmella eri ryhmällä ja niihin osallistui yhteensä 100 henkilöä. Ensimmäisessä osatutkimuksessa arvioitiin interventiota, jossa yhdistettiin teknologialaitteet ja verkkoportaaali hyväksymis- ja omistautumisterapian periaatteisiin pohjautuvaan ryhmämuotoiseen intervention. Tutkimukseen osallistui 23 työikäistä 28–58-vuotiasta miestä, jotka kokivat stressiperäistä kuormittuneisuutta ja mielialaongelmia. Toinen ja kolmas osatutkimus arvioivat hyväksymis- ja omistautumisterapian menetelmiin pohjautuvaa *Hyvän elämän kompassi* -verkko-ohjelmaa ja intervention vaikuttavuutta masennusoireisiin ja hyvinvointiin. Toiseen osatutkimukseen osallistui 38 ja kolmanteen 39 masennuksesta kärsivää henkilöä. Tulokset osoittivat, että teknologialla tuettu hyväksymis- ja omistautumisterapiaan pohjautuva ryhmä ja yksilöinterventio vähensivät merkittävästi masennusoireita ja paransivat yleistä hyvinvointia. Tutkimuksiin osallistuneet henkilöt hyväksyivät kyseiset interventiot ja olivat valmiita suosittamaan vastaavanlaista hoitoa myös muille masennuksesta tai uupumuksesta kärsiville. Yhteenvetona voidaan todeta, että sekä teknologialaitteilla tuettu hyväksymis- ja omistautumisterapiaan pohjautuva ryhmäinterventio että yksilöhoitoina toteutetut verkkointerventiot vähensivät merkittävästi masennusoireita ja paransivat yleistä hyvinvointia. Näin ollen teknologian yhdistäminen psykologisiin hoitoihin antaa vaihtoehtoja perinteisesti tarjottavien psykologisten hoitojen rinnalla ja joustavia mahdollisuuksia tarjota hoitoa useammille tarvitseville.

Avainsanat: teknologia- ja verkko-pohjaiset interventiot, masennus, hyväksymis- ja omistautumisterapia



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*Focus on the journey, not the destination. Joy is found not in finishing an activity but in doing it. - Greg Anderson -*

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- II Lappalainen, P., Granlund, A., Siltanen, S., Ahonen, S., Vitikainen, M., Tolvanen, A., & Lappalainen, R. (2014). ACT Internet-based vs face-to-face? A randomized controlled trial of two ways to deliver acceptance and commitment therapy for depressive symptoms: An 18-month follow-up. *Behavior Research and Therapy*, 61, 43-54.
- III Lappalainen, P., Langrial, S., Oinas-Kukkonen, H., Tolvanen, A., & Lappalainen, R. (2015). Web-based acceptance and commitment therapy for depressive symptoms with minimal support: A randomized controlled trial. *Behavior Modification*, OnlineFirst, doi: 10.1177/0145445515598142.

Taking into account the instructions given and comments made by the co-authors, the author of the present thesis wrote the original research plan, participated in planning and execution of the interventions, and in collecting the data. The author contributed to the statistical analysis, and was the main author of the three publications.

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# 1 INTRODUCTION

Internet and mobile devices have become an important part of most people's lives all over the world. With technology allowing 24/7 media access, people spend a large amount of time online, through various social networking sites. Given the pervasiveness of such technologies, it is only natural that they have also found their way into healthcare. Mental health service providers have begun to realize that technology-delivered psychological interventions can complement and extend the present health care service, providing low-cost alternative resources around the clock, and also serving populations that are difficult to reach.

During recent years, the delivery of psychological treatments through the Internet has encountered a considerable amount of opposition and criticism. Notwithstanding, the field continues to grow, and Internet-based treatment programs for various disorders are being developed and evaluated at pace. Several factors can be adduced to explain the fact that Internet-delivered psychological treatments have become more acceptable both by professionals and recipients of services. First, Internet is nowadays a generally accepted, in many cases indispensable, tool in people's lives. Second, computer hardware and software have improved, making the computers easy to use and to communicate with. Also, specific ethical guidelines have been developed for Internet-based treatments, and online training possibilities have been established for professionals. Last but not least, the growing research on Internet-based treatments has demonstrated that such treatments are effective (Barak, Klein, & Proudfoot, 2009).

Internet-delivered psychological interventions are one approach among many others in the field of eHealth resources. For the term *eHealth* Oh, Rizo, Enkin, and Jadad (2005) found 51 different definitions, most of them referring to two universal themes, *health* and *technology*. The most commonly cited definition is that proposed by Eysenbach (2001), according to which it is essential to bear in mind that eHealth encompasses much more than the development of technology alone: "...In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude,

and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology" (para. 3). According to Eysenbach, the "e" in eHealth does not only stand for "electronic", but also for 10 other "e's" what eHealth is or what it should be: efficient, enhancing quality, evidence-based, empowering, encouraging, educating, enabling information exchange and communication, extending access to health care, ethical and equitable.

Today, eHealth encompasses a wide range of different eHealth categories, such as computerized self-help, websites that provide information, social media approaches, Internet chat forums for health-related discussions, personal blogs, videogames, tools to assess symptoms, mobile phone applications, virtual reality systems, and online psychotherapy (Parikh & Huniewcs, 2015; Richards, 2013). Among these, Internet-delivered psychological interventions have been the most evaluated in terms of validity and efficacy, with strong evidence for the use of online interventions in the treatment of various psychological disorders (Parikh & Huniewcs, 2015; Richards, 2013).

Internet-delivered psychological treatments are not, however, a new invention. In fact, the first fully automatic computerized treatments were developed by Dr. Isaac Marks in Great Britain as early as in the 1980s. The first psychological applications and treatments were delivered via CDs, DVDs, phone applications, and special computer programs. Today, psychological treatments are delivered mainly through the Internet, and very recently via smartphones (Andersson & Cuijpers, 2009). They can be used alone, in conjunction with conventional face-to-face treatment or pharmacotherapy, or as an alternative to individual contact with a psychotherapist for those who for various reasons lack access to conventional psychotherapy (Foroushani, Schneider, & Assareh, 2011; Parikh & Huniewics, 2015; Richards, 2013). In remote areas where evidence-based psychological treatment is often not available, Internet- and technology-delivered interventions may be the only means to provide access to psychotherapy. Improving access to psychological treatments is a vital health care issue worldwide (Richards & Bower, 2011). In the case of mood disorders, in particular depression – which is one of the leading contributors to burden of disease worldwide – it is of great importance to provide access to effective preventive interventions and reduce the high prevalence of depressive disorders. Preventive interventions can reduce the onset of depressive disorders by 22% (Cuijpers, van Straten, Smit, Mihailopoulos, & Beekman, 2008).

Cognitive behavior therapy (CBT) has been shown to be an evidence-based treatment for several kinds of psychological disorders, in particular for depression and anxiety disorders (Roth & Fonagy, 2005; Tolin, 2010). Internet-based cognitive behavior therapy (ICBT) has also been widely evaluated in studies investigating the efficacy, validity and acceptability of this delivery format. During the last decade, new approaches in the CBT family have emerged, such as mindfulness-based treatments and acceptance and commitment therapy (ACT). Acceptance and commitment therapy is an empirically-based psychotherapeutic intervention that uses acceptance and mindfulness



strategies, combined with commitment and behavior-change strategies, to increase psychological flexibility (Hayes, Strosahl, & Wilson, 2012). The ACT model has been applied to a number of conditions, and several studies have found ACT to be an effective or likely to be effective form of treatment for a wide range of psychological disorders (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Powers, Zum Vörde Sive Vörding, & Emmelkamp, 2009; Ruiz, 2010, 2012). There is also growing evidence that ACT is effective in reducing depressive symptoms (Kohtala, Lappalainen, Savonen, Timo, & Tolvanen, 2015; Bohlmeijer, Fledderus, Rokx, & Pieterse, 2011; Powers et al., 2009) and might have an equal impact on depression when compared with traditional cognitive-behavioral or cognitive therapy treatments (Forman, Herbert, Moitra, Yeomans, & Geller, 2007; Lappalainen, Lehtonen, Skarp, Taubert, Ojanen, & Hayes, 2007; Zettle & Rains, 1989).

No prior studies have investigated the effectiveness of guided Internet-delivered ACT interventions on depressive symptoms. Therefore, technology- and in particular Internet-delivered psychological interventions occupy a central role in this report the aim of which was to evaluate the outcomes and acceptability of three ACT-based, technology-delivered interventions for individuals with depressive symptoms. The second aim was to shed more light on Internet-based interventions in general.

## **1.1 Technology- and Internet-delivered interventions for improving mood**

### **1.1.1 Technology-delivered interventions to promote mental health**

In the field of psychology and psychiatry, eHealth for mental health is much more than just a set of static online website resources providing information about illnesses. In addition to psychoeducation, eHealth for mood ranges from various website interventions, such as Internet programs for symptom tracking and Internet-delivered psychological self-help to online counseling, social media platforms, Internet forums, blogs, virtual reality systems and mobile phones (Parikh & Huniewcs, 2015; Richards 2013). Under the heading of website interventions are tools for providing assessment and symptom tracking, such as a mood diary, and Internet-delivered self-help interventions for mood. Among tools for providing assessment and tracking symptoms of mood and anxiety, applications such as Check Up and WhatsMyM3, merit mention. The last-mentioned has been validated in a research study (Gaynes et al., 2010).

In addition to Internet-delivered psychological self-help interventions, social media offers new opportunities for promoting mental health, engaging with other people (peer support) and fostering interaction. Social media applications include Facebook, Twitter, various discussion forums, blogs, and online video games (Parikh & Huniewcs, 2015). Social media applications used for mood-

related purposes have not been widely investigated, but some preliminary results are available. A Facebook application developed by Park, Lee, Kwak, Cha, & Jeong (2013) examining the usage of Facebook showed that a user views of webpages related to depression were positively correlated to depressive symptoms. On the other hand, the number of Facebook friends and location tags was negatively associated with depression. Furthermore, Pereira (2014) reported that having a psychiatrist as a friend on Facebook enhanced the effects of medication in patients who were on antidepressants.

A promising alternative to treating mood disorders with the help of social media are the online videogames designed for adolescents with mood disorders. The program called SPARX is a CBT-based videogame for adolescents that aims at managing the symptoms of depression, anxiety and stress. Merry, Stasiak, Shepherd, Frampton, Fleming, & Lucassen (2012) found that SPARX was effective in reducing depressive symptoms and these results were also maintained in the 3-month follow-up. Another CBT-based video game, gNats Island, is also used to treat depression and anxiety symptoms in adolescents. gNats Island has been evaluated in three studies and support found for the usefulness of this videogame. Hence, videogames may be a novel, intriguing means of treatment for mood disorders in future (Parikh & Huniewcs, 2015).

Further interesting applications are presented by virtual reality systems. These have been developed during the last 15 years and can be successfully used to treat disorders such as anxiety, phobias, panic disorders and post-traumatic stress disorders (Riva, 2005). The efficacy of social support provided by blogs has not yet been investigated, but blogs could be very well used as a reflection resource in conjunction with psychotherapy or as a means to obtain support from peers. Support of this kind may influence adherence to treatment and decrease stigma (Parikh & Huniewcs, 2014).

Mobile phones are widespread, popular, portable, always on, and have advanced multimedia capabilities. These features mean that there are many ways to harness their potential in the treatment of mental disorders. For example, the phone can be used as a supplementary to means to support client adherence to treatment (Miloh et al., 2009; Strandbygaard, Thomsen, & Backer, 2010). There are also tasks in therapy and counseling that can be administered using mobile phones, such as sending text messages as reminders for medication intake (Mao, Zhang, & Zhai, 2008), weight loss (Patrick et al., 2009), diabetes (Franklin, Waller, Pagliari, & Greene, 2006; Kim, Kim, & Ahn, 2006), smoking cessation (Rodgers et al., 2005), or for making appointments. Motivational messages or check-ins can be delivered to clients between sessions or to support suicidal clients (Haszelwood, 2008). Young people, in particular, can easily be reached by mobile phones.

Cognitive behavior therapy delivered in automated text messages has been successfully tested as a means of preventing the onset of depressive disorder in adolescents (Whittaker et al., 2012). Mobile phones can also be used as diaries, for example for tracking or recording mood, anxiety, sleep, medication or eating behaviors (Matthews, Doherty, Sharry, & Fitzpatrick, 2008; Shapiro et

al., 2010). Mobile phones can deliver interventions for various purposes, for instance, for smoking cessation (Bricker, Mann, Marek, Liu, & Peterson, 2010; Bricker et al., 2014; Whittaker, Borland, Bullen, Lin, McRobbie, & Rodgers, 2009), and for obesity and stress (Ahtinen et al., 2013; Lappalainen et al., 2014) and for general well-being (Ly, Dahl, Carlbring, & Andersson, 2012). Despite the potential of mobile phones, only a small number of studies have tested their efficacy so far (Free et al., 2013).

In sum, eHealth interventions for mood disorders encompass a wide spectrum of different approaches. The advantages deploying information technology in mental health are potentially many. eHealth approaches such as social media should not be regarded as treatments per se, but rather as complements to traditional treatments by offering possibilities to connect with others and as a means of reducing stigma (Parikh & Huniewcs, 2015). The different possibilities offered by eHealth technologies need to be further developed and their efficacy and acceptability more closely investigated. Among the different prospective eHealth interventions, strong evidence exists for the benefits of Internet-delivered psychotherapy. Hence, this report aims to provide an overview of Internet-based psychological treatments.

## 1.1.2 Internet-based treatments

### 1.1.2.1 Definition

The field of Internet-based treatments has long been diffused and unstructured, lacking proper terminology, standards and methodology. This situation is partly due to the wide array of forms of treatment and of techniques delivering treatment on the Internet. Terms that have been used in the field include *web-based therapy*, *e-therapy*, *cybertherapy*, *eHealth*, *e-Interventions*, *computer-mediated interventions*, *online therapy*, and *online counseling*.

In 2009, Barak and colleagues proposed a four-fold classification of Internet-supported interventions, along with their terminologies, that could be used as a guide in further research in the field. The categories were: 1. web-based interventions, 2. online counseling and therapy, 3. Internet-operated therapeutic software, and 4. other online activities (Barak, Klein, & Proudfoot, 2009). They defined the term web-based interventions as follows: “a primarily self-guided intervention program that is executed by means of a prescriptive online program operated through a website and used by consumers seeking health- and mental-health related assistance. The intervention program itself attempts to create positive change and or improve/enhance knowledge, awareness, and understanding via the provision of sound health-related material and use of interactive web-based components” (Barak, Klein, & Proudfoot, 2009, p. 5)

Under this broad heading, Barak et al. (2009) identified three subtypes of web-based interventions: 1. web-based education interventions, 2. self-guided web-based therapeutic interventions, and 3. human-supported web-based therapeutic interventions. As the term reveals, web-based education interventions are mostly “inactive” programs designed for consumers seeking information

about a particular problem, and understanding of health- and mental health - related issues. They may contain some behavior change techniques but do not form a particularly structured treatment program.

Like human-supported interventions, self-guided web-based interventions are based on a particular psychotherapeutic approach (e.g. CBT; Interpersonal Therapy, IPT), often developed in line with an equivalent face-to-face treatment, and with the goal of creating positive cognitive, behavioral and emotional change in clients. Self-guided treatments may be relatively dynamic, providing a variety of multimedia and online activities, as well as some degree of automated feedback in various forms (text, graphical form or automated SMS or e-mails) and various degrees of tailoring (no, partial or high individual tailoring). Several of these self-guided treatments are open access programs (Andersson, Carlbring, Ljótsson, & Hedman, 2013; Christensen, Griffiths, Groves, & Korten, 2006). One advantage with open access applications without guidance is that they are often fully automated and do not require any therapist input. Thus, they can be delivered at a low cost, and additionally, they can reach a large number of participants. Research has shown, however, that open programs without guidance show higher drop-out rates and smaller treatment effects (Baumeister, Reichler, Munzinger, & Lin, 2014; Hedman, Carlbring, Ljótsson, & Andersson, 2014; Johansson & Andersson, 2012; Richards & Richardson, 2012). For this reason, they might be more suitable for less severe health-related problems and not for individuals suffering from more severe conditions (Andersson et al., 2013a). To date, there are several Internet-delivered, CBT-based self-help programs for mood disorders, some of them also including diagnostic and symptom monitoring, medication, and mood and thought trackers. Some programs also incorporate elements of mindfulness and Interpersonal Therapy. Two of these programs have free access and accordingly a large number of users: MoodGYM and Living Life to the Full. MoodGYM has been translated into Norwegian, Chinese, Dutch and Finnish, and has now over 850,000 registered users worldwide (<https://moodgym.anu.edu.au/welcome/faq>). Figure 1 illustrates one page of MoodGYM.

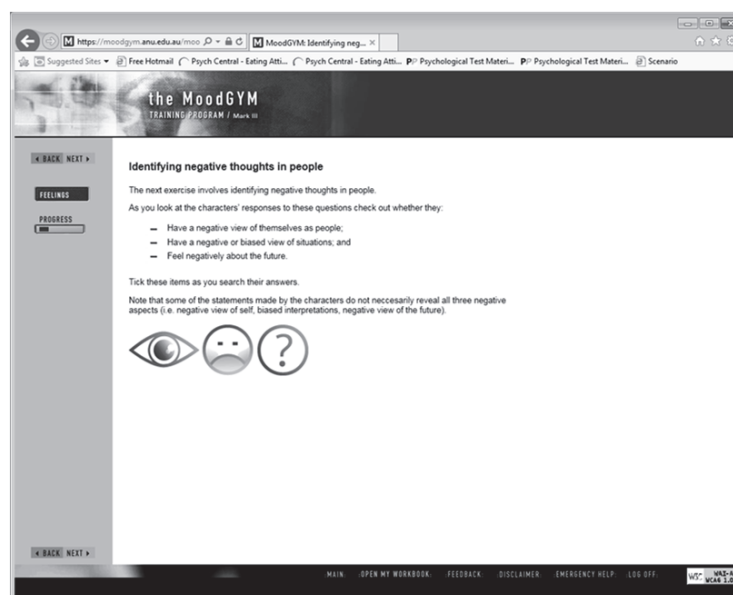


FIGURE 1 Example page of the MoodGYM program (available at <https://moodgym.anu.edu.au/>)

Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick (2009) propose a model to help to guide the development of Internet-based interventions. According to their model, effective Internet-based intervention produce and maintain behavior change through nine steps: (1) User characteristics (age, gender, socioeconomic status, traits, cognitive factors, beliefs and attitudes, physiological factors, skills) influenced by (2) Environmental factors (family, friends, employer, school, community, health care system), affects (3) Website (appearance, instructions on what to do to the problem, barriers, content, delivery - text, illustrations, sound, animations, audio, video, message - participation, and assessment), which is influenced by (4) Support (human support or without support, support via e-mails, SMS, telephone or face-to-face sessions), and (5) Website use or utilization of the intervention, which leads to (6) Behavior change (critical behaviors have changed) and (7) Symptom improvement (symptoms have reduced and a positive outcome has been achieved), through (8) Mechanisms of change (mechanisms responsible for bringing about behavior change and symptom improvement). The improvement is finally sustained through (9) Treatment maintenance (relapse prevention). This model can help developers and researchers to evaluate the different aspects of Internet-based interventions and to plan feasible interventions.

One of the goals of this report is to shed more light on the third category, human-supported web-based therapeutic interventions. However, the term *human-supported web-based therapeutic interventions* has not received recognition worldwide. A more widely used and accepted term for human-supported treatments is *guided Internet-delivered treatments* which can be defined as an ap-

proach where self-help materials are presented via the Internet and support is provided by a therapist or a clinician (Andersson, 2009; Hedman et al., 2014). The term *guided* is also used by Andersson (2009), suggesting that treatment delivered via the Internet can be unguided, pure self-help, without support or with minimal support from a therapist, or guided, where the therapist provides support and encouragement.

### 1.1.2.2 Development

Alternative, non-face-to-face methods, of providing psychological treatment have existed for decades, including the use of letters and telephone calls (Mozer, Franklin & Rose, 2008). One of the first to use letters to provide therapeutic consultation was Sigmund Freud. The first “tele-health application” was probably the experiment with a closed circuit television link that provided psychiatric and other health services between the Nebraska Psychiatric Institute and Norfolk State Hospital as early as 1959 (Perle, Langsam, & Nierenberg, 2011). The first computer program *Eliza* was developed at Massachusetts Institute of Technology by Joseph Weizenbaum between 1964 and 1966. Eliza is an early example of primitive language processing and operated by processing users' responses to scripts. The most famous script was that of *Doctor*, simulating a Rogerian psychotherapist. The person seeking help would just type his/her questions into the program and hit return. The Doctor would then answer to the question. Eliza marked the first attempt at creating a human-human interaction between a machine and a human (Perle et al., 2011). Figure 2 illustrates an example of Eliza.

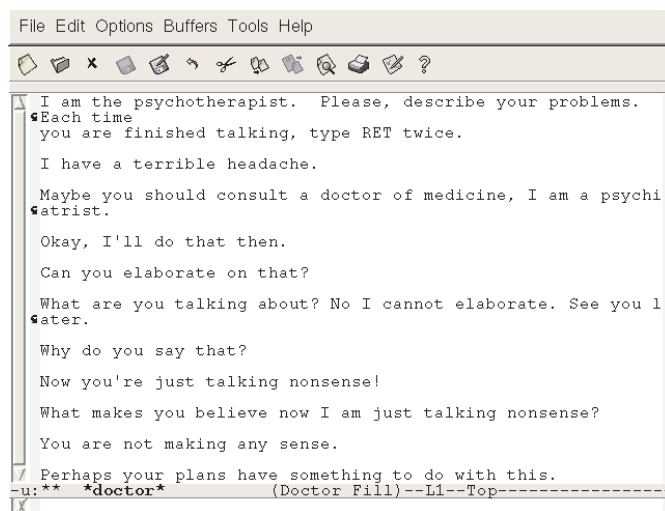


FIGURE 2 Example of Eliza (available at [http://commons.wikimedia.org/wiki/File:GNU\\_Emacs\\_ELIZA\\_example.png](http://commons.wikimedia.org/wiki/File:GNU_Emacs_ELIZA_example.png))

As stated earlier in this report, the first fully automatic computerized treatments were developed in the 1980s, while psychological research on Internet-delivered treatments started at the end of the 1990s (Marks, Shaw, & Parkin, 1998; Barak, 1999). In 1997, the world's first Internet-delivered treatment program, *Interapy*, was developed in the Netherlands (Ruuwaard, 2011), followed by the first Swedish Internet-based treatment in 1998, and, at about the same time, the world's first Internet-based program for panic disorder in Australia (Hedman et al., 2014; Klein & Richards, 2001). These three countries – together with Great Britain – continue to be pioneers in the field of Internet-based treatments.

Today, a clear majority of psychological web-based treatments worldwide are based on cognitive behavior therapy, although recent studies have shown that other psychological approaches can also successfully be delivered via the Internet, such as psychodynamic psychotherapy (Johansson, Frederick & Andersson, 2013; Johansson, Nyblom, Carlbring, Cuijpers, & Andersson, 2013). The roots of Internet-based cognitive behaviour therapy (ICBT) lie in bibliotherapy, e.g. self-help texts developed for the treatment of various disorders (Watkins, 2008). The effects of CBT delivered through self-help texts have been investigated and found effective in several studies (Scogin, Jamison, & Cochneaur, 1989; Mimeault & Morin, 1999; Fritsche et al., 2010). This in turn has encouraged the transfer of treatments based on self-help texts to the Internet, with Internet-based CBT becoming a new delivery format. Thus, ICBT can be regarded as online bibliotherapy delivered via the medium of the Internet (Andersson, 2009). In ICBT, the client is treated using the same principles and methods as in conventional treatment, with structured material and instructions provided through an Internet platform (Hedman, Andersson et al., 2011).

The field of Internet-delivered CBT is growing rapidly and there is now a wide array of conditions for which Internet-delivered CBT has been investigated. Between the years 2000 and 2012, ICBT had been tested for 25 different clinical problems and investigated in about 108 randomized controlled trials (RCTs), and their number continues to increase (Hedman, Ljótsson, & Lindefors, 2012). Clinical disorders where ICBT has been investigated are depression or depressive symptoms, panic disorder, social phobia, post-traumatic stress disorder, generalized anxiety disorder, obsessive-compulsive disorder, severe health anxiety, and spider phobia. Among health-related disorders, Internet-delivered CBT has been investigated in studies aiming at ameliorating chronic pain, tinnitus, irritable bowel syndrome, fatigue, sexual dysfunction, eating disorders, cannabis use, smoking cessation, pathological gambling, infertility stress, workplace stress, stress in caregivers of persons with dementia, child loss, grief, parental distress and body dissatisfaction (Hedman, Ljótsson, & Lindefors, 2012). However, data on the suitability of ICBT in certain patient groups continues to be lacking. It is possible that ICBT is less optimal in, for example, borderline personality disorders, obsessive-compulsive disorders and psychotic disorders (Hedman, Ljótsson, & Lindefors, 2012).

In addition to social phobia and panic disorder, the best support for ICBT has been found for depression (Hedman, Ljótsson, & Lindefors, 2012). A recent example is a study conducted at the Karolinska Institutet, Sweden. The study is one of the first depression studies to look at treatment given in a conventional care context. In the study, around 1,200 patients who received Internet-based CBT for depression at the Internet Psychiatry Unit, were monitored. The results indicated that the treatment was effective in reducing depressive symptoms and sleep difficulties (Hedman, Ljótsson et al., 2014).

### 1.1.2.3 Efficacy

Several reviews and meta-analyses have examined the efficacy of Internet-based treatments during the past 10 years (e.g. Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010; Baumeister et al., 2014; Barak, Hen, Boniel-Nissim, & Shapira, 2008; Cuijpers, Donker, Johansson, Mohr, van Straten, & Andersson, 2011; Cuijpers, Donker, van Straten, Li, & Andersson, 2010; Foroushani et al., 2011; Griffiths, Farrer, & Christensen, 2010; Hedman, Ljótsson & Lindefors, 2012; Kaltenthaler, Parry, Beverley, & Ferriter, 2004; Richards & Richardson, 2012; Marks, Cuijpers, Cavanagh, van Straten, Gega, & Andersson, 2009). These meta-analyses have investigated the efficacy of Internet-delivered treatment programs in general, as well as Internet-delivered treatments given with or without support, or compared to conventional treatment forms. Hedman et al. (2012) investigated 12 randomized controlled trials comparing ICBT with conventional CBT and found a mean pre- to post-treatment effect-size of  $d = 1.04$  for ICBT compared with the effect size of  $d = 1.14$  for traditional CBT. This finding is supported by Cuijpers et al. (2010) and by the recent meta-analysis and review of Andersson et al. (2014), according to which guided ICBT and face-to-face CBT produce equivalent effects. A recent meta-analysis suggests that self-guided programs are effective, especially if combined with support from a clinician (Wagner, Horn, & Maercker, 2014). Of these, MoodGYM and Beating the Blues have been evaluated in several effectiveness studies earlier (Christensen, Griffiths, & Jorm, 2004; Foroushani et al., 2011; Proudfoot, Ryden, Everitt, et al., 2004).

As stated earlier, ICBT has the best empirical support for depression, social phobia and panic disorder (Hedman, Ljótsson, & Lindefors, 2012). For depression and depressive symptoms alone, 20 ICBT-based randomized controlled trials had been conducted by 2012. Most of these studies targeted mild or moderate depression. One of the most recent ones is the review by Arnberg and colleagues (2014) in which the short-term efficacy of ICBT versus waiting-list control was investigated, resulting in an average effect size of  $d = 0.83$ . In the meta-analysis of Hedman, Ljótsson & Lindefors (2012) the within-group effect-size for ICBT (pre- to post treatment) in the treatment of depression or depressive symptoms ranged from  $d = 0.38$  to 2.27, with a mean of  $d = 0.94$ . The large variation is due to differences in the amount of therapist contact, with the lowest value ( $d = 0.38$ ) in wholly unguided ICBT and the largest ( $d = 2.27$ ) in ICBT enhanced with individualized e-mail contact. Another recent meta-



analysis by Richards and Richardson (2012), examining Internet-delivered treatments for depression with various grades of support, revealed an effect size of  $d = 0.56$  at post-treatment. In therapist-supported studies, the mean effect size was  $d = 1.35$ , in administrative supported studies  $d = 0.95$ , and in non-supported studies  $d = 0.78$ . Interestingly, the effect-sizes for all categories remained the same or improved at follow-up, with  $d = 1.29$  for supported,  $d = 1.20$  for administrative supported, and  $d = 1.13$  for non-supported treatments. Cuijpers et al. (2011a) examined the effects of psychotherapy for adult depression, including also Internet-based treatments. They found a mean effect size of  $d = 0.41$  for the 15 studies comparing Internet-based treatments and control groups. Supported treatments yielded an effect size of  $d = 0.61$  whereas unsupported treatments showed an effect size of  $d = 0.25$  which is in line with the effect sizes reported in other studies. Cuijpers et al. (2011b) also conducted a meta-analysis of studies on self-guided psychological interventions for depression, e.g. interventions without any contact between the participant and the therapist/coach. Comparison of intervention groups with a controls indicated a mean effect size of  $d = 0.28$ , and at follow-up  $d = 0.23$ . Thus, the effects of a self-guided intervention on individuals with depressive symptoms was small, but significant. Griffiths et al. (2010) conducted a review of 26 randomized controlled trials on Internet interventions and found effect sizes ranging from  $d = 0.42$  to  $d = 0.65$  for the treatment of depression, with varying amount of therapist support.

In sum, the meta-analyses conducted so far support the efficacy and effectiveness of Internet-based treatments for depression, both in diverse settings and among diverse populations. A challenge presented by Internet-delivered CBT is the maintenance of the outcome. Research on Internet-based treatments has been criticized for using too short follow-up periods, usually six months, while only a few studies have included longer follow-ups. However, the results obtained from studies with longer follow-up periods (from one year to 4 years) are promising and show that the results can be maintained over time (Hedman, El Alaoui et al., 2014; Ruwaard et al., 2009; Spek et al., 2008; Vernmark et al., 2010). Table 1 presents some of the recent reviews and meta-analyses examining Internet-based randomized controlled trials for depression.

TABLE 1 Recent reviews and meta-analyses examining Internet-based treatments (RCTs) for depression or depressive symptoms

Meta-analysis	RCTs included	Subjects	Control group	Therapist guidance	Effect size (mean) pre-post
Arnberg et al., 2014	8 (depressive disorder, dysthymia)	958	wait list control, online forum, online supportive therapy	phone or email, chat	$d = 0.83$ (M)
Hedman et al., 2012	20 (depression or depressive symptoms)	4776	waitlist control, discussion forum controls, treatment as usual	varying from no guidance to individualized e-mail contact	$d = 0.94$ (within-group ES)
Johansson & Andersson, 2012	25 (major depression)	5719	waitlist control, treatment as usual	varying from no contact to contact via e-mail, phone, chat	$d = 0.21$ for no human contact $d = 0.44$ contact before treatment $d = 0.58$ contact during treatment $d = 0.76$ contact before, during and after treatment (between-group ES)
Richards & Richardson, 2012	19 (depression)	10499	waitlist control	therapist-supported administrative-supported no support	$d = 0.56$ (M) 0.78 for therapist-supported 0.58 for administrative-supported 0.36 for no supported treatments
Cuijpers et al., 2011b	7 (depressive disorder or symptoms)	1362	control group	no contact	$d = 0.28$ (between-group ES)
Griffiths et al., 2010	8 (prevention, depressive disorder or symptoms)	2873	wait list control, treatment as usual, attention placebo	with or without support	$d =$ varying from 0.42 to 0.65 for participants with clinically significant symptoms
Andrews et al., 2010	6 (major depression)	642	waitlist, treatment as usual	varying from no support to therapist contact	$g = 0.78$ (between-group ES)
Andersson & Cuijpers, 2009	12 studies, 10 delivered via the Internet (depression)	2446	control group	supported and unsupported treatment	mean for all studies, $d = 0.41$ $d = 0.61$ for guided treatments $d = 0.28$ for unguided treatments (between-group ES)

#### 1.1.2.4 Characteristics

##### Assessment

An important component of Internet-delivered treatment is assessment – as in CBT treatment in general - including self-report questionnaires that can easily be administered online. Online data collection offers several advantages, such as overall flexibility, increased control and fewer data recording errors (Hedman, Carlbring, Ljótsson et al., 2014). This is also supported by studies showing that psychometric properties can be maintained even if the measures are administered online (Carlbring et al., 2007; Hedman, et al., 2010). The advantages of online data collection include, for instance, the feature that items cannot be skipped and that the scores of the online questionnaires can be calculated automatically. Data on clients' progress and symptoms may also be collected on a weekly basis during treatment. Automated alert systems can easily be built into online treatment and assessment, alerting the coach or therapist when a client reports severe symptoms or suicidal thoughts (Carlbring & Andersson, 2006). However, there are also risks associated with online data collection including lack of control and the fact that the client may seek to answer in a socially desirable way. Nevertheless, the same problem exists in "paper and pencil" data collection, as well.

Hedman, Carlbring et al. (2014) divide assessment in association with Internet-based treatments into three categories: 1. Assessment before treatment, 2. Assessment during the course of treatment, 3. Post-measurement after treatment. Careful assessment before commencing Internet-based treatment is important in order to match to the client to the correct treatment (Carlbring & Andersson, 2006). The ideal means to achieve a proper assessment is to meet the client personally before the start of the treatment. However, in Internet-based treatment, this is often not possible. An alternative way to assess the client is via a telephone or video call (Hedman, Carlbring et al., 2014). A careful assessment, including a diagnosis, may be even more important in Internet-based treatments than in conventional treatment. First, it may help to decide whether Internet-based treatment is to be considered at all as a treatment format. Second, a diagnosis may guide the choice of treatment steps or content. This is due to the fact that some online treatment programs are flexible and can be modified according to the client's needs. A proper assessment before the beginning of treatment also helps to decide for whom Internet-delivered treatment is suitable. Questions to consider include the following: Is the client motivated enough to participate in an Internet-delivered treatment? Are the client's problems suited to Internet-based treatment? Has the client adequate cognitive skills to take part in Internet-based treatment? (Hedman, Carlbring et al., 2014).

Assessment during the course of the treatment should be integrated into the online program and, preferably, conducted once a week. This will give the therapist valuable information on the symptom development and progress of the client. Measurement after treatment should preferably be conducted twice:

immediately after treatment (post-measurement) and after a follow-up period of 6 to 12 months (Hedman, Carlbring et al., 2014).

### **Treatment content**

Content of the website is the most important component of an Internet-based program. Without good content, it is not likely that behavior change can be achieved (Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick, 2009).

As high-speed Internet communication has become more common and the field of Internet-delivered treatments has become increasingly versatile, treatment content has also advanced. In the late 1990s, the first materials were downloadable pdf -files, but today, along with self-help texts, treatment programs consist of audio and video files, chat forums, discussion groups and other interactive elements. In spite of integrating more interactive elements, the core of the treatment continues to be based on self-help texts (Andersson, Carlbring et al., 2013).

In addition to content, the readability and structure of the text material is crucial, as also are home assignments with a clear deadline (Andersson, Carlbring Berger, Almlöv, & Cuijpers, 2009; Andersson, Carlbring et al., 2013). Self-help texts need to be compact, easy to understand and provide clear instructions for home assignments and behavioral activation. Too much material could lead to unnecessarily complex treatment programs that clients perceive as too stressful, which, in turn, could have an impact on client adherence and compliance (Andersson, Carlbring et al., 2013).

Treatment should preferably be delivered in modules within a fixed timespan. Most programs consist of 6-15 modules of different length and follow a specific structure. Currently available ICBT treatments usually start with psychoeducation and end with relapse prevention – with the actual treatment modules in between. Ideally, modules may be revised, shortened or extended, new features may be added or removed to suit the needs of individual clients and their capacity to take in information. As stated earlier in this study, highly educated participants are used to reading and writing while others may have a hard time to completing the same tasks. For this reason, some treatment programs have been tailored according to client characteristics and their preferences, as well as according to their symptoms, with personalized treatment as the goal (Andersson, Carlbring et al., 2013; Johansson et al., 2012).

Technical issues such as the ease of navigation, accessibility and readability of the relevant webpages are essential for treatment adherence and for the effectiveness of the treatment (Andersson et al., 2009; Whitehead & Proudfoot, 2010). Also, relevance for the particular patient group, currency and interactivity to enhance user engagement are further criteria for a good intervention site (Whitehead & Proudfoot, 2010). In addition, ethical and security issues must be taken into account to ensure a secure exchange of information between the client and the therapist (Andersson et al., 2009; Whitehead & Proudfoot, 2010); see Whitehead and Proudfoot (2010) for standards and guidelines for Internet interventions).

According to Andersson, Carlbring et al. (2013), there is no reason to believe that more interactive treatment programs are more effective than text-based treatments. On the contrary, interactive treatments tend to be rather short, and therefore do not include the same amount of treatment sensitive information as text-based ones which can be equal a book in length. Therefore, the length of Internet-delivered CBT-treatments is close to that of traditional CBT-treatments.

Individual tailoring of the treatment may be more effective for patients with higher severity of depression and comorbid symptoms than a standardized treatment. Johansson et al. (2012) compared a tailored treatment targeting depression with highly prevalent comorbid symptoms with a standardized treatment group and a discussion group. Results indicated that tailored treatment was more effective than the two other treatments among those who had a high level of depression and more comorbidity at pretreatment. Therefore, addressing comorbidity by tailoring may make Internet-based treatments more effective, in particular in the treatment of severe depression.

The efficacy of Internet-delivered treatments can be derived from the fact that they are able to include more information and treatment components than traditionally delivered treatments (Andersson, Carlbring et al., 2013). Another advantage is that the effectiveness of Internet-delivered treatments is enhanced due to the fact that the program is accessible at any time and at any place. Andersson, Carlbring et al. (2013) point out that IBCT may be compared to online distance learning with certain texts to read, video or audio recordings to view and to listen to, and home assignments and other tasks to complete by a certain deadline.

### **Guidance and communication**

Internet-based interventions can be delivered in different forms, varying from self-help open access treatment delivered without therapist guidance to supported treatments that provide a certain degree of support to clients. Some studies have shown that online therapy programs can be effective even without the support of a therapist (e.g., Griffiths et al., 2010). However, most research indicates that the treatment outcomes in Internet-based treatment are associated with the amount of therapist support (Andersson, 2006; Andersson & Cuijpers, 2009; Andersson et al., 2007; Andrews et al., 2010; Newman et al., 2011; Ruwaard et al., 2009; Vernmark, et al., 2010). In other words, treatments offered with therapist support yield better results in the form of larger effect sizes than fully automated Internet-based treatments (Hedman et al., 2012; Johansson & Andersson, 2012; Palmqvist, Carlbring, & Andersson, 2007). Entirely self-guided programs have also shown larger attrition rates (Christensen, Griffiths, Mackinnon, & Brittliffe, 2006; Clarke et al., 2005; Kaltenthaler et al., 2008). Therefore, the provision of guidance from a support person is essential in promoting adherence to treatment (Andersson & Carlbring, 2010). Based on the results of a recent review, however, Baumeister et al. (2014) suggest that compared to unguided treatments the effect of guidance is smaller than has been

reported. In spite of this finding, they take the view that guidance should be an important part of internet-based interventions, whenever this is feasible and affordable. Researchers do not know for sure what the optimal amount of support given by the therapist should be (Griffiths et al., 2010). Based on earlier findings, Andersson et al. (2009) suggested that it may be sufficient for the therapist to spend 100 minutes per client providing feedback and giving comments on home assignments during the course of a 10-week program. Interestingly, there are also indications that increasing therapist contact time beyond a certain level does not improve treatment gains (Vernmark et al., 2010).

The most common format of delivery and therapist contact in Internet-based treatment is asynchronous (delayed) communication (Perle et al., 2011). This refers to communication in which there is a time lag between the contact made by the participant and the feedback given by the therapist. The contact may be via e-mail, chat room, message board or via a special platform. This form of communication has several advantages, for example, it allows the client and the therapist to work at their own pace without the need to make appointments in advance. There is also some evidence that text-based communication is more honest communication (Mora, Nevid, & Chaplin, 2008) when compared to real-time face-to-face treatment or other synchronous communication.

Synchronous (real-time) communication between therapist and client includes methods that can be applied in real time, such as video conferencing through web cameras, text messages and live chat rooms. The advantages include spontaneity and the possibility to reveal important information, which cannot be reached in asynchronous communication. These forms of real-time communication are suitable alternatives, for instance, if the client is less eager to complete writing assignments. However, while synchronous forms of Internet-delivered treatment do not save much therapist time, they offer an option when, for various reasons, the client is not able to attend face-to-face treatment.

Therapist support is most often implemented via e-mail, preferably in a secure system, or/and telephone calls. The channel of support may also be face-to-face, by regular post, SMS, voicemail or the Internet (Marks, Cavanagh, & Gega, 2007). In a pilot trial, Lindner and colleagues (Lindner, Linderot, Olsson, Johnsson, Dahlin, Andersson, & Carlbring, 2014) found that therapist guidance by telephone was equal to guidance by e-mail in regard to treatment outcome, therapeutic alliance and treatment engagement. While the type of support may not play such an important role, it is, however, essential to make it clear to the client that there is a person behind the treatment program, particularly when the program includes less contact. This can be done by presenting the staff along, with names and pictures, in the Internet program (Andersson et al., 2009).

Support is usually given in the form of answers to questions, encouragement, and feedback on homework assignments (Paxling, Lundgren, Norman, Almlöv, Carlbring, Cuijpers, & Andersson, 2013), and the mode of delivery is often email or text messages. The best way to handle feedback and home assignments is through a shared portal to which both therapist and client have access (Andersson et al., 2009). The therapist spends usually about 15-20

minutes on support and feedback weekly. In a closer scrutiny of therapist support, and especially the timing of feedback, Paxling et al. (2013) found a positive correlation between encouragement and treatment outcome. In contrast, flexibility with home assignments had a negative impact on treatment outcome. In other words, when clients were allowed more time to complete their home assignments, they improved less. Nordin, Carlbring, Cuijpers, & Andersson (2010) found that a clear deadline for treatment and an interview at the end of the treatment had an impact on client adherence and decreased the drop-out. Thus, setting clear deadlines for the completion of home assignments is considered an essential and important part of Internet-delivered treatments. There are indications that this might even decrease the need for continuous therapist support. Compliance with treatment increases when the client knows that there is a person “watching over” her, expecting her to complete the weekly home assignments and show recovery (Andersson et al., 2009).

Therapist support is likely to be crucial especially in the treatment of depression where no support leads to poor results (Andersson et al., 2009). Such support may also come from a non-clinician as shown in the studies of Titov et al. (Robinson, Titov, Andrews, McIntyre, Schwencke, & Solley, 2010; Titov, Andrews, Choi, Schwencke, & Johnston, 2009; Titov, Andrews, Davies, McIntyre, Robinson, & Solley, 2010; Titov, Andrews, Schwencke, Solley, Johnston, & Robinson, 2009). This is in line with Baumeister et al. (2014) who suggest that the qualification of e-coaches seems to be of less importance. This may be interpreted by the fact that Internet-based interventions are often highly standardized and less therapeutically oriented interventions. In addition, higher motivation and more time spent on each client may compensate for a lack of qualifications. Andersson and Carlbring (2010) suggest that the supportive role of the therapist in online treatments might require less skills than in face-to-face delivered therapies. Excellent results have also been obtained with psychology students as coaches.

Further studies are needed to investigate the best way of providing guidance. Questions of interest concern when guidance should be provided and how much of a “dose” is needed. Alternative approaches are guidance at the beginning, at the end or/and during the course of intervention. Guidance on demand is another option to be considered. Too much contact does not necessarily lead to better treatment results (Bendelin, Hesser, Dahl, Carlbring, Zetterqvist Nelson, & Andersson, 2011). It may instead decrease the client’s self-efficacy and lead her to believe that she is not responsible for her own well-being. In addition, research should investigate and establish skills that are needed for an e-coach to be effective. Along with efficacy, the focus should be on cost-effectiveness (Baumeister et al., 2014).

### **Engagement, adherence, attrition and therapeutic alliance**

As the available evidence suggests, Internet-delivered interventions can have a significant impact on common mental health problems (e.g., Klein & Proudfoot,

2010). However, there are several challenges that Internet interventions may encounter, such as engagement, adherence and attrition. Cavanagh (2010) defines *engagement* as starting and continuing to work with the intervention, *adherence* as active use of the intervention, as it is “prescribed”, and last, *attrition* as terminating use of the intervention before its end or being lost to follow-up. There are several reasons why clients may or may not take up an Internet treatment. In order to facilitate engagement, it may be appropriate to provide the client with “taster” sessions, to address the client’s concerns and expectations and to clear up misunderstandings. Adherence and attrition can be improved by offering brief weekly therapist support (face-to-face, telephone or email) before and during Internet interventions and using different kinds of reminders and prompts (Cavanagh, 2010; Titov, Andrews, Choi et al., 2009).

Adherence to guided Internet-based treatment (ICBT) has been investigated in two meta-analysis. Richards and Richardson (2012) found a completion rate of 72% in therapist-supported, and 65% in treatments with administrative support. A slightly lower rate, 65%, was found by van Ballegooijen and colleagues (2014). They also found that participants in guided ICBT completed on average 80.8% of the treatment. Equivalent rate among participants allocated to face-to-face CBT was 84.7% (van Ballegooijen et al., 2014). These results suggest that adherence to guided ICBT is adequate compared with face-to-face ICBT.

The influence of the *therapist factor* or *common factor* on treatment efficacy has been noted in several studies and is considered the most important factor determining treatment outcome (Wampold, 2001; Wampold & Brown, 2005). In guided Internet-based treatments, contact with the therapist is understandably much less frequent, and shorter in duration, and owing to the lack of face-to-face visibility different than in face-to-face treatments. This may result in a weaker or even non-existent client-therapist -relationship. Therefore, study of the therapeutic alliance in Internet-based treatments has received more interest in recent years, with the research yielding in somewhat mixed results. On the one hand, some studies suggest that the therapist effect plays a less essential role in Internet-delivered treatments (Almlöv, Carlbring, Källqvist, Paxling, Cuijpers, & Andersson, 2011; Andersson, Paxling, Wiwe, Vernmark, Bertholds Felix, Lundborg, Furmark, Cuijpers, & Carlbring, 2012), although it is not totally absent. According to Carlbring & Andersson (2006), clients can develop a good relationship with the therapist via, for instance, e-mail correspondence.

On the other hand, other recent studies indicate that the working alliance in online treatments may be comparable to that of the more conventional type of treatments. A review based on 11 studies investigating the therapeutic relationship indicated that there was a relationship between the therapeutic alliance and e-therapy outcome. Internet-based therapy seemed to be equivalent to face-to-face therapy in terms of the therapeutic relationship (Sucala, Schnur, Constantino, Miller, Brackman, & Montgomery, 2012). Preschl, Maercker and Wagner (2011) explored the therapeutic alliance in an RCT for depression comparing an Internet-based treatment group and a face-to-face group and found that the working alliance in the online group was comparable to that in the face-to-face



group. This is also supported by earlier studies investigating the therapeutic alliance in Internet-based interventions (Cook & Doyle, 2002; Knaevelsrud & Maercker, 2006, 2007). Andersson et al. (2012) investigated the working alliance in guided ICBT across three different treatments - depression, generalized anxiety disorder and social anxiety - and found high alliance ratings in all three groups, comparable to those in face-to-face treatment. Very recently, Jasper, Weise, Conrad, Andersson, Hiller and Kleinstäuber (2014) explored the working alliance by comparing Internet-based self-help and face-to-face cognitive behavior therapy and found a strong alliance in both conditions, although more time might be needed to build a strong alliance in Internet-based treatment. In addition, the results indicated that in ICBT and face-to-face CBT different aspects of the alliance may be crucial for treatment success. Jasper and colleagues (2014) claimed that the personal affective bond between therapist and client might be important in face-to-face treatment, whereas the (highly structured) therapeutic tasks might be the most important factor for treatment success in Internet-based interventions.

In sum, these results suggest that it is possible to establish a good therapeutic alliance in Internet-based treatments although owing to the lack of visibility the therapist-client relationship may be slightly different. To some extent, Internet-delivered treatments may also question current perceptions about the psychotherapeutic relation (Carlbring & Andersson, 2006).

#### **For whom is Internet-based treatment suitable?**

Knowledge on the predictors of the Internet-based treatment outcomes remains limited, making it difficult to assess for whom this treatment mode is best suited. One might expect Internet-based treatments to be best suited to young people and males with high computer skills. However, some studies have indicated that computer skills seem to have little or no impact on treatment success (Hedman et al., 2012). There are some indications that Internet treatment works best with slightly older people and persons who are able to take responsibility for their treatment (Hedman, Carlbring et al., 2014). Further factors that seem to play an important role are motivation and treatment credibility, e.g. how convinced the client is about the value of Internet treatment before it starts (Andersson, 2009; Carlbring et al., 2006). Fewer comorbid depressive symptoms, a stable economic situation, being in employment, and relationship status have also been found to be predictors of positive outcome (Hedman, Carlbring et al., 2014). In a recent study investigating predictors of adherence, Farrer, Griffiths, Christensen, Mackinnon, and Batterham (2014) found that persons with higher levels of motivation, those with higher education and younger participants were more adherent to the intervention. Those with lower levels of baseline depression also showed more adherence. However, the Internet program used in this study was MoodGYM, which was originally developed for younger people. Results from a recent meta-analysis based on data from 2705 participants from ten self-guided web-based interventions for depression (RCTs) indicated that

male gender, lower educational level and co-morbid anxiety symptoms significantly increased the risk of drop-out (Karyotaki, Kleiboer, Smit et al., 2015).

Interesting results have been reported concerning personality traits in Internet-based treatments. Andersson, Carlbring and Grönlund (2008) investigated predictors of treatment outcome in Internet versus face-to-face treatment for patients suffering from panic disorder and found that certain signs of personality disorders, in particular trait anxiety, may predict a worse outcome for Internet treatment than face-to-face treatment. Thus, it may be important to assess personality disorders before choosing the treatment format (Andersson et al., 2008). The study of Hedman, Andersson et al. (2014) was the first to demonstrate that a brief ICBT intervention for severe health anxiety had an impact not only on health anxiety, but it also caused long-term changes in personality traits related to neuroticism.

Internet-delivered treatment is often based on text materials and written correspondence between client and therapist, which may imply that good cognitive capacity, particularly verbal fluency is an essential factor in Internet treatment. Therefore, it has been suggested that Internet-delivered treatment may best suit for highly educated people – those who are used to reading, writing and applying the relevant skills to themselves – and data supporting this has also recently been reported (Farrer et al., 2014). Accordingly, Hedman, Carlbring et al. (2014) suggest that the therapist should explore the client's reading habits in order to minimize the risk of unsuccessful treatment.

Although the outcome predictors in Internet-delivered treatments are in many cases the same as those in conventional treatments (Hedman, Ljótsson et al., 2014), such as motivation, employment, family and female gender, there are indications that the outcome predictors for Internet treatment are different. Research suggests that clients with severe symptoms, such as personality disorders and high comorbidity may need a more individually tailored face-to-face treatment protocol than Internet-based treatment. Outcome predictors may also vary from disorder to disorder. However, it is clear that it is increasingly important to investigate for whom Internet-delivered treatment is best suited.

#### **1.1.2.5 Pros and cons**

Internet-based treatments allow a variety of treatment options and ways of reaching different clientele. Internet-based interventions or parts of them can also be used to complement face-to-face treatment, which may enhance the efficacy of the treatment. In the near future, it is possible that patients in face-to-face therapy may start asking for online material to support them during the course of their treatment (Andersson, 2010).

Internet-based treatments offer several advantages, including reduced stigma, cost-effectiveness, and the ability to reach out to people who would otherwise not be able to receive evidence-based treatment. Hedman, Ljótsson et al. (2014) and Marks et al., 2007 list the reasons why Internet (or computer-aided) treatment is to be considered as a feasible alternative:

First, the Internet is rapidly expanding and becoming more accessible also through portable and wireless devices, such as mobile phones. It has been estimated that 73.5% of the European population were potential Internet users in 2014, and in Finland, the corresponding figure was 93.5, one of the highest in Europe (Internet World Stats, 2014). Second, Internet-based treatments are effective and their results are comparable to face-to-face treatments, as stated earlier in this review. Third, Internet-based treatments can widen access to evidence-based psychological treatment. In many countries, the demand for psychotherapy is larger than the number of trained psychotherapists. Internet-based treatment may reduce therapist time per client and reduce the barriers experienced in conventional face-to-face treatment, such as the inconvenience of scheduling, making appointments, and missing work or school. Also, clients living in remote areas, physically restricted patients, and patients who are reluctant to seek face-to-face treatment owing to the stigma related to psychological treatment may be reached through Internet-based programs. Furthermore, Internet-based treatment offers a viable and cost-effective option particularly for socially withdrawn individuals, such as severe agoraphobic patients who are unwilling or unable to attend a clinic (Andersson, 2010; Carlbring & Andersson, 2006; Emmelkamp, 2005). A fourth advantage, particularly in treatments that are not delivered in real time, is the convenience of home use and accessibility of the treatment: both client and therapist are able to access the treatment and work at their own pace in any time and at any place, at their own convenience. The findings of Winzelberg (1997) indicate that participants in an electronic support group posted more than half of their messages at times when conventional therapy was unavailable. Fifth, Internet-based treatment may contribute to better adoption and rehearsal of the treatment material. Owing to its accessibility on the Internet, the client can go back to the treatment material and rehearse it several times, thereby facilitating and strengthening learning. Also, the client becomes more independent of the therapist, more or less his/her own therapist (Andersson et al. 2012). Sixth, Internet-based treatment may be a feasible way to use scarce resources in health care: not all clients need the same type and intensity of help. Some clients benefit from less intensive care. Therefore, clients with more severe symptoms, who need longer and more intensive treatments, can get face-face treatment while others can be offered Internet-based treatment as a the first stage of treatment. Importantly, easing access to psychological treatment also allows earlier access to care, thus enabling prevention and early intervention and reducing costs to health services. Furthermore, computers and the Internet offer several tracking systems to monitor the client's progress and compliance with treatment, preferably on a weekly basis (Carlbring & Andersson, 2006). Additionally, assessment and working materials can be administered and stored online which enables the therapist to monitor the client's progress in therapy (Hedman et al., 2012). A further advantage of Internet-based interventions is that it ensures delivery of evidence-based treatment that otherwise might not be available.

A potential problem in Internet-based interventions is the absence of visual cues and facial expressions. However, some clients find it easier to deal with sensitive issues on a computer rather than seeking to conceal them in a face-to-face interview with the therapist (Marks et al., 2007). Interestingly, there is also some evidence that the use of virtual humans, animated characters that interact with people in natural ways, i.e. via speech, can facilitate the sharing of sensitive issues in assessment interviews and make patients more willing to disclose (Lucas, Gratch, King, & Morency, 2014).

Moreover, one of the primary advantages of Internet-based treatments is cost-effectiveness. With decreasing and limited health care resources, cost-effectiveness has become more and more important. According a review by Tate and colleagues (2009), detailed analyses of cost-effectiveness in Internet-based treatment were lacking, recently, however, research results have suggested that Internet-based treatment is more cost-effective in the long run compared to group therapy (CBT) for social anxiety disorder (Hedman, Andersson, Ljöttson, Andersson, Rück, Mörtberg, & Lindfors, 2011). Studies conducted on the treatment of irritable bowel syndrome (Andersson et al., 2011; Ljöttson et al., 2011) and severe health anxiety (Hedman, Andersson, Lindfors, Andersson, Rück, & Ljöttson, 2012), as along with the review by Hedman et al. (2012) support the view that Internet-based treatments are a cost-effective alternative. Hedman et al. (2012) estimate that ICBT has a 79.5% probability of being more clinically efficacious at a lower cost to society, and therefore conclude that ICBT is highly cost-effective.

The disadvantages of Internet-based treatments include dissemination of poor or wrong information, security risks and risks of personal integrity, risk of identifying and managing acute crises, loss of information, and dissemination of Internet-based treatment to clients for whom this treatment format is unsuitable, and who, as a result, may experience treatment failure and conclude that psychotherapy does not work for them. The fact that visual cues and facial expressions are missing in Internet-based treatment, poses a potential risk for misunderstandings between therapist and client. Further, potential risks are possible deterioration of the clinician's skills - if they start doing most of their therapy work on the Internet - and the threat that regular clinical services may no longer be funded if Internet-based treatments take over. Further disadvantages include lack of engagement, attrition and continuity of care (Andersson, 2010; Carlbring & Andersson, 2006; Christensen, 2010).

In sum, in spite of the caveats and future challenges, Internet-based treatments offer numerous advantages to the extent that it would be inappropriate not to use Internet treatment at least as a complement to our other treatments (Andersson et al., 2009). Importantly, various eHealth applications, including Internet-delivered treatments have the potential to improve equity of access to health services in an easy accessible and cost-effective way (Banbury, Roots, & Nancarrow, 2014). Additionally, they may improve opportunities for professional development. Guided Internet-based treatments compare well with traditionally delivered face-to-face treatments and produce equivalent (Andersson

et al., 2014; Cuijpers et al., 2010) and often long-lasting effects (Ruwaard et al., 2009; Spek et al., 2008; Vernmark et al., 2010). Furthermore, there are indications that Internet-delivered interventions increase a client's self-efficacy, stimulate self-management and make him/her less dependent on the therapist (Bendelin et al., 2011). Empowerment along with easy accessibility may contribute to good maintenance and to equivalent treatment outcomes when compared to traditionally delivered treatments (Andersson et al., 2007).

## 1.2 Depression

### 1.2.1 The global burden of depression

Depression is the most common mental disorder, affecting about 350 million people throughout the world and at least 21 million in Europe (Sobocki, Jönsson, Angst, & Rehnberg, 2006). Depression causes considerable suffering and imposes an immense burden on individuals, communities and health services (Mathers, Vos, Stevenson, & Begg, 2000). According to the 17-country World Mental Health Survey, about 1 in 20 people reported experiencing an episode of depression (WHO 2012). Mental disorders are not only highly prevalent conditions but they are also highly disabling. The World Health Organization (WHO) ranks major depressive disorder (MDD) as the fourth leading cause of disability worldwide. At the individual level, mental disorders, especially depression, are estimated to cause more disability days than physical disorders (Bruffaerts, Vilagut, Demyttenaere, Alonso, AlHamzavi et al., 2012).

In addition to human suffering depression is associated with significant costs to society (Luppa, Heinrich, Angermeyer, König, & Riedel-Heller, 2007). In 2004, the costs caused by depression amounted to €118 billion in Europe, which is equal to 1% of the total economy (Sobocki et al., 2006). Evidence from a study of 10000 Swedish patients with depression in psychiatric care revealed a mean annual cost per patient of €17.279 of which the largest single item comprised the indirect costs caused by sick leave and early retirement (Ekman, Granström, Omérov, Jacob, & Landén, 2013). Both major depressive episodes and mild depression cause significant societal costs (Cuijpers et al., 2007). According to a large cost-of-illness study in a German population by Kleine-Budde, Kawohl, Müller, Bramesfeld, Moock, & Rössler (2013), the costs for persons with severe depression were five times higher than the costs for those with mild depression and two times higher than for those with moderate depression. In the sample studied by Ekman et al. (2013), the average cost for mild depression per patient was €14.200 and for €21.500 for severe depression.

Given the knowledge that depression has a high impact on both an individual and societal level and results in both partial and full disability days, it should be considered as a public health priority (Bruffaerts et al., 2013). Research clearly indicates that persons with severe depression incur more costs than persons with mild depression (Ekman et al., 2013; Kleine-Budde et al.,

2013). However, even minor improvements in depressive symptoms can be of societal significance.

### 1.2.2 Stress and depression

Depression can be caused by several factors, including genetic, biological, environmental, and psychological factors that vary across individuals. The current biologic understanding of depression sees depression as an outcome of dysregulation of the central nervous system responses to stress (Richards, Timulak, Doherty, Sharry, Colla, Joyce, & Hayes, 2014). In particular during the developmental years, exposure to intense and chronic stress has long-lasting neurobiological effects and increases the risk for anxiety and mood disorders (Schneidermann, Ironson, & Siegel, 2005). A large body of research suggests that there is a robust association between stressful life events and a major depressive episode (Hammen, 2005), and that first depressive episodes are often developed after a major negative life event (Schneidermann, et al., 2005). According to Kendler, Thornton, and Gardner (2001), there are specific gender differences in exposure to stressors. For men, the most distressing life events are divorce, separation and work-related problems, whereas women are likely to become depressed in response to problems in relationships with people close to them.

Work-related stress is a risk factor for developing symptoms of depression (Clays, De Bacquer, Leynen, Kornitzer, Kittel, & De Backer, 2007). Research suggests that high job demands in combination with low job control and social support may increase adverse health effects and risk for depression (Clays et al., 2007; Sinokki, Hinkka, Ahola, Kivimäki, Honkonen, Puukka et al., 2009; Virtanen, Honkonen, Kivimäki, Ahola, Vahtera, Aromaa et al., 2007). In the presence of repeated high job strain, for example, risk for developing high levels of depression was high both among men and women (Clays et al., 2007). Men with repeated low levels of social support at work were also more likely to become depressed.

### 1.2.3 Treatment of depression

The phenomenon of depression has been divided into several diagnostic categories by the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013). The most common diagnosis, major depressive disorder, is characterized by low mood, fatigue or decreased energy, decreased interest or pleasure in most activities, feelings of worthlessness or guilt, disturbed sleep or appetite, diminished ability to concentrate, for at least 2 weeks. Moreover, depression is often related to several other psychological disorders such as anxiety disorders.

Depression can be successfully treated with antidepressant medication or psychotherapy and comparable effects have been shown for major depression (Cuijpers, Sijbrandij, Koole et al., 2014). Antidepressant medication is the most

common treatment for mood disorders. However, they do not work for everyone and can cause troublesome side effects.

Different types of psychotherapies provide an alternative to antidepressants for individuals suffering from unipolar depression which is the most common depressive disorder, occurring in about 10% of men and 20% of women. However, it is still under debate whether all types of psychotherapy and antidepressants medication are equally efficacious. There are some indications that psychotherapies such as cognitive behavior therapy, interpersonal therapy, behavioral activation (BA) or problem-solving treatment (PST) are as efficacious as medication (DeRubeis et al., 2005; Elkin et al., 1995; Dimidjian et al., 2006; Mynors-Wallis, Gath, Day, & Baker, 2000), whereas non-directive supportive counseling and Tricyclic antidepressants seem to be less efficacious than other treatments (Cuijpers et al., 2013). A meta-analysis of 53 studies conducted by Cuijpers, van Straten, Andersson, and van Oppen (2008) found that IPT was slightly more efficacious than other major types of psychotherapies (CBT, non-directive supportive treatment, BA, psychodynamic treatment, PST, IPT, and social skills training). All in all, there appear to be no large differences in efficacy between the major psychotherapies for mild to moderate adult depression. It appears that the type of treatment may matter only when dealing with patients with more severe depression (Hollon & Cuijpers, 2013).

According to recent reviews and meta-analyses (Spijker, van Straten, Bockting, Meeuwissen, & van Balkom, 2013) combined treatment (psychotherapy and antidepressants) appears to be more effective and long lasting than treatment with antidepressant medication alone in cases of major depression. There are also indications that the effects remain strong and significant up to two years after treatment (Cuijpers, Berking, Andersson et al., 2014). While antidepressants are associated with a high relapse rate following cessation, the effect of psychological therapies can persist over time. Also, antidepressant medication may be an effective form of treatment for more severe depression, but the effectiveness of antidepressants for mild and moderate depressive episodes is questionable (Fournier et al., 2010).

As stated earlier, CBT is a treatment approach that has been shown to be an evidence-based treatment for several kinds of psychological disorders, in particular for depression and anxiety disorders (Roth & Fonagy, 2005; Tolin, 2010). A recent meta-analysis examined the effects of cognitive behavior therapy for adult depression and found it to be an effective treatment. There are also indications that CBT has a longer lasting impact after the treatment period than medication. A recent meta-analysis comparing the effects of acute phase CBT with the effects of pharmacotherapy at long term follow-up found that patients who received acute phase CBT were less likely to relapse than patients treated with pharmacotherapy (Cuijpers, Sijbrandij, Koole et al., 2014).

Despite the availability of efficacious interventions, depression may often go unrecognized and untreated. It has been documented that more than 75% of depressed individuals do not receive adequate treatment (Andrews, Issakidis, Sanderson, Corry, & Lapsley, 2004; Young, Klap, Sherbourne, & Wells, 2001).

Access to effective care is not always easy to obtain owing to lack of resources and competent evidence-based treatment providers as well as the stigma associated with mental disorders (Shafran et al., 2009). Alternative modes of delivery would facilitate access to CBT especially in rural areas where there are few therapists (Vos, Corry, Haby, Carter, & Andrews, 2005).

Since depression poses a substantial public health challenge and is associated with significant human suffering and economic costs, it is important to improve the availability of empirically supported psychological treatments and to develop new flexible and cost-effective modes of treatments. Ensuring access to treatment for psychological problems is a top priority in many countries around the world (Richards & Bower, 2011).

### **1.3 Acceptance and commitment therapy**

Acceptance and commitment therapy (ACT) is a so called “new wave” of cognitive behavioral therapy that has its foundations in applied behavior analysis, specifically in Relational Frame Theory, a theory of how human language and cognition influences experience and behavior. RFT investigates how people become so controlled by their thoughts, memories, feelings and bodily sensations, that they become insensitive to environmental contingencies (Hayes, Strosahl, Bunting, Twohig, & Wilson, 2004). ACT is based on the view that language is at the core of human suffering and of many psychological disorders. What prolongs this suffering is experiential avoidance and cognitive fusion (Hayes et al., 2004). However, although many of our psychological problems originate in thought and language, it is not possible for us to live without language. ACT attempts to help the client to bring language and thought under “appropriate control” (Hayes et al., 2004).

ACT is not a disorder specific treatment or a set of techniques, rather, it can be regarded as a general model of psychological health, psychopathology and change (Twohig & Hayes, 2008). It can be applied to a broad range of psychological and health problems, in different settings and with various populations (Hayes et al., 2004). In ACT, direct instructions and logical analyses play a limited role. Instead, ACT uses a non-linear language based on metaphors, stories, experiential exercises, behavioral tasks and paradox (Hayes et al., 2004). Despite belonging under the umbrella of CBT approaches, its model differs from traditional cognitive behavior therapy (Zettle, Rains, & Hayes, 2011). One of the key differences is that ACT does not aim to modify or correct distorted cognitions, as in the traditional CBT or cognitive therapy (CT) models (Beck, 1993), but rather the goal is to change the function of thoughts, feelings, memories, and sensations that are feared or avoided (Hayes et al., 2004). ACT uses mindfulness and acceptance strategies to teach awareness and focus on the present, and to develop an attitude of acceptance towards those thoughts and feelings. Another important feature of ACT is a strong emphasis on clarifying per-



sonal values and committing to value-based actions to help create a meaningful life (Strohsal & Robinson, 2008; Twohig & Hayes, 2008).

The ACT treatment model has been applied to a number of conditions, and several studies have found ACT to be an effective, or likely to be effective, form of treatment for a wide range of psychological disorders including depression, anxiety disorders, chronic pain, substance abuse, diabetes, and psychosis (A-Tjak, Davis, Morina, Powers, Smits, & Emmelkamp, 2015; Hayes et al., 2006; Powers et al., 2009; Ruiz, 2010, 2012). In addition, ACT has been used in non-clinical context, in educational and occupational settings, and for performance enhancement (Flaxman, Blackledge, & Bond, 2011). In particular, ACT has been applied successfully in work settings to improve psychological well-being of diverse employee groups. The results of studies conducted in occupational settings indicate that ACT significantly improved people's mental well-being and propensity to innovate, and it does so because it increases psychological flexibility and acceptance (e.g., Bond & Bunce, 2000; Bond & Bunce, 2003; Bond & Hayes, 2002). As of August 2014, there were 102 randomized controlled trials of ACT published, since when many further studies have been published and many more are underway (see [https://contextualscience.org/ACT\\_Randomized\\_Controlled\\_Trials](https://contextualscience.org/ACT_Randomized_Controlled_Trials)).

### 1.3.1 The six core processes of ACT

The six core processes define the ACT intervention model: values, value-based actions, self as context, contact with the present moment, acceptance, and defusion (Hayes et al., 2004). In the model, the first two, values and value-based actions, form the commitment and behavior change processes while the remaining four (acceptance, defusion, self as context and contact with the present moment) constitute the mindfulness- and acceptance processes (Hayes, Strohsal, & Wilson, 2012). These are all inter-connected and support each other. Each of them plays an important role in determining how well humans are able to adapt to changes and challenging life situations (Hayes et al., 2012). However, there is no "correct" order for training these processes, and not all clients need to work in all six of these areas (Hayes et al., 2004). By targeting these processes, the purpose of ACT is to help develop greater psychological flexibility. Psychological flexibility is the capacity to continue with a behavior, or change it, guided by one's chosen values (McCracken & Vowles, 2014). The flip side of each of these processes constitute an ACT model of psychopathology: unclear values, inaction, conceptualized self, not present, avoidance and fusion. This is the pathological core of problems from an ACT point of view, the outcome of which is psychological inflexibility (Twohig & Hayes, 2008).

**Values.** The ultimate goal of ACT is to increase the frequency of valued living (Hayes et al., 2004). Technically speaking, values or valued living can be defined as "ways of responding that give increased access to relatively *stable, long-term* sources of positive reinforcement" (Blackledge & Barnes-Holmes, 2009,

p. 42-43). The emphasis here is on stable and long-term, indicating that behaviors a person is committed to give access to sustainable and long-term positive reinforcement. An individual may receive *immediate* positive reinforcement from the use of alcohol, but, in the long run, consequences for health may be fatal. Value-driven behavior is not about “musts” or “have-tos” – it is more about “want-tos”. In other words, values reflect sources of positive reinforcement rather than avoidance of negative consequences (Blackledge & Barnes-Holmes, 2009). The goal of values clarification is to help the individual to find and choose directions in life that offer an increased sense of vitality, meaning and purpose. On the basis of the direction determined by an individual’s personal values, the individual’s concrete goals, behaviors and actions are then defined (Hayes et al., 2004).

**Value-based actions.** At its’ core, ACT is a therapy for behavior change (Strohsal & Robinson, 2008). The goal of ACT is to help the individual get into motion, to make and keep commitments that work to promote one’s sense of vitality and well-being. Committed action is rooted in values one has chosen (Strohsal & Robinson, 2008). For instance, when you struggle with depression, you may avoid spending time with friends because you feel too depressed. Eventually, your friends stop reaching out to you and you feel even more depressed. You are deeply trapped in a toxic cycle of avoidance. When ‘friends and close relationships’ is a value that the person has chosen, a value-based action would be, for example, to commit to various activities and social gatherings with friends, like going out with somebody, invite someone for coffee, make a phone call to someone. In particular for persons suffering from depression, values and value-based actions are essential processes to work with. Values can be considered as motivators of change, incentives for action, and value-based actions as activators of meaningful, values-consistent action – which is often lacking in depressive persons.

When striving to act in ways that are consistent with values, psychological barriers, such as distressing thoughts, feelings, memories and sensations will arise along the way. To cope with these barriers and be able to experience problematic thoughts in a new context requires the processes and skills of defusion, present moment and acceptance (Hayes et al., 2004).

**Defusion** strategies aim to decrease unhelpful effects of language and cognition. Cognitive fusion is a process in which thoughts and language have a strong impact on behavior. Thoughts seem to be what they are related to, not what they really are (Twohig & Hayes, 2008). ACT teaches clients to see thoughts as thoughts, feelings as feelings, memories as memories, and sensations as sensations. Thoughts per se are not harmful or toxic, even though they often are experienced as bad, and thus need to be eliminated. Defusion techniques are utilized to reduce the believability and distress produced by thoughts (Hayes et al., 2004). They include various exercises designed to break down the literal meaning of thoughts and to see thoughts simply as thoughts. A depressed client may be fused with a particular thought, for example, that she is “an unlovable person” which may cause her to withdraw from life activities

and worsen depression. Defusion exercises teach her to take distance from that thought, to say to herself: "It is only a thought I observe I am having, it's just a thought, nothing more". In this way, the thought is no longer experienced as threatening as it was at first.

**Present moment.** Most of the time people live in their heads, either in the past or in the future, thinking about what has happened to them or worrying what could happen in the future. We spend much less time experiencing what is really happening right now, around us (Twohig & Hayes, 2008). ACT promotes effective and open contact with the present moment. The goal is to put the client in contact with experiences, thoughts, feelings, emotions, sensations and the environment, that are occurring right at this moment, and not as products of thought (Hayes et al., 2004). If one is aware of what is happening right now, one's opportunities to choose behaviors based on one's values should increase (Blackledge & Barnes-Holmes, 2009). Work on the present moment requires at least two skills: the ability to experience what is occurring at this moment, and to label and the ability to describe these events without judging them (Twohig & Hayes, 2008).

**Self-as-context** involves an awareness of the unchanging perspective from which a person can experience various aspects of life (Blackledge & Drake, 2013). A central goal of ACT is to help clients to adopt this kind of perspective. Although many things change during the course of a lifetime, in a deep sense the "I" remains the same "I", despite all the changes. When adopting the sense of self-as-context, it is possible to become more aware of what is happening in the moment and also act according to one's values (Hayes et al., 2004). Likewise, it is possible to respond in a healthier and flexible manner to difficult thoughts, feelings and sensations. A depressed client may describe herself as forty-five years old, depressed, anxious, bad at relationships, responsible for a failed marriage. This is a story she has been selling herself. It contains all the thoughts, feelings, memories and evaluations she has bought into and integrated into her verbal picture of herself. They are like labels that she has put on herself. Rigid attachment to these labels, this self-story may guide behaviors that maintain the story - and depression - and thus serves as a barrier to valued living.

**Acceptance.** As a result of our cognitive abilities, we carry painful thoughts, feelings and memories with us all the time. Verbal cues, words, are enough to bring them alive (Hayes et al., 2004). The problem is that we cannot run away from them. According to ACT, *experiential avoidance* is the key problem in many forms of psychopathology including depression: an unwillingness to remain in contact with painful thoughts, feelings, memories and bodily sensations, and attempts to escape, avoid or modify these (Hayes et al., 1996). Emotions and cognitions that are "bad" should be avoided. Unfortunately, the short-term consequences of experiential avoidance are often positive and avoidance appears to work, but in the long term, the desire to control or avoid one's own unacceptable or intolerable thoughts and feelings can actually lead to much more suffering. Attempts to cope with unwanted emotions by avoiding or sup-

pressing them can lead to substance use, social withdrawal, overeating or other self-destructive behaviors that may cause even more suffering in the long term.

There are two main forms of experiential avoidance: suppression and avoidance of situations (Hayes et al., 2004). Suppression is the attempt to control and/or eliminate an unwanted thought, feeling, memory or bodily sensation. Situational escape or avoidance means avoiding places, situations and things that may trigger unwanted thoughts, feelings and sensations. Depression can very often be caused by emotional and situational avoidance. People engage in avoiding painful emotions or situations in the hope that controlling painful emotions and thoughts may reduce depression. Unfortunately, trying not to think of something evokes thinking of it, and can even increase the frequency of the very thoughts and feelings we are trying to get rid of. Paradoxically, these strategies may only strengthen depression (Hayes et al., 2004). For example, a person with depression avoids going out with friends because of the thought that “she is unlovable” or “nobody likes me”.

From an RFT perspective, thought suppression can be interpreted as follows. A person thinking about a dog she has recently lost might think “Stop thinking about the dog. You should think about something else”. The rule the person thus constructs for herself is “Think about something else and not your dog because that makes you sad”. That something else could be, for example, “a holiday”. The thought is now: “Think about the holiday and not your dog because thinking about the dog makes you feel sad and thinking about the holiday makes you happy”. The “holiday” is now verbally related to “happy” but also to “sad” and “dog”. Because these words are now verbally related, they can change the function of “holiday”, and the word “holiday” can evoke thoughts of the dog and sadness. In this way, thoughts of the dog will paradoxically increase and not decrease, as the person had hoped.

Acceptance is taught as an alternative to control and experiential avoidance (Blackledge & Barnes-Holmes, 2009). It does not mean tolerance or resignation, or putting up with life experiences. Instead, it means choosing to experience those painful thoughts, feelings and memories as they are, openly, without putting up a defense. Technically speaking, acceptance involves “a lack of verbally based avoidance in the context of valued actions” (Blackledge & Barnes-Holmes, 2009, p. 54). A person who has lost someone very close to her may want to avoid sadness and so acts by trying to avoid thinking of that person. As seen above, this strategy may lead to more of the same sad thoughts. Instead of getting rid of negative emotions, the strategy is to accept painful experiences, and, at the same time, focus on building and living the life one wants to live. In ACT, this stance is often described as “making space” for something painful. Painful, unwanted thoughts and feelings are not toxic - even though we think that they are. It is natural and normal to feel pain when we experience challenging life events: serious illnesses, deaths, losses or other difficult circumstances. They don't feel good but avoiding and controlling them may be very toxic indeed. With acceptance, the power of thoughts, feelings and sensations is diminished and instead of the struggle to control, the person is able to move toward

towards her/his values (Strohsal & Robinson, 2008). As a matter of fact, acceptance is *exposure* to something you would rather avoid or escape from: willingness to expose yourself to sadness, painful memories or something you would rather like to escape (Hayes et al., 2004). Willingness can be defined as the *choice* to enter a difficult situation or painful feelings and acceptance as the adoption of an open, flexible *posture* to stay in contact with those difficult thoughts, feelings and memories when doing so (Strohsal & Robinson, 2008).

There is a substantial body of evidence on how psychological acceptance is essential in dealing with psychological distress (Hayes et al., 1996). In depression, acceptance plays an important role, as it is often caused by difficult life circumstances. These painful memories and other unwanted private events will inevitably arise – whether we want them to or not. The question is whether we are willing to face our “demons” or continue struggling with them.

RFT can be used as a tool to understand why acceptance and other ACT-related processes could be applied in the treatment of depression.

### 1.3.2 Acceptance and commitment therapy for depression

In the field of depression, there is growing evidence that ACT is effective in reducing depressive symptoms (Kohtala et al., 2015; Bohlmeijer et al., 2011; Powers et al., 2009) and might have an equal impact on depression when compared with traditional cognitive-behavioral or cognitive therapy treatments (Forman et al., 2007; Lappalainen et al., 2007; Zettle & Rains, 1989), showing also that ACT works through different mechanisms than cognitive therapy (Zettle, Rains, & Hayes, 2011).

One of the first studies to investigate ACT for depression is that by Zettle and Rains (1989), in which depressed clients were treated with group cognitive therapy or with comprehensive distancing – the term by which ACT was known in the 1980s. While all three treatments showed significant reductions in depression symptoms, the results pointed at different underlying therapeutic mechanisms. Zettle, Rains and Hayes (2011) conducted a reanalysis of this 12-week group ACT compared with group cognitive therapy. ACT was shown to produce larger improvements in self-reported depression, and the effect was mediated through the process of cognitive defusion at post-treatment. In line with other studies, this study adds to the evidence that ACT works through different processes than cognitive therapy. Similarly, Forman and colleagues (2007) conducted a randomized study of 101 patients receiving cognitive therapy or ACT. The results suggest that both treatments were equally effective but seemed to work through different mechanisms. The study of Lappalainen et al. (2007) compared the impact of traditional CBT and ACT treatment given by trainee therapists. Clients treated within an ACT model showed better symptom improvement than clients treated with CBT. Bohlmeijer et al. (2011) investigated the efficacy of an early intervention based on ACT for depressive symptoms and found that an early intervention aimed at increasing acceptance led to a statistically significant reduction in depressive symptomatology (Cohen's  $d = .60$ ). These reductions were maintained at the three-month follow-up. A re-

cent study by Kohtala et al. (2015) examined the effectiveness of a four-session ACT-based treatment for self-reported depressive symptoms administered by masters level psychology students compared to a waiting list control (WLC) group. The results showed that depressive symptoms decreased by an average of 47%, compared to 4% in the WLC group, and that treatment outcomes were maintained at 6 months post-treatment. Other studies, however, have reported that long-term treatment outcomes for depression were slightly better maintained in the CT condition when ACT was compared with Cognitive Therapy (Forman, Shaw, Goetter, Herbert, Park, & Yuen, 2012).

Elements of ACT have also been successfully combined with behavioral activation (BA) in the treatment of depression. Carlbring et al. (2013) investigated Internet-delivered behavioral activation combined with components of acceptance and commitment therapy. Results at post-treatment showed a large difference between group effect sizes on the primary BDI-II measure. Gaudio, Nowlan, Brown, Epstein-Lubow, & Miller (2012) investigated the efficacy of a combination of elements of behavioral activation and acceptance and commitment therapy for major depression with psychotic features and found that patients improved significantly from post-treatment to follow-up. ACT is considered as an empirically supported treatment, though still with only modest support ("probably efficacious treatment") on depression by the American Psychological Association (2013).

### **1.3.3 Internet-delivered acceptance and commitment therapy**

Internet-based psychological interventions based on acceptance and commitment therapy remain scarce, although their number is growing rapidly. Internet-delivered acceptance and commitment therapy -based treatments have been investigated for a number of conditions. Hesser et al. (2012) compared guided Internet-delivered ACT with guided Internet-delivered CBT for tinnitus, suggesting that both treatments were equally effective for this disabling complaint. ACT-based interventions for chronic pain have recently received extensive empirical support. For example, in their investigation of a guided Internet-delivered treatment based on ACT, Buhrman et al. (2013) found that Internet-delivered ACT can be a viable alternative in the management of chronic pain. In turn, Ljótsson et al. (2014) conducted a pilot study on Internet-delivered ACT investigating acceptance and exposure strategies for fibromyalgia. The results showed significant improvements in all outcome measures and suggest that Internet-delivered acceptance- and value-based treatment is a feasible option for fibromyalgia.

Recently, Internet-based prevention and treatment programs have been developed for college students. Levin, Pistorello, Seeley, and Hayes (2014) developed and tested a web-based program called ACT on College Life with promising results. Räsänen, Lappalainen, Muotka, Tolvanen and Lappalainen (Submitted manuscript, 2015) investigated the efficacy of a program called The Student Compass aimed at students at the University of Jyväskylä. Moreover, an online ACT-based values training program based on acceptance and commitment

therapy has been found to improve undergraduate students' academic performance (Chase et al., 2013). Additionally, the first pilot trial investigating web-based acceptance and commitment therapy intervention for smoking cessation supported the feasibility and efficacy of this approach to the problem (Heffner, Wyszynski, Comstock, Mercer, & Bricker, 2013).

These studies suggest that Internet-delivered psychological programs based on the principles of acceptance and commitment therapy are efficacious and well-accepted, and have – in addition to symptom reduction – a positive impact on quality of life, psychological flexibility and academic performance.

## 1.4 Aims of the research

The aim of the present research was to evaluate the outcomes and acceptability of technology- and Internet-delivered treatments based on acceptance and commitment therapy for individuals with stress-related and depressive symptoms.

This report includes three studies with the general goal of providing a better understanding on how new technologies can be employed in the service of mental health and well-being. The studies investigated short- and long-term intervention outcomes in depressive symptoms, physiological and psychological symptoms, psychological flexibility and various ACT-related process measures in three groups of individuals and their controls.

### 1.4.1 Specific aims of the studies

**Study 1** assessed the feasibility of a personal health technology-based psychological intervention for men reporting stress-related mood problems and compared treatment outcomes with a waiting list control group. The main goal of this small-scale randomized controlled pilot trial was to investigate whether the intervention would be feasible and produce improvements in depression and other health-related measures compared with controls.

The aim of **Study II** was to investigate two interventions based on acceptance and commitment therapy for depressive symptoms: face-to-face treatment (ACT) was compared to guided self-help treatment delivered via the Internet consisting of two assessment sessions (pre and post) and an ACT-based Internet program (iACT). Our hypothesis was that both ACT-interventions would have similar effects in reducing depressive symptoms and distress. The study also investigated the acceptability of the iACT intervention.

The aim of **Study III** was to explore the effectiveness of Internet-delivered ACT-based treatment with email-based reminders for depressive symptoms without any face-to-face contact. We expected that the ACT-intervention would show positive effects on the symptoms of depression, and on the ACT-related process measures. A further aim of the study was to investigate treatment acceptability.

## 2 METHOD

### 2.1 Participants

In **Study 1**, participants were recruited through an advertisement seeking males aged 25 to 45 years old with symptoms of exhaustion, stress or sleeping problems. Eligibility criteria were full time employment, basic computer skills, and access to Internet. Exclusion criteria included diabetes and simultaneous attendance in other stress management programs. 29 prospective clients contacted the psychotherapy clinic of the University of Jyväskylä via telephone or email. Due to the low number of respondents, who met the criteria, the age range was adjusted from 29 to 58 years. The number of participants finally included in the study was 23 (mean age = 43.42; SD = 7.57). The Research Ethics Committee of Jyväskylä University approved the study protocol. Research participants were informed about the research protocol and signed informed consent before enrolling in the study.

In **Study II** participants were recruited by means of an advertisement in a local newspaper stating that a university project was seeking individuals suffering from depressive symptoms. Sixty participants responded to the advertisement through email and telephone, and were screened over the telephone using a structured interview. Depressive symptoms - the most important eligibility criteria - were assessed using three questions based on the DSM-IV. In addition, they had to meet the other inclusion criteria, including no simultaneous treatment of depression or other psychological problems, at least 18 years of age, basic computer skills and access to the Internet at home. Twenty of 60 individuals were excluded, either they did not meet the criteria or were not able to participate in the entire study. Of the 40, two persons were placed on a waiting-list as we were only able to offer treatment to 38; hence, the final sample comprised of 38 participants (26 females, 12 males; mean age = 44.61; SD = 14.28). Ethical approval was obtained from the Research Ethics Committee of the University of



Jyväskylä. Informed consent was received from research participants before the commencement of the study.

In **Study III**, recruitment of research participants was implemented through an advertisement in two regional newspapers, based in cities of Jyväskylä and Oulu, respectively. The advertisement stated that the university clinic was seeking participants with depressive symptoms and that treatment would be delivered online. Forty-two prospective participants contacted the clinic at the University of Jyväskylä through email and telephone during the given timetable, and were screened over the telephone by psychology students using a structured interview format. The telephone screening was conducted in order to determine the suitability of the participants for the study. The main inclusion criterion was the presence of self-reported depressive symptoms which was assessed by both a single question (*Do you feel depressed at the moment?*), and questions elaborated on the basis of the DSM-IV criteria for major depressive disorder (American Psychological Association, 1994). The other inclusion criteria were: no parallel treatment for depression and/or other psychological problems, at least 18 years of age, possession of an email account and access to Internet at home, and a telephone. Exclusion criteria were no depression according to the interview and receiving parallel psychological treatment. Additionally, if on medication, the participants were asked to keep the dosage constant throughout the study. Two participants did not meet all the inclusion criteria and were excluded from the study. For reasons unknown, one person dropped out before randomization. Thus, the total sample consisted of 39 participants (28 females, 11 males, mean age = 51.90; SD = 12.88). The study was approved by the Ethics Committee of the University of Jyväskylä. Informed consent was obtained from participants before joining the study.

## 2.2 Procedure and measurements

In **Study I**, the 23 participants included in the study were randomly assigned to either the intervention group ( $n = 11$ ) or the waiting-list control group ( $n = 12$ ). Following the randomization, and during the pre-measurement phase, the participants in each of the two groups had attended an individual assessment meeting where they were given questionnaires and a wearable beat-to-beat heart rate recording device with instructions to conduct a 3-day HR variability recording. After the questionnaires and heart rate belts had been collected and analyzed, the participants in both groups received feedback on the recording by an exercise physiologist (1 hour). The intervention group participated in 3 psychologist-assisted group meetings which were spread over 3 months. Both groups were measured a second time two weeks after the intervention group had finished its third and last group meeting (i.e., after 3 months). After the post-intervention measurement, the control group was offered a mini-intervention session including feedback on the HRV recordings.

Data were collected pre- and post-treatment, and, for the intervention group, follow-up measurements were conducted six months after intervention end. The control group was assessed pre- and post-intervention. At pre- and post-treatment, data were obtained from 11 participants in the intervention group and from 12 participants in the control group, and at follow-up, for 11 participants in the intervention group.

The primary outcome measures of Study I were depressive symptoms, psychological symptoms and stress. Depressive symptoms were assessed by the 21-item Beck Depression Inventory (BDI) which is a widely used measure of depression. Psychological symptoms were measured using the general symptom index GSI based on the Symptom Checklist (SCL-90). Stress was assessed with the 15-item Bergen Burnout Indicator (BBI-15) which is the Finnish version of the original 25-item BBI and measures three aspects of burnout: exhaustion, cynicism and sense of inadequacy. As secondary outcome inventories we used measures of quality of life, psychological flexibility, job strain and over-commitment. Five different aspects of quality of life were assessed using a Visual Analogue Scale (VAS): mood, self-rated health, life satisfaction, self-confidence and working ability. The Acceptance and Action Questionnaire (AAQ-II) was used to measure psychological flexibility. This questionnaire assesses the ability to accept difficult thoughts and feelings and to engage in meaningful actions in their presence. Job strain and over-commitment were assessed using the Effort-Reward Imbalance Questionnaire (ERI) in which extrinsic effort is measured with six and reward with 11 items. The heart rate variability measures and actigraphy were mainly intervention components, and were not used as outcome measures. The utility of the intervention as a whole was assessed with questions about perceived benefits from participation in the study. References for the measures can be found in the published articles.

In **Study II**, 38 participants were matched for gender and randomized to either an Internet-based (iACT;  $n = 19$ ) or face-to-face group (ACT;  $n = 19$ ). In addition, they were randomly assigned to coaches, such that each coach ( $n = 18$ ) had one client from the iACT and one client from the ACT group. Two coaches randomly selected 3 clients each. Following randomization, all participants, with their informed consent, received a battery of measurements by regular mail. Data were collected offline at pre- and post-intervention, and follow-up data at 6 and 18 months after intervention end. Data was obtained from 37 participants at the post-measurement, 36 participants at the 6-month follow-up, and 35 participants at the 18-month follow-up.

Self-administered inventories including symptom and outcome measures were used to assess the outcomes of the interventions. Symptoms were assessed with four self-report questionnaires. Depressive symptoms, the main outcome measure, were assessed by Beck's Depression Inventory (BDI-II). Psychological and physiological symptoms were measured by the Symptom Checklist (SCL-90). General health and mental well-being was assessed by the General Health Questionnaire (GHQ-12). Life satisfaction was measured with the Finnish De-

scriptive Visual Rating Scale. ACT-related processes were measured using another set of four questionnaires. Psychological flexibility was measured with the Acceptance and Action Questionnaire (AAQ-II) which measures experiential avoidance. Mindfulness skills were assessed by the Kentucky Inventory of Mindfulness Skills (KIMS) which is a self-report inventory with four subscales: observing, describing, acting with awareness and accepting without judgment. Thought suppression was assessed by the White Bear Suppression Inventory (WBSI) which measures the amount of obsessive thinking and negative affect associated with depression. The Automatic Thoughts Questionnaire (ATQ) is designed to measure frequency of depressive thoughts on the one hand, and believability of those thoughts on the other. In addition to the standardized instruments, data on participant motivation and satisfaction were collected before and after the intervention using Visual Analogue Scales (VAS).

In **Study III**, 39 participants were randomly assigned to either the treatment group, i.e., Internet-delivery group, (iACT;  $n = 19$ ) or a waiting list control group (ACT;  $n = 20$ ), and received a measurement package including an informed consent form, by regular mail. When the measurements and the signed informed consent had been returned, the participants in the iACT group were given a password and a username that gave them access to the treatment program. Post-intervention measures were obtained for both groups (7 weeks from the pre-measurement), and for the iACT group also at 12 months after treatment end. The waiting-list control group received the same treatment as the study group after the latter had completed the intervention.

Six different symptom and outcome measures were used to assess the outcomes of the intervention. The main outcome measure, depressive symptoms, were assessed by the Beck Depression Inventory (BDI-II). Psychological and physiological symptoms were measured by the Symptom Checklist (SCL-90). ACT-related processes were measured using four different questionnaires. Psychological flexibility and experiential avoidance was measured by the Acceptance and Action Questionnaire (AAQ-II). Mindfulness skills were assessed by the Five Facet Mindfulness Questionnaire (FFMQ) in which five mindfulness skills are specified: observing, describing, acting with awareness, non-judging, and non-reactivity. As in the previous trial, thought suppression was assessed by the White Bear Suppression Inventory (WBSI), and frequency of and believability of depressogenic thoughts by the Automatic Thoughts Questionnaire (ATQ). In addition, data using Visual Analogue Scales (VAS) were utilized to measure participant motivation and satisfaction with the intervention. Table 2 presents the measures used in the studies comprising this report.

TABLE 2 Assessment measures and phases

Measures	Study I	Study II	Study III	Time of assessment
Beck Depression Inventory (BDI and BDI-II) measuring depressive symptoms	X	X	X	Study I: pre, post, 6-month follow-up Study II: pre, post, 6- & 18-month follow-up Study III: pre, post, 12-month follow-up
Symptom Checklist (SCL-90) measuring psychological and physiological symptoms	X	X	X	Study I: pre, post, 6-month follow-up Study II: pre, post, 6- & 18-month follow-up Study III: pre, post, 12-month follow-up
Bergen Burnout Indicator (BBI-15) measuring exhaustion, cynicism, and sense of inadequacy	X			Study I: pre, post, 6-month follow-up
Quality of life (VAS-scale) measuring mood, self-rated health, life satisfaction, self-confidence and working ability	X			
Acceptance and Action Questionnaire (AAQ-II) measuring psychological flexibility and experiential avoidance	X	X	X	Study I: pre, post, 6-month follow-up Study II: pre, post, 6- & 18-month follow-up Study III: pre, post, 12-month follow-up
Effort Reward Imbalance Questionnaire (ERI) measuring job strain and over-commitment	X			Study I: pre, post, 6-month follow-up
Questionnaires (VAS) about utility and acceptance of technology tools and intervention components	X			Study I: post, 6-month follow-up
General Health Questionnaire (GHQ-12) measuring mental well-being/ psychological distress		X		Study II: pre, post, 6- & 18-month follow-up
Life satisfaction (VAS)		X		Study II: pre, post, 6- & 18-month follow-up
Kentucky Inventory of Mindfulness Skills (KIMS) measuring mindfulness skills		X		Study II: pre, post, 6- & 18-month follow-up
Five Facet Mindfulness Questionnaire (FFMQ) measuring mindfulness skills			X	Study III: pre, post, 12-month follow-up
White Bear Suppression Inventory (WBSI) measuring thought suppression		X	X	Study II: pre, post, 6- & 18-month follow-up Study III: pre, post, 12-month follow-up
Automatic Thoughts Questionnaire (ATQ) measuring depressogenic thought frequency (ATQ-F) and believability (ATQ-B)		X	X	Study II: pre, post, 6- & 18-month follow-up Study III: pre, post, 12-month follow-up
Questionnaires (VAS) measuring participant experiences and acceptance of the intervention		X	X	Study II: post, 6- & 18-month follow-up Study III: post, 12-month follow-up

## 2.3 Interventions

Study I was based on the methods of acceptance and commitment therapy (group sessions), with some features in the web portal derived from cognitive behavior therapy (CBT). Study II and Study III were based on ACT, and consequently, their content differed to some extent from Study I.

**Study I** was an ACT and CBT-based intervention with three group meetings spread over three months. The aim of the P4Well intervention was first to test the P4Well concept, and second, to empower participants in the daily self-management of their psychological and physical well-being. To support this, a number of personal health technologies, such as a web portal, mobile phone applications, personal monitoring devices, and analysis software, were combined with a brief 6-hour ACT-based group intervention and offered to the participants. A web portal, called *Hyväksi* (Good Life), was developed specifically for the P4Well intervention, and participants were given credentials which granted the access to the portal. The P4Well portal integrated psychological methods for bringing about behavior change, physiological information, personal health technologies and psychological intervention methods. The content of the portal was divided into modules focusing on different aspects of well-being, such as stress, sleep and mood. Each module consisted of five phases: information, assessment, planning of lifestyle changes, putting plans into action, and follow-up. Figure 3 depicts the P4Well technology system.

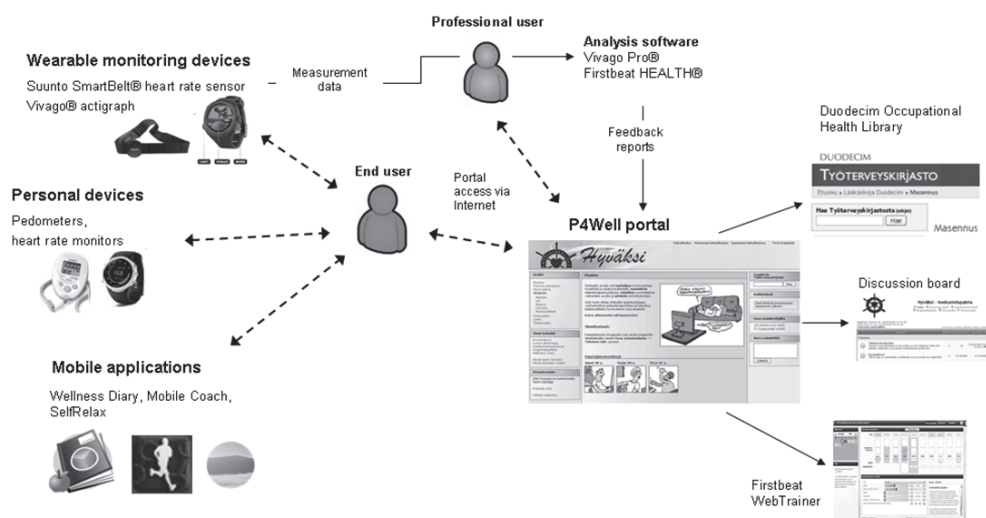


FIGURE 3 TheP4Well technology system

The intervention program comprised group meetings led by a psychologist and spread over 3 months. The goal of the first group session was to inform participants about the study and technology tools, and to motivate them with respect to the intervention. Technology tools were issued to the participants during the first meeting. The toolkit consisted of a mobile phone with preinstalled mobile applications including a wellness diary, a fitness coaching application, and an audio-based relaxation application, and a pedometer. These tools were at the participants' disposal throughout the study. The wellness diary and the web trainer were also integrated to the web portal. Additionally, participants received a heart rate monitor, and an actigraph that was used for approximately one month to monitor sleep quality and quantity. As a home assignment, participants were instructed to continue with their value clarification process and plan actions that they could take based on their values. In addition, they were asked to practice mindfulness and relaxation with the help of exercises placed in the web portal. They were also instructed to start monitoring their sleep with the actigraph. Finally, the participants were encouraged to use one or several mobile applications for self-observation purposes after this meeting.

The second group session (2 hours) took place 4 weeks after the first meeting. The goal was to introduce a psychological assessment tool in the portal that included an individual problem analysis. Participants were encouraged to continue with self-management using the technology tools issued in the first meeting. At this point, the actigraphs were collected and a report, including the results of the measurement, was sent to them via the web portal.

The third meeting (2 hours) was held 4 weeks after the second group session. The aim of this session was to introduce the participants to the idea of acceptance, meaning the ability to accept all kinds of thoughts, feelings, sensations and whatever comes in life, without seeking to avoid, change or control them (e.g. Hayes, Strosal & Wilson, 2012). Experiential exercises related to acceptance were also carried out and discussed. Finally, all the technology previously issued was collected from the participants and a closing 3-day HRV recording, together with an individual stress and recovery analysis, was repeated after the meeting. See Table 3 for an overview of the components in the intervention program.

TABLE 3 Overview of the treatment components in Study I

Intervention phase	Content	Technology tools received
Individual assessment meeting	Instructions on how to perform a 3-day heart rate variability recording	Heart rate variability (HRV) recording device (Suunto Memory Belt)
<b>Group meeting 1</b> (3 hours) <i>Informative and motivational:</i> Measurements Introduction Mini-intervention (90 minutes) 11.2.2009	Psychological mini-intervention: Information about stress and stress management Motivational analysis: Value analysis to motivate participants to make behavioral changes: defining values and goals in life and choosing actions to accomplish these goals. Mindfulness exercise Self-observation worksheet	Mobile phones with pre-installed applications: <ul style="list-style-type: none"> <li>• Wellness Diary</li> <li>• Fitness training program</li> <li>• Relaxation program</li> </ul> Pedometer Heart rate monitor Actigraph to monitor sleep and activity during 4 weeks Access to Web portal providing information, experiential and relaxation exercises, self-assessment and self-reflection tools, access to Duodecim Health Library
Assignment	Continue with value work, practice mindfulness and relaxation, start making self-observations	
<b>Feedback session</b> (1 week after first group meeting)	Individual feedback from the HRV recordings by a sports physiologist concerning stress, sleep, relaxation and exercise habits	
<b>Group meeting 2</b> (2 h, 4 weeks later) 11.3.2009	Skills training: Problem solving. A psychological assessment Web tool was used for individual problem analysis (stressors in daily life, sleep, exercise) Mindfulness exercise	Actigraphs monitoring sleep and activity collected; analyzed sleep time reports delivered to participants through Web portal
Assignment	Continue working with problem solving tool, practice mindfulness and self-observations	
<b>Group meeting 3</b> (2 h, 4 weeks later)	Skills training and preparing for maintenance: Idea of acceptance introduced Acceptance-related experiential exercises	All technology tools collected
Assignment	Continue practicing acceptance and mindfulness	
Assessment: HRV recording	The 3-day recording repeated and accompanied with individual stress and recovery analysis	Suunto Memory Belt Firstbeat HEALTH stress and recovery analysis

**Study II** consisted of two ACT-based treatments: guided Internet-based ACT (iACT) and traditional face-to-face ACT treatment (ACT). The content of the treatments was identical and followed the six processes of ACT, but the mode of delivery was different. Both treatments lasted for six weeks. Master's level

students acted as coaches. Both groups started and closed with a face-to-face session. The Internet-based ACT received support through an Internet platform once a week, whereas each of the participants in the face-to-face treatment met weekly for a regular therapist-led session (6 sessions, 1 hour each). The iACT treatment was divided into six modules intended for a six-week treatment program. The program consisted of a weekly text highlighting each one of the six processes of ACT, along with experiential exercises and metaphors based on ACT that could be downloaded as MP3 recordings, and weekly home assignments that were placed in the participant's own folder in the treatment platform. The coach provided written support through the Internet platform once a week. See Table 4 for an overview of the components in the iACT treatment program.

TABLE 4 Overview of the iACT treatment components in Study II and III

<b>Treatment phase and content</b>	<b>Information, rationale Assignment of the week</b>	<b>Number of exercises</b>
<b>Session 1: Assessment</b> (Study II)	Behavioral assessment through discussion for case formulation (Haynes & O'Brien, 2000) Short introduction to the web program Form for value work provided	
<b>Week 1: Choose your values!</b>	Text of the week: Creative hopelessness, values Video: What Are Values in Life? (Study III) Automated e-mail reminder sent with a link (Study III)	13 exercises, incl. 8 audio recordings such as Attending Your Own Funeral, Half a Year to Live, Passengers in the Bus
Weekly assignment	Value analysis: Reflect and write about your values A 2nd automated e-mail reminder if assignments had not been returned by given date (Study III)	
<b>Week 2: Take action!</b>	Text of the week: Value-based Actions Video: What are Value-based actions?	The same exercises as above
Weekly assignment	Take action: Choose actions based on your values	
<b>Week 3: Live here and now!</b>	Text of the week: Be present, live here and now. Video: What is Mindfulness? (Study III)	12 exercises, incl. 8 audio recordings such as Follow Your Breath, Mindful Sitting, Mindful Eating
Weekly assignment	Practice mindfulness exercises and mindfulness in everyday life; Take action: Choose another value-based action	



<b>Week 4: Self as Context</b>	Text of the week: Different stories about myself: What story are you telling yourself? Video: The Art of Observing (Study III)	7 exercises, incl. 3 audio recordings, such as Observer, Leaves in the Stream
Weekly assignment	Retell your story and write about it; Practice experiential exercises; Take action: Choose another value-based action	
<b>Week 5: Watch your thinking!</b>	Text of the week: Watch your thinking! Video: Gaining a New Perspective (Study III)	6 exercises, incl. 5 audio recordings, such as Milk, Milk; the Little Man
Weekly assignment	Practice exercises related to Cognitive Defusion Take action: Choose another value-based action	
<b>Week 6: Accept your feelings and thoughts, accept what you cannot change</b>	Text of the week: What do I need to accept? Video: What is Acceptance?	3 exercises, incl. 1 audio recordings, such as Stone on a Beach, The Child.
Weekly assignment	Observer-exercise; Reflect and write about: What do I need to accept? Take action: Choose another value-based action	
<b>Final session (Study II)</b>	Review and summary of the experiences obtained during the intervention  Planning of the follow-up period based on what has worked during the intervention Continue with mindfulness exercises and value-based actions	

During the therapist-led treatment (ACT), coaches were instructed to follow the themes in the same order as in the iACT group, including the experiential exercises, metaphors and discussions. Session 1 was identical with that of the intervention group. During session 2, a value analysis was conducted, followed by experiential exercises. Sessions 3, 4 and 5 were more personally tailored, whereas session 6 focused on experiences and observations made during the intervention and participants' plans for the future. Student therapists used a total of 27 different exercises and 31 different metaphors during the whole treatment. Each client received approximately 9 exercises ( $M = 9.11$ ,  $SD = 3.69$ ) and 6 metaphors ( $M = 6.50$ ,  $SD = 4.09$ ) during the 6-week therapist-led treatment. See Table 5 for an overview of the components in the face-to-face ACT treatment.

TABLE 5 Overview of the face-to-face ACT treatment components in Study II

<b>Treatment phase and content</b>	<b>Information, rationale Assignment of the week</b>	<b>Exercises</b>
<b>Session 1: Assessment</b>	Behavioral assessment through discussion for case formulation (Haynes & O'Brien, 2000) Follow your breath - exercise	Follow your breath - exercise
Home assignment	Value work: Define your own values Start value-based actions Practice mindfulness (Follow your breath - exercise)	
<b>Session 2</b>	Review of the case formulation Value work assignment and value discussion Reevaluation of the case formulation based on value work Discussions of control	Observer-exercise An individually selected metaphor Follow you breath - exercise
Home assignment	Continue with value-based actions Practice mindfulness (Follow your breath - exercise)	
<b>Sessions 3-5</b>	Review of home assignments 1-3 individually selected experiential exercises 1 individually selected metaphor Discussions of control	Individually selected metaphors and experiential exercises
Home assignment	Continue with value-based actions Practice mindfulness (Follow your breath - exercise)	
<b>Session 6</b>	Review of home assignments 1 individually selected experiential exercise 1 individually selected metaphor Review and summary of the experiences obtained during the intervention	Individually selected metaphors and experiential exercises
Home assignment	Planning of the follow-up period based on what has worked during the intervention Continue with mindfulness exercises and value-based actions	

**Study III** was a guided iACT intervention based on the intervention in Study II, but with a few modifications. Instead of a face-to-face meeting, the intervention started with a telephone interview. The purpose of the structured telephone interview was to carry out a case formulation which would serve as basis for the treatment. Moreover, the web-based program was enhanced with e-mail-based reminders. Similarly, as in Study II, psychology students provided writ-

ten support through the Internet platform once a week. The intervention group was compared to a waiting-list control group (WLC), who received the same treatment after the intervention group had finished their treatment. See Table 3 for an overview of the components of the interventions in Studies II and III.

## 2.4 Support/Therapist guidance

**Study I** was a group-based, psychologist-led intervention with three group sessions and one 1-hour individual feedback session given by a sports physiologist. Over the three meetings at roughly 4-week intervals, participants had access to the Web portal and the technologies. Between the group meetings, participants were able to consult the group leader or other professionals by sending them private messages through the web portal and receive an answer through the same portal. Despite the large variety of technological tools available, professional support was seen as the most important intervention component. Both group meetings and personal feedback from a professional were ranked as the most useful elements in the intervention.

In **Study II**, the Internet-based ACT group (iACT) intervention consisted of two face-to-face meetings, one at the beginning and one at the end of the intervention. The active comparison group, the face-to-face group, had a 6-week ACT-consistent intervention, consisting of one 1-hour session per week. The content of the iACT intervention is illustrated in Table 4. The participants in the iACT participants were instructed to complete one module per week and to place their weekly written home assignments in their personal folder in the intervention platform, by a given date. The weekly home assignment took the following form. Participants were instructed, first, to read a set text that highlighting that week's ACT process, and then, complete the experiential exercises included in the module, reflect upon questions arising from the weekly process, and write a report. For example, in the module focusing on the present moment (Week 3) they were instructed to watch the video provided and read the text highlighting mindfulness, conduct the daily mindfulness exercises described in the module, write a report on their reflections on the exercises and their experiences and place the report in their personal folder in a secured encrypted platform. They received personalized feedback from their personal coach within 72 hours. Feedback consisted mainly of encouragement and advice, answers to possible questions and suggestions for additional exercises suited to each participant's situation. All the communication between the therapists and the participants was asynchronous during the 6-week intervention period.

During **Study III**, no face-to-face contact with the participants took place during the intervention and all the communication between the coaches and the participants was asynchronous. First, the coaches performed telephonic assessments, collecting general information on problems experienced by the partici-

pants, in order to construct a case conceptualization model, which was then posted to the participants by regular mail. The online intervention consisted of six modules based on the core processes of ACT that promote psychological flexibility. All six modules were open to the participants throughout the intervention. However, participants were instructed to follow the modules in a given order, and to complete each module within a week. Home assignments and feedback were delivered through the same portal to which both the participants and the coaches had access. Each week, the participants received personalized written feedback through the platform within three days of the day they had completed the weekly exercise and saved it in their personal folder. Two automated email-based reminders were sent to the participants each week. The first email explained the theme of that particular week along with motivating ACT-based quotes and a URL to the system. The quotes were tailored to each week's process to remind the participant of each week's theme, and while clicking the URL, redirected the client to the system. The second email included the date on which the assignments were to be completed. If a given participant did not complete the weekly exercise, a third reminder was sent out on the following day. If the participant did not complete the weekly assignment after receiving these three reminders, the coach contacted her/him via telephone. The student coaches were supervised throughout the intervention.

## 2.5 Analyses of treatment effects

### 2.5.1 Statistical differences

In **Study I**, the repeated-measures ANOVA was used to test whether the two groups changed differently during the intervention (pre- and post). Repeated-measures ANOVA was also used to analyze the pre-, post-, and the 6-month follow-up measurements of the intervention group.

In **Studies II** and **III**, pre-measurement differences between the groups were examined using T-tests. The analyses of the intervention effects were performed with the Mplus statistical package, using hierarchical linear modeling (HLM). HLM with the full information maximum likelihood (FIML) estimation method uses all the available information compared to repeated measures ANOVA/MANOVA. In this study, the most important advantage of using HLM with full information maximum likelihood (FIML) estimation method instead using repeated measures ANOVA/MANOVA is that it uses all the available information. In HLM & FIML, the missing data is assumed to be Missing at Random (MAR). The ANOVA/MANOVA approach uses listwise deletion requiring that the missing data have to be Missing At Completely Random (MCAR). First, the between-group differences in the changes between the two groups were investigated between a) the pre- and post-measurement (Study II & III), b) the post-measurement and 6-month follow-up (Study II), and c) the 6-

month follow-up and 18-month follow-up (Study II). The group  $\times$  time interaction was tested with the Wald test. Second, as the interaction was significant, the group differences were tested for each variables separately, and finally, change was examined for each of the two groups separately.

### 2.5.2 Effect sizes

In **Study I**, Effect sizes (ES) measured by Cohen's  $d$  (Cohen, 1988) were calculated to describe between-group differences and within-group changes. The post-treatment between-group ES was calculated by dividing the difference between the mean value of the treatment group and the mean value of the control group with the pooled standard deviation of the two conditions. The within-group ES was calculated by dividing the mean change between the pre- and post-measurement with the pre-treatment SD.

In **Studies II and III**, Effect sizes (ES) were reported using Hedges'  $g$ . The between-group ES was calculated post treatment and at the 6-, and 18-month follow-up (Study II) and at the 12-month follow-up (Study III) by dividing the difference between the intervention group mean and the treatment as usual (Study II)/control group (Study III) mean by the pooled standard deviation of the two groups. The within-group ES was calculated for the post- and follow-up measurements by dividing the mean change from the pre-measurement by the pooled standard deviation (SD) (Feske & Chambles, 1995; Morris & DeShon, 2002). Possible bias in ES due to small sample size was corrected by unbiased estimate of Hedge's  $g$  (Hedges, 1981; Hedges & Olkin, 1985). To take into account a possible lack of pre-test equivalence, post and follow-up ES values were corrected by the pre-measurement difference. A between-group ES of 0.2 was considered small, 0.5 medium, and 0.8 large, while the corresponding within-group ES values were 0.5, 0.8, and 1.1.

### 2.5.3 Clinical significance

In **Studies II and III**, clinical significance was evaluated with the Jacobson-Truax method in two steps (Lambert & Ogles, 2009). The first step calculates the reliable change index (RCI), indicating whether the change is large enough not to be attributable to measurement unreliability. The second step calculates the cut-off value to find a weighted midpoint between the means values of a patient and those of a non-patient population (Atkins, Bedics, McClinchey, & Beauchaine, 2005). These steps are used to classify persons into one of four categories: recovered, improved, unchanged, and deteriorated.

## 3 SUMMARY OF THE RESULTS

### 3.1 Study I

The objective of the study was to promote well-being through the development of a concept (P4Well) that would combine a brief ACT-based group intervention with both a web-based psychological intervention and a technological toolkit. The primary interest was focused on the feasibility and effectiveness of the P4Well intervention among working age males reporting mild to moderate symptoms of stress and depression.

The results indicate that the P4Well intervention had positive effects on depression, psychological symptoms, self-rated health, and self-rated working ability. Depressive symptoms as measured by the BDI, decreased in both the intervention and control groups, although the change in depressive symptoms was larger in the intervention group. A marginally significant group by time interaction effect for BDI ( $p = .072$ ), with a medium between-group ES ( $d = 0.57$ ) in favor of the intervention group, was also found. Likewise, a marginally significant group by time interaction effect was found in psychological symptoms ( $p = .053$ ), with a small between-group ES. The intervention had significant effect on self-rated health ( $p = .008$ ), and working ability ( $p = .016$ ). Between-group and within-group effect sizes were small for health (0.38 and 0.58, respectively) and working ability ( $d = 0.21$  and 0.60, respectively), however, a medium within-group effect size was found for psychological symptoms ( $d = 0.39$  and 1.07 respectively). The intervention also showed positive effects on the process variables - cynicism, over-commitment, and control over one's leisure time - related to recovery from stress and burnout. In these variables, however, no significant group by time interaction was found. The follow-up measurements indicated that the positive changes obtained in the intervention group were maintained over the six months post intervention. Significant within-group effect sizes from the pre- to follow-up measurement were detected for depression, psychological symptoms, life satisfaction, self-rated health, and self-rated working ability. The effect size was large for depression ( $d = 1.11$ ).

**Conclusions.** All the participants in the intervention group reported that their well-being had improved as a result of the intervention. However, there was only a marginally significant difference between the two conditions on the primary outcome measure depression. The number of participants reporting at least mild depression at the beginning of the study, as measured by BDI, was 7 out of 11 in the intervention group, and 6 out of 12 in the control group. In the intervention group, only one participant reported depressive symptoms at intervention end, whereas half of the participants in the control group continued to be depressed at the post-measurement. In addition, the participants in the intervention group reported benefits, such as weight loss, improved sleep, decreased psychological symptoms, better mood and better working ability. They also reported having gained better understanding on their health, and increased motivation to improve their health in the future. According to the participants, the most useful intervention components were measurement and feedback, personal monitoring devices, group meetings and mobile applications.

**Key findings.** Work-related stress is an important problem which may lead to depression and work disability. To prevent problems getting worse, and given that health care resources are limited, early interventions based on self-management are justified. Our results confirm that it may be possible to positively affect psychological well-being, health and working ability through an intervention that combined a brief group intervention, a web portal and technological tools in the target population, i.e., working-age men experiencing stress-related problems and mild depression. In addition, the intervention was well received by the participants who made active use of the personal health technologies during the intervention. The results suggest that combining different technological tools with a psychological intervention to support life-style change may be a promising approach in seeking to ameliorate psychological and stress-related problems.

### 3.2 Study II

The main objective of Study II was to compare the effects of two parallel treatment groups, an Internet-based ACT and a face-to-face ACT, delivered by student therapists. It was hypothesized that both treatment options would have similar effects in reducing depressive symptoms and psychological distress.

**Symptom measures.** Depressive symptoms and psychological symptoms decreased significantly in both groups across the whole study period, from the pre-measurement to 18-month follow-up. Similarly, general health improved and life satisfaction increased significantly across the same period. The results showed that the Internet-delivered iACT -group changed differently in terms of depression (BDI-II;  $p < 0.001$ ) and general health (GHQ-12;  $p = 0.005$ ) during the first follow-up phase, i.e., from post intervention to the 6-month follow-up. The change was in favor of the iACT group. During this 6-month period, depressive symptoms consistently decreased in the iACT group whereas depressive symp-

toms showed a slight upturn in the face-to-face ACT group. A similar pattern was found for general health ( $p = 0.067$ ). During the second follow-up period, from 6- to 18 -months, the treatment effects persisted in both groups. Between-group effect sizes indicated medium-sized differences at the 6-month follow-up for depression, general health and life satisfaction in favor of the iACT group, whereas the effect sizes for psychological and physiological symptoms were small during the same period. Within-group effect sizes revealed that the overall effectiveness of iACT from pre-measurement to 18-months was large on all the outcome measures. For the ACT group, large effect sizes were found for most of the measures for symptoms, except life satisfaction. The mean values for depression at the respective measurement points are presented in Figure 4.

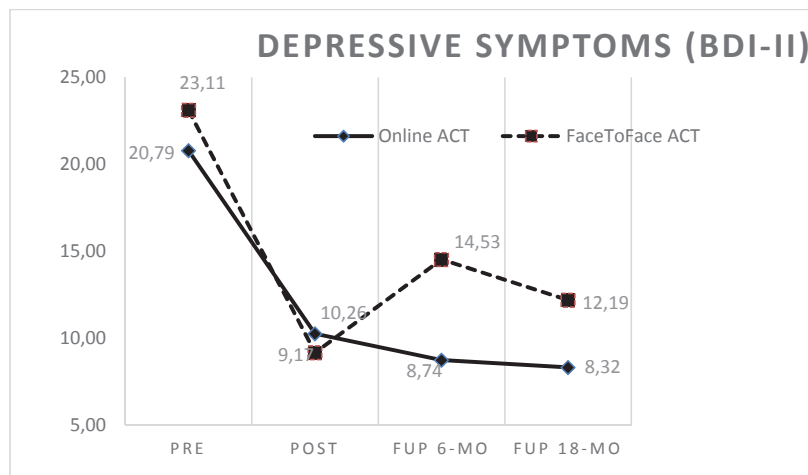


FIGURE 4 Mean values for depressive symptoms

**Process measures.** In the ACT-related process inventories measuring psychological flexibility, mindfulness and thought suppression, no group  $\times$  time interaction was found. Thus, the groups showed similar changes in process measures throughout the study period. In both groups, a significant increase in psychological flexibility and mindfulness was detected. Similarly, frequency of automatic negative thoughts (ATQ-F) decreased in both groups. However, believability of automatic thoughts (ATQ-B) and suppression of thoughts (WBSI) decreased significantly over time in the iACT group during the study period whereas the change in these measures in the ACT group was non-significant. With respect to between-group effect sizes, small effect sizes were observed for most measures, however, a medium-sized effect was observed for frequency of automatic thoughts at the 18-month follow-up in the iACT group. The mean values for psychological flexibility at the respective measurement points are presented in Figure 5.



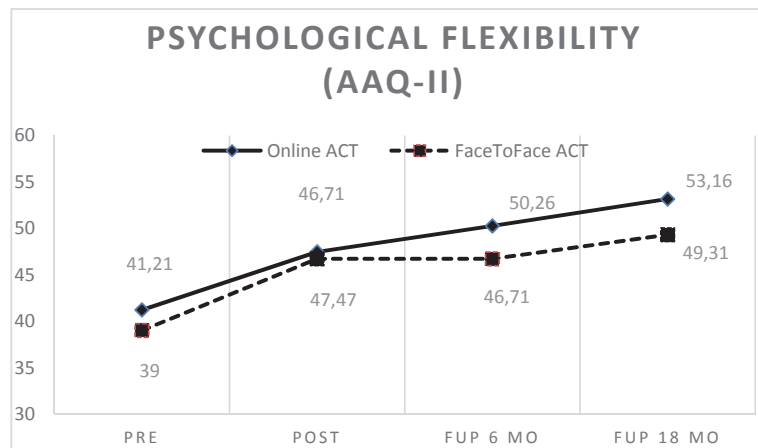


FIGURE 5 Mean values for psychological flexibility

**Conclusions.** The results showed that the two types of interventions for depressed individuals were equally effective in reducing depressive symptoms and improving general health across the entire study period. However, slight differences in the effectiveness of the interventions were detected. Participants receiving the Internet-delivered ACT intervention showed continuous improvement measured by most inventories throughout the study period whereas depressive symptoms increased and general health decreased in the traditional face-to-face group during the first follow-up period (post- to 6-month follow-up). However, the treatment effect persisted throughout the second follow-up period. The Internet-delivered group achieved slightly better results throughout the whole intervention. Both treatments were well received by the participants. When examining clinical significance (Jacobson & Truax, 1991) at 18-month follow-up, we found that 80% of the participants in the iACT group had recovered, 6.7% had improved and 13.3% remained unchanged. In the traditionally delivered ACT group, 42.9% of the participants had recovered, 42.9% had improved and 14.3% remained unchanged.

**Key findings.** The findings of this study confirm the previous results on the effectiveness of guided Internet-delivered interventions for depression. In line with earlier studies (Andersson, Carlbring et al., 2013; Cuijpers et al., 2013; Fledderus et al., 2012, Speck, et al., 2007; Wagner et al., 2014) we can conclude that Internet-delivered treatment with the guidance of a therapist can lead to improvements of equal size as those obtained by more traditional face-to-face psychotherapy. Specifically, our results indicate that guided Internet-delivered ACT treatment can be as effective as a face-to-face delivered ACT treatment. We also found that ACT treatment delivered by inexperienced therapist can be effective. Persons without formal health care training can also provide support, provided that they are adequately supervised (e.g. Robinson et al., 2010; Titov, 2011; Titov, Andrews et al., 2009 and Titov, Andrews, Schwenke et al., 2009; Titov et al., 2010). Our study also indicates that the effects of a relatively brief 6-session treatment program can be maintained 18 months post-treatment. Furthermore, the study shows that the ACT-related processes such as psychological flexibility, acceptance and mindfulness, can also be significantly affected through an Internet-based ACT treatment. In addition, both interventions were well received by the participants. In the online treatment group no drop-outs were registered during the entire study period from pre to 18-month follow-up which indicates that even the Internet-delivered group was well-received by the participants. ACT-based interventions rely to a large extent on experiential exercises that need to be rehearsed regularly. It may be that the slightly better results of the Internet-delivered intervention are due to the fact that individuals do not receive enough repetition and practice via the traditional type of intervention.

### 3.3 Study III

Study III investigated the efficacy of an active Internet-delivered ACT-based intervention (iACT) for depressive symptoms compared to a non-active waiting list control group. The web-intervention was delivered without any face-to-face contact but enriched with email-based reminders and weekly feedback given by students of psychology through the Internet platform. Equally of interest was how the participants would experience and accept the intervention without any face-to-face support.

**Symptom measures.** The results showed that the iACT intervention was superior to the control group. Depressive symptoms as well as psychological and physiological symptoms decreased significantly in the iACT group during the intervention period (pre-post), resulting in large between-group effect sizes for depression and medium effect sizes for psychological and physiological symptoms. The treatment effects lasted over the 12-month follow-up period. Statistically significant changes were observed in all the symptom measures both during the active treatment period (pre-post) as well as during the entire intervention (pre to follow-up). Within-group effect size was large for depres-

sive symptoms and medium-sized for psychological and physiological symptoms. Figure 6 illustrates the development of depressive symptoms (BDI-II) at the respective measurement points.

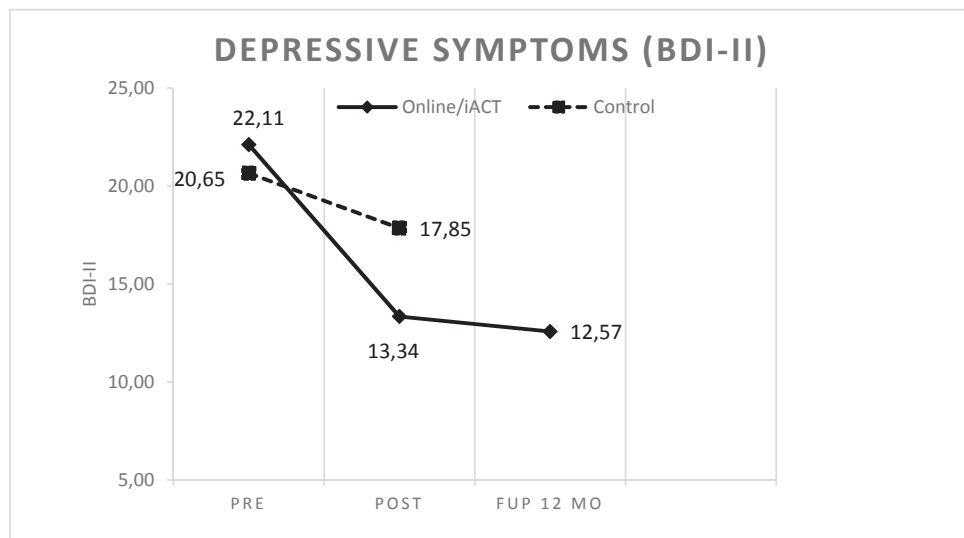


FIGURE 6 Mean values for depressive symptoms

**Process measures.** Psychological flexibility, mindfulness, frequency of automatic thoughts and thought suppression also showed significantly larger changes in favor of the iACT group. Between-group effect sizes at post measurement indicated medium-sized differences for these constructs. Notably, the treatment effects lasted over the 12-month follow-up period, the only significant decrease being detected in thought suppression from post-measurement to follow-up. Medium-sized within-group effect sizes were observed for psychological flexibility, mindfulness, frequency of negative thoughts and thought suppression. Mean values for thought suppression (WBSI) at the respective measurement points are presented in Figure 7.

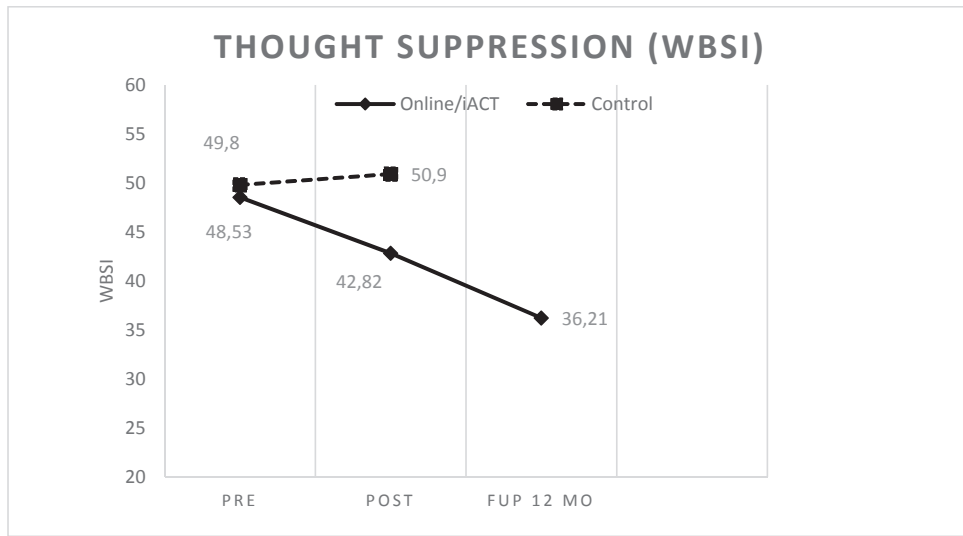


FIGURE 7 Mean values for thought suppression

**Conclusions.** The results revealed that the iACT intervention which included email-based reminders but no face-to-face contact was effective in reducing depressive symptoms compared with the waiting list control condition. Furthermore, the participants received the intervention well. Examination of the clinical significance of the iACT group at post measurement, showed that 50% (9) of the clients had recovered, 11.1% (2) had improved, and 38.9% (7) remained unchanged. In the control group, 80% (16) of the participants remained unchanged.

**Key findings.** An Internet-delivered ACT intervention delivered without face-to-face contact but with weekly written support and email-based reminders may be an effective and feasible alternative to traditional treatment. Despite of less face-to-face contact, participants were satisfied with the treatment and recommended it to other people with depressive symptoms. They also reported improved health and well-being as a result of the intervention.

## 4 DISCUSSION

The objective of the present report was to evaluate outcomes and acceptability of three technology-assisted and guided Internet-based psychological treatments. To achieve this goal, qualitative and quantitative evaluation methods were employed in three randomized controlled trials implementing modern technology combined with methods of acceptance and commitment therapy (ACT) for mood and stress-related distress in diverse settings and populations. One of the studies evaluated the use of technological tools and the Internet combined with an ACT-based group intervention for mood and stress-related problems. Two studies evaluated an ACT-based, mainly Internet-delivered intervention for depressive symptoms.

The results indicated that depressive symptoms decreased and general well-being improved as a result of the interventions. Most importantly, the results showed positive short- and long-term effects over a prolonged period. In addition, all three interventions were well-received by the participants. The initial results of the three studies appear promising but must be taken cautiously. The results warrant further studies.

### 4.1 Treatment effects

The results in Study I showed that persons with stress-related and depressive symptoms can benefit from a brief intervention combining personal health technologies and a web portal with ACT-based group meetings. The intervention had positive effects on depression, psychological symptoms and on working ability, and reductions in other stress-related measures were also achieved. However, the change between the two conditions was only marginally significant on the main outcome measure depression. Furthermore, participants reported several benefits from the intervention and stated that the intervention had improved their overall wellbeing. They ranked the group interventions and personal feedback from a professional as the most useful components of the

intervention. However, the impact of different intervention components on outcomes remains open.

The treatment outcomes in Study II indicated that depressed individuals can be helped not only by traditional face-to-face treatment but also by Internet-delivered psychological treatment based on acceptance and commitment therapy. It was expected – in accordance with earlier research findings (Andrews et al. 2010; Cuijpers et al., 2010) – that the Internet-delivered treatment might be as effective as the traditional treatment format. Depressive symptoms and psychological symptoms decreased significantly in both groups across the study period, from the pre-measurement to 18-month follow-up. Similarly, general health improved and life satisfaction increased significantly across the same period. There was also a significant change in process measures psychological flexibility, mindfulness skills, and frequency of depressogenic thoughts in both groups. In thought suppression and believability of depressogenic thoughts the change was only significant in the Internet-based group (iACT). The study also found evidence for a significant effect of Internet-based intervention on psychological flexibility and related processes. All in all, the results pointed to a slightly better long-term maintenance of treatment effects in the Internet-based treatment group. Furthermore, the study demonstrated that the support does not need to be delivered by professionals. This is in line with the findings of Robinson et al. (2010), Titov (2011); Titov, Andrews et al., 2009, Titov, Andrews, Schwenke et al., 2009; and Titov et al. (2011) according to which excellent clinical effects can be obtained from Internet-delivered programs that are supported by persons without specialist training, provided they receive adequate supervision.

The treatment results from Study III indicated that individuals suffering from depressive symptoms can be helped by a mode of guided iACT treatment that does not include any face-to-face contact but is enhanced with email-based reminders. The participants in this study were supported in several ways. At the beginning of the study, they were interviewed in depth by telephone on their current situation. During the treatment process, they received two automated reminders, one to introduce the weekly theme and the other to do their home assignments, along with weekly written support via the Internet program. Moreover, as in Study II, psychology students acted as coaches during the intervention, providing support. The results showed improvements in both depression-related symptoms and processes throughout the study period. Significant effects in favor of the intervention group were observed in depression symptomatology, psychological and physiological symptoms, psychological flexibility, mindfulness skills, frequency of automatic negative thoughts, and thought suppression.

Although face-to-face contact was not included in the iACT group in Study III, the results indicated that the within-group effects (pre to post; post to follow-up) for the main outcome measure, depression (BDI-II), were as large as those in the iACT group in Study II. Assessment of clinical significance after the active intervention period, however, showed that 80% of the iACT participants in Study II were recovered or had improved, whereas the corresponding

percentage in the iACT group in Study III was 61.1%. This is in line with earlier research, showing that Internet interventions with more guidance – in this case face-to-face contact – produce better treatment effects (e.g., Andersson, 2006; Andersson et al., 2007; Andersson & Cuijpers, 2009; Andrews et al., 2010).

Comparison of the outcomes of Studies II and III with corresponding ICBT interventions clearly shows that the Internet-delivered ACT-based brief interventions implemented here produced effects equivalent to those of ICBT when measured by effect sizes. For example, our results in both Studies II and III indicated a medium-sized between-group effect size of  $g = 0.76$  and  $g = 0.83$  for the main outcome measure (depression) which is in line with the results of the meta-analyses by Johansson & Andersson (2012), where the mean between-group ES in 25 ICBT studies was 0.76 for treatments with contact before, during and after treatment.

In sum, our brief 6-week- long ACT-based treatments, delivered by psychology students, compete well with international ICBT trials. Thus, it can be concluded that ACT holds promise as an effective treatment for psychological distress and depressive symptoms, not only when traditionally delivered but also when delivered via Internet.

## 4.2 Acceptability and feasibility of the interventions

A common problem in Internet-based treatments is a high drop-out rate (Mathieu, McGeechan, Barratt, & Herbert, 2013). The drop-out rate in all three of the present studies was rather low which may be explained by the fact that the satisfaction among the participants in all three studies was rather high. In Study I, one participant was lost at follow-up. In Study II, the drop-out rate was 2.6% at post-measurement, 5.3% at the 6-month follow-up, and 7.9% at the 18-month follow-up. Interestingly, in Study II, no drop-out occurred in the Internet-delivered iACT group during the entire intervention period from the pre-measurement to the 18-month follow-up which may be considered a sign of satisfaction with the treatment. In Study II, the parallel face-to-face treatment group, three drop-outs were registered during the same period of time. In Study III, the drop-out rate at the post-measurement was 2.6%, however, at the 12-month follow-up it had risen to 15.4%.

Another reason for satisfaction with the treatment might be the sample effect, as the participants in all three trials were recruited through an advertisement placed in a newspaper which may indicate that they were highly motivated to participate. Although self-referral can be problematic from the research point of view, Andersson & Titov (2014) point out that self-referral also offers several advantages. Many people with mood or anxiety disorders may remain untreated for several years owing to shortage of adequate treatment, unwillingness to seek help or for other reasons. Internet-delivered treatments may provide these people with access to evidence-based treatment for the first time.

Research indicates that adherence and attrition can be improved by adding brief weekly support which may be provided face-to-face, via telephone, email or by using reminders during the intervention (e.g., Cavanagh, 2010). In our studies, support was provided partly face-to-face (Study II), via telephone (Study III), via weekly written support through the platform (Study II and III) and using weekly reminders (Study III). In Study III, despite less contact with the therapist, participants reported having learned many new skills and improved well-being as a result of the intervention.

In addition, research indicates that higher level of education may be positively associated with adherence (Farrer et al., 2014), and, in fact, in both Study II and III, nearly 50% of the participants had received a university education. This is also in line with Andersson & Titov (2014) who claim that in Internet research trials, participants tend to be better educated than the general population.

### 4.3 Clinical implications

All three studies have important clinical implications. The studies showed a decrease in the primary outcome measure, depressive symptoms, as measured by BDI-II. In the first study the decrease was marginally significant while in Studies II and III the decrease was statistically significant and continued to improve across the treatment period. In Study II the changes were also clinically significant showing that nearly 90% of the participants in both iACT and ACT groups had either recovered or improved at 18-month follow-up and that not one client had deteriorated. Examination of the severity of depressive symptoms at the 18-month follow-up revealed that over 84% (16) of the participants in the iACT group were classified as not depressed and nearly 16% (3) were mildly depressed. In the face-to-face group the corresponding percentages were 50% (8, not depressed), 25% (4, mild depression) and 25% (4, moderate depression). In Study III, over 60% of the participants in the intervention group had either recovered or improved at the post measurement, and nearly 40% had remained unchanged. Again, no participants had deteriorated. In addition to depression, the participants in all three studies also improved in other scales suggesting that their discomfort had decreased and wellbeing improved. When we compare these results with, for example, those of Roth & Fonagy (2005), who claim that about one-fourth of patients treated with brief therapy usually remain well, the results obtained in Studies II and III can be considered excellent. Importantly, the Internet-delivered ACT also manifested positive long-term effects on depressive and other psychological symptoms. The within-group effect sizes reported at the post treatment measurement continued to improve over the subsequent 6-18 months. This trend was visible not only in depressive symptoms (BDI-II) but also in several other measures. ACT-based treatments are powerful therapeutic interventions – even brief ones. ACT teaches clients psychological skills needed to deal with difficult thoughts and emo-



tions, and, at the same time, motivates them to actions that improve their lives. Once they have been trained in those skills, they are able to apply them in challenging life situations, as these arise. This may be one explanation for the continued improvement observed in our ACT treatment outcomes. However, it is important to remember that the total sample size in the studies included in this report was small. Therefore, the results need to be replicated in a larger study.

The studies suggest that Internet-delivered ACT combined with support could be useful as a primary intervention for individuals with minimal, mild or moderate levels of depression. Those who do not improve and those with severe depression would then receive more support in the form of face-to-face sessions. This is in line with earlier research findings. For example, the stepped-care model advocates that briefer, simpler and the most accessible therapies should be offered first, and more complex - and more costly - treatments should be offered only if the client does not benefit from the simpler approach (Parry, Roth, & Fonagy, 2005). Hedman, Carlbring et al. 2014) also argue that all clients do not need the same intensity of help. Internet-based treatments may be offered as the first stage of treatment for clients with less severe symptoms, whereas clients with severe symptoms can be offered more intensive care face-to-face, possibly enhanced with Internet-based elements.

Therefore, the standard practices of depression care require rethinking. At present, many people with depressive symptoms or symptoms of work-related stress do not receive evidence-based care with continuous assessment and long term evaluation of the treatment outcome. Current practice in health care means, in some cases, that a patient is seen, for instance, once a month for a short consultation. This practice should be replaced by interventions that seek to identify individuals at risk and provide them with an effective and persistent intervention with long-term positive effects. Currently, it is more common to focus on people who already have high levels of symptoms. The empirical evidence, however, suggests that preventive interventions or interventions aimed at individuals with mild and moderate levels of depression are effective in alleviating this condition (Cuijpers, et al., 2008). Internet-based psychological interventions are well suited for this purpose. They can be used to reduce the disease burden of highly prevalent disorders, such as depression and anxiety, and are able to offer prevention and early intervention at population level. Importantly, they increase accessibility to psychological treatment at early stages of the disease and prevent worsening of the symptoms.

One of the key concerns in health care at the moment is accessibility to treatment (Richards & Bower, 2011). Interventions that are both effective and cost-effective are needed to solve this problem and to combat highly prevalent disorders, such as depression. Internet-based psychological treatment are important treatment alternatives that - according to a large body of research - can be as effective as face-face treatments and medication. They offer a cost-effective means to reduce waiting-lists and the therapist time, ensuring access to psychological treatment and improved well-being for many people who are currently affected by access block. Internet-delivered treatments can provide

services that otherwise would not exist owing to obstacles such as undermanning in psychological health services, long distances to treatment centers, or stigma related to mental health concerns. Internet-based psychological treatments also offer a means to provide treatment at an early stage, before the onset of severe symptoms. Prevention and early intervention mean savings in health care costs and in indirect costs incurred by depression such as sick leave and early retirement. The costs incurred by severe depression are estimated to be five times higher than for mild depression (Kleine-Budde et al., 2013). Even minor improvements in depressive symptoms would have a significant impact on both the individual and society.

In addition to cost-effectiveness (Hedman et al., 2012), the benefits of e-health and Internet-based interventions are numerous (Christensen, 2010), and include effectiveness, acceptability and client empowerment. When combined with support, they produce effects equivalent to those of traditional treatment formats (e.g., Andersson et al., 2014). Internet-delivered applications also facilitate patient self-care and use a patient-centered approach, enabling patients to take responsibility for their own well-being and to better manage their health. One important aim of psychological treatment is that the client learns and practices new skills independently, eventually becoming more independent of the therapist, and, ultimately his/her own therapist (Andersson et al., 2012). This was also observed in our interventions, when participants reported that they had become more independent and acquired skills to take responsibility for their own health and well-being. The ACT-based Internet-delivered program aimed at motivating individuals to behavioral changes, e.g. committed actions affecting their well-being, and at training the skills needed to deal with and accept negative thoughts and emotions. The program *Good Life Compass* provided an online training environment for acquiring these many faceted skills that are essential for improving and maintaining well-being.

Despite the many studies that have been published in the field of Internet-delivered treatments, much remains unknown about the role of the therapist. There is evidence that guided ICBT is more effective than unguided ICBT, but it is not clear, for instance, what constitutes an optimal amount of support, and whether guidance by professionals would produce better outcomes. In line with earlier research findings (Robinson et al., 2010; Titov, Andrews et al., 2009; Titov, Andrews, Schwenke et al., 2009; Titov et al., 2010), the outcome of Studies II and III demonstrate that excellent results can also be achieved with non-clinicians as coaches, as reported by Andersson & Carlbring (2010). Our results support the findings of Baumeister et al. (2014) who suggest that the qualifications of e-coaches are not as important as they are when therapies are delivered face-to-face, because Internet-based interventions are highly standardized and less therapist-centered. In the studies included in this report, guidance played an important role. It was provided in different forms including group sessions, feedback via an Internet platform, face-to-face sessions, telephone contact and automated e-mail based reminders. According to the participants, support and feedback during the interventions were highly appreciated, and there are also

indications that more face-to-face contact might have led to better outcomes (Study III). This was also obvious in Study I where individual contact was considered as one of the most important components of the intervention, despite the large number of technological tools provided.

It is obvious that modern technology will play an increasingly important role in psychological treatments in future. The utilization of electronic and mobile technologies have the capability to reduce the treatment gap in mental health care – one of the objectives explicitly stated in the World Health Organization's Mental Health Action Plan 2013-2020 (World Health Organization, 2013). There is also reason to believe that Internet-based psychological treatments could be enhanced through integration with modern technological applications including social media, blogs, virtual reality, and various mobile phone applications (Miller, 2012). In particular modern mobile phones can expand the reach of mental health care to a larger group of users. Mobile phones have advanced multimedia capabilities including SMS, voice and interactive multimedia features. Since people carry their mobiles with them wherever they go, it is easy to integrate the interventions into the everyday life, to have the “intervention” at hand when and where it is most needed (see e.g., Ahtinen et al., 2013; Lappalainen et al., 2014). They can also be used as tools in therapy and counseling, such as electronic diaries for tracking and recording purposes (e.g., Shapiro et al., 2010). Internet-delivered treatments can also be enhanced by the latest achievements of modern technology, such as tailoring and adapting treatment material to individual client's needs, providing automated feedback and reminders. The question revolves around to what extent technology can replace human contact.

#### **4.4 Limitations**

There are some limitations which should be taken into consideration in any attempt to generalize the results of the three studies reported in this thesis. First, the most obvious limitation of all three studies is the small sample size. In Study I, in particular, lack of statistical power affected our ability to detect differences between the groups. Therefore, the results of these trials must be interpreted with caution and further replication is warranted in larger-scale studies.

Second, the selection of participants may be biased, as in all three trials participants were recruited via an advertisement in a local newspaper. Participants who respond via a newspaper advertisement may be more motivated to participate than subjects recruited from clinical settings which in turn may yield better results. It can be argued that one major disadvantage is that the present studies were not conducted in clinical settings, possibly hindering their application in the real-world health care context. Therefore, promising new therapies and ways to deliver psychological treatment should not only be formally investigated, but also field-tested in larger samples in natural health care settings.

Third, the participants in all three studies were not diagnosed. However, in Studies II and III they were thoroughly interviewed using the DSM-IV criteria for depression. Study I was intended mainly for individuals without clinical levels of depression.

Fourth, in particular in Studies I and III, the use of a waiting-list control group can be considered as a weakness, as such groups do not offer a strong test of treatment efficacy. Finally, the use of self-reported measures may be considered as a limitation, although self-report assessment is common and often the only feasible way to assess the constructs of interest. The more specific limitations of each study have been discussed previously in this report.

## 4.5 Future research

The advantages of deploying technology in promoting mental health and well-being are many. The growing body of research on the topic has demonstrated that technology can be fruitfully deployed in various ways to enhance existing psychological treatments. Among the different eHealth interventions, the evidence on the usefulness of Internet-based treatments is convincing. However, there are still a large number of open questions remaining regarding the delivery of treatment via the Internet and combined with electronic devices.

Future research should investigate how technology could be deployed to further improve Internet-based psychological treatments. There is reason to believe that integrating new technologies with existing psychological treatments would enhance the effectiveness of treatments and potentially also improve the outcomes of unguided psychological treatments more effectively. Another interesting question is how to tailor technology-based interventions to specific user groups. In general, individually tailored interventions have shown better treatment effects compared to standardized interventions (Johansson et al., 2012). For example, gender differences continue to be an understudied topic. Research - including the present findings - indicates that men are less likely than women to seek help for their health problems, especially mental health problems (Galadas, Cheater, & Marshall, 2005). Our study with middle-aged men showed, however, that men found the technological tools used in the treatment process appealing. Therefore, research efforts should be targeted at finding out how different technologies could be used to encourage men to seek help for mental health issues, and how psychological interventions could be technologically enhanced in ways that would encourage men to take part in them. For instance, integrating mobile phones into mental health care might enable men and young people to use mental health services more anonymously, thereby diminishing the stigma of mental illness.

In addition, future research should explore if and how technology can improve the outcome of regular models of psychological treatments. Face-to-face delivered psychotherapy would likely benefit from integration of modern information technology, and, for example, placement of certain components of

the treatment protocol, e.g., experiential exercises, on the Internet so that the client could practice between sessions without having to try to remember the previous session's content or exercises. This would enhance the efficacy of the face-to-face treatment. By combining social media and emerging technologies with Internet-based psychological interventions therapists could find a "perfect fit", an option that would best suit clients' needs, preferences and characteristics. Further relevant questions to be addressed include: Could unguided Internet-based treatments be enhanced by technology so that they produce outcomes comparable to those of guided treatments? Can technology provide systems that are able to identify when human support is necessary in Internet-based treatments?

In addition, more research is needed to facilitate comparison of technology-supported and Internet-based treatments with other effective treatments. Studies should focus on conducting well-powered trials with active controls, such as conventional treatment formats. Future investigations should also explore methods to enhance the efficacy of Internet-based treatments. In particular, it would be helpful to determine which treatment components are effective for depression and other common mental disorders. Examining the relationship of outcome to process factors is another important area. In ACT-related research, the set of subprocesses underlying psychological flexibility and their relationship to the outcome have been investigated, but only to a limited extent (e.g. Lundgren, Dahl, & Hayes, 2008; Wicksell, Olsson, & Hayes, 2011). In the field of Internet-based ACT, mediators of change have been examined in the field of chronic pain (e.g., Braun, 2013), but more research is needed in other areas.

It would also be important to explore how much support is needed for a treatment to be effective. In Internet-delivered interventions, in general, effectiveness can be further enhanced by building a certain amount therapist support into the treatment program. Particularly in the treatment of depression, support seems to play a crucial role (Andersson et al., 2009). Future research should investigate to what extent this is in fact the case – and also how much support and in what form, is needed to obtain positive treatment outcomes with large effect sizes. We know that support is usually given in the form of questions, encouragement and feedback on home assignments and delivered via email or text messages or handled via a shared portal (Paxling et al., 2013), and that therapist guidance given by email and by telephone yields equivalent effects (Lindner et al., 2014). More research is needed to identify which modes of delivery would be optimal for better outcomes.

Furthermore, an important question concerns the providers of support provided. Internet-based treatments are often highly standardized, leaving the therapist less space to improvise. For this reason, they may require less in the way of therapeutic skills than in traditionally delivered treatments. In Studies II and III good results were obtained when support was provided by inexperienced psychology students, most of them treating their first clients. A question worth investigating is whether even better results can be obtained when sup-

port is provided by experienced therapists. Knaevelsrud & Maercker (2007) and Cuijpers et al. (2010) argue that contact per se is important and not its intensity. This should be investigated more thoroughly.

Future research might also further explore the therapeutic alliance which has been investigated in Internet-based treatments with somewhat mixed results. Studies suggest that it is possible to establish a good therapeutic alliance in Internet-based treatments although the therapist-client relationship may be slightly different (see Andersson et al., 2012; Jasper et al., 2014; Preschl et al., 2011). Therefore, more research on the therapist-client relationship in Internet-based treatments is needed.

Also, client characteristics that predict adherence to Internet-based treatment need to be investigated more thoroughly. The findings of recent studies suggest, for example, that lower baseline symptomatology, less comorbidity symptoms and higher education are positively, and male gender negatively associated with adherence (e.g., Farrer et al. 2014; Karyotaki et al., 2015). Many users do not complete the intervention or do not benefit from the treatment. Characteristics, such as the severity and chronicity of depression, and earlier first onset tend to predict higher relapse in psychological treatment in general (Roth & Fonagy, 2005). Are there patient groups or characteristics that explain why certain patients are treatment-resistant to Internet-based therapy? We found indications that individuals with severe depressive symptoms may not benefit from an Internet-delivered intervention without face-to-face contact to the same extent as individuals with lower depression rates. It is possible that this group of depressed individuals need more support in the form of face-to-face contact. In addition, more research on personality traits are needed since recent studies suggest that they could be affected through Internet-based psychological treatment (Hedman, Carlbring et al., 2014). Greater knowledge about these factors in Internet-delivered treatment is warranted, as it will help to identify those for whom Internet-based treatment is best suited- and who those who should be receiving more conventional type of therapy.

Yet another important question to be addressed is how knowledge about technological applications and Internet-based treatments could be better disseminated into health care settings. At the moment, there is a gap between research findings and current health care practices. Thus, more research should be targeted at examining how technology and Internet-delivered interventions could be embedded in the health care context, as a way to supplement and improve the traditional treatment practices. In addition, clinicians and patients need to know more of Internet-based interventions.

Finally, the behavior change model for Internet interventions proposed by Ritterband et al. (2009) provides a framework to develop Internet interventions, trying to identify factors that may lie behind behavior change and positive outcomes. This model that combines various theories and empirical findings offers a useful tool to identify, develop, test and measure the various aspects and components of Internet-based interventions and their impact on behavior

change. This framework could serve as a fruitful source for improving Internet-based interventions in the years ahead.

## 4.6 Conclusions

The present report provides an overview of the field of technology- and Internet-delivered interventions and how they can be applied with a view to improving mood and general well-being. The key aim of this research was to evaluate three technology- and Internet-delivered interventions for stress-related psychological distress and depressive symptoms. The interventions were based on acceptance- and commitment therapy (ACT). To date, the studies included in this report are among the first ones in the world to investigate ACT-based Internet-delivered treatments for depressive symptoms.

The results of the three studies indicate the potential of guided technology- and Internet-delivered interventions based on acceptance and commitment therapy as a treatment for alleviating depressive symptoms and enhancing well-being. Moreover, in line with earlier research, we conclude that, the treatment outcomes of guided Internet-based acceptance and commitment therapy are comparable to those achieved in traditionally delivered face-to-face ACT-based treatment. We also found that the treatment outcomes were slightly better maintained in the Internet-delivered intervention. Further, this research demonstrated that guided interventions based on the methods of acceptance and commitment therapy can be effective for individuals suffering from depressive symptoms. The interventions implemented in these studies produced not only short-term gains but also improvements across a longer period of time. Moreover, ACT-related processes, including psychological flexibility and mindfulness skills were also influenced via Internet-delivered treatments. This work also found that, in Internet-based interventions, support can be provided by persons without formal health care qualification, given that they are well supervised. Although the impact of support on treatment outcome was not a focal point in this research, we can assume, on the basis of earlier results, that individual contact during the interventions enhanced the treatment outcome. However, such contact did not necessarily have to be face-to-face in order to obtain significant effects, although personal contact was appreciated. Furthermore, the technology-delivered treatment formats were well-received by the participants.

Technology- and Internet-based treatments can be both highly cost-effective and expand the reach of mental health care to include larger and more diverse groups of people. By employing these means, we can reduce psychological suffering and distress for many individuals across a range of mental health issues. Technology- and Internet-delivered interventions should not be regarded as the only approach to the provision of psychological treatment in the future. Instead, they should complement and extend, rather than replace, existing care, and be considered as an alternative, yet effective mode of treatment for

those who for various reasons are not able to access adequate treatment or are reluctant to seek help for their mental health concerns. However, the great promise of technology-delivered interventions may be diminished if they are not carefully evaluated before broadly released or disseminated.

To be effective, technology-based interventions need first of all to be based on research. It is desirable, therefore, that guidelines for clinical practice are informed to a much greater extent than is currently the case by the abundance of evidence obtained from randomized controlled trials and scientific research conducted in the field of Internet-based psychological interventions than is currently the case.

Technology offers manifold opportunities to extend or improve existing health care practices and to provide empirically supported treatments to underserved and difficult-to-reach populations who would never otherwise have access to mental health care. This only leaves the question of where these possibilities will take us next.



## YHTEENVETO (FINNISH SUMMARY)

### **Teknologia- ja internet-pohjaiset psykologiset interventiot mielialan ja hyvinvoinnin edistämässä: Hyväksymis- ja omistautumisterapiaan pohjautuvien interventiomenetelmien arviointi**

Tämän tutkimuksen tavoitteena oli tutkia kolmea teknologia- ja internetpohjaista mielialaongelmiin suunnattua psykologista interventiota ja niiden vaikuttavuutta mielialaongelmiin ja yleiseen hyvinvointiin. Lisäksi kartoitettiin sitä, miten interventioihin osallistuneet mielialaongelmista ja stressistä kärsivät henkilöt hyväksyivät kyseiset interventiot. Tutkimuksen viitekehyksenä käytettiin kognitiivisen käyttäytymisterapian uuteen aaltoon luettavaa hyväksymis- ja omistautumisterapiaa (HOT; acceptance and commitment therapy, ACT; Hayes, Strosahl, & Wilson, 2012). Tutkimuksen tarkoituksena oli selvittää erityisesti, voidaanko teknologia- ja verkkopohjaisen, pääosin hyväksymis- ja omistautumisterapiaan perustuvan psykologisen intervention avulla vähentää masennusoireita ja parantaa yleistä hyvinvointia.

Tutkimukseen osallistui yhteensä 100 henkilöä ja se koostui kolmesta satunnaistetusta vertailevasta osatutkimuksesta, joissa yhdistettiin uutta teknologiaa sekä hyväksymis- ja omistautumisterapian menetelmiä. Osatutkimukset toteutettiin kolmessa eri vaiheessa ja kolmella eri koehenkilöryhmällä. Osatutkimuksessa I arvioitiin interventiota, jossa yhdistettiin internet ja teknologiavälineet hyväksymis- ja omistautumisterapian periaatteisiin pohjautuvaan ryhmämuotoiseen interventioon. Tutkimukseen osallistui 23 työikäistä miestä iältään 28–58-vuotiaista miestä, jotka kokivat työstä aiheutuvaa kuormittuneisuutta ja mielialaongelmia. Koeryhmä koostui 11 ja kontrolliryhmä 12 henkilöstä. Osatutkimukset II ja III arvioivat hyväksymis- ja omistautumisterapian menetelmiin pohjautuvaa *Hyvän elämän kompassi* verkko-ohjelmaa ja intervention vaikuttavuutta masennusoireisiin. Ensimmäiseen näistä interventioista osallistui yhteensä 38 masennuksesta kärsivää henkilöä, joista 18 satunnaistettiin ns. verkkoryhmään ja 19 perinteisesti kasvokkain hoitoa saavaan ryhmään. Toiseen kokeiluun osallistui 39 henkilöä, joista vastaavasti koeryhmä koostui 19 osanottajasta ja kontrolliryhmä 20 osanottajasta.

Osatutkimuksen I kohteena oli Jyväskylän yliopiston psykologian ja liikuntabiologian laitoksen, teknologian tutkimuskeskuksen (VTT) sekä yhdeksän teknologia- ja palveluyrityksen muodostaman konsortion yhteistyössä kehittämä interventio, jonka yhtenä osana oli verkkoportaali *Hyväksi*. Interventio oli osa Tekesin tukemaa P4Well-tutkimushanketta. Tutkimushankkeessa kehitettiin palvelukonsepti, joka tarjoaa työikäisille työkaluja stressinhallintaan ja omasta hyvinvoinnista huolehtimiseen. Palvelukonseptissa hyödynnettiin henkilökohtaisia mittalaitteita ja matkapuhelinsovelluksia kuten syke-, askel- ja aktiivisuusmittareita sekä hyvinvointipäiväkirja- ja rentoutussovelluksia. Hankkeessa kehitetty verkkopalvelu yhdisti eri teknologiat yhtenäiseksi kokonaisuudeksi yhdessä psykologisten työkalujen kanssa. Teknologiat ja verkkopalvelu räätälöitiin käytettäväksi psykologin johdolla tapahtuvien ryhmätera-

piatapaamisten yhteydessä ja tapaamisten välillä. Intervention kulku oli seuraava: Tutkimuksen alussa sekä koe- (n = 11) että kontrolliryhmän (n = 12) tutkittaville suoritettiin fysiologiset mittaukset ja he saivat sykemittarin kolmepäivästä sykemittausta varten. Sykemittarit palautettiin viikon kuluttua ja kullekin koeryhmän tutkittavalle järjestettiin henkilökohtainen yhden tunnin palautesessio, jossa he saivat liikuntafysiologilta palautetta sykemittarin tuloksista sekä tulosten yhteydestä tutkittavien kokemaan stressiin, uneen, rentoutumiseen ja liikuntatottumuksiin. Koeryhmä osallistui psykologin pitämään kolmeen ryhmätapaamiseen n. neljän viikoin välein.

Ensimmäisessä ryhmätapaamisessa (3 tuntia) tutkittavat täyttivät aluksi psykologiset tutkimuslomakkeet ja heitä informoitiin tutkimuksen kulusta. He saivat myös psykologisen intervention, jonka tarkoituksena oli motivoida tutkittavat käyttäytymismuutoksiin ja omasta hyvinvoinnista huolehtimiseen. Tässä hyödynnettiin hyväksymis- ja omistautumisterapian arvoanalyysia, jonka pohjalta laadittiin tavoitteet. Työskentelyn tueksi tehtiin kokemuksellisia harjoituksia. Tapaamisen päätteeksi tutkittavat saivat arviointilomakkeen sekä teknologialaitteet, kuten matkapuhelimen sovelluksineen sisältäen hyvinvointipäiväkirjan (WellnessDiary), liikuntavalmennusohjelman sekä rentoutusohjelman, askelmittarin, sykemittarin, unta seuraavan aktiivisuusmittarin sekä tunnukset Hyväksi-verkkoportaaliin. Portaaliin oli koottu tietoa stressiin liittyvistä aihepiireistä sekä viisiportainen elämäntapamuutosmalli, erilaisia mindfulness- ja rentoutusharjoituksia sekä itsearviointityökaluja oman tilanteen pohjimiseen ja seuraamiseen. Toisen tapaamisen (2 tuntia) teemana olivat ongelmanratkaisumenetelmät, joiden avulla omaa tilannetta ja siihen vaikuttavia tekijöitä (stressitekijät, uni, liikunta jne.) analysoitiin. Tapaamisen aikana tehtiin myös hyväksymis- ja omistautumisterapian kokemuksellisia harjoituksia. Unta mittaavat aktiivisuusmittarit kerättiin pois ja niistä annettiin palautetta Hyväksi-portaalin kautta. Kolmannen tapaamisen aiheena oli hyväksyntätaitojen harjoittelu ja tutkittavien valmistaminen taitojen ylläpitoa varten. Tapaamisen aikana tehtiin lisäksi kokemuksellisia harjoituksia. Tapaamisen päätteeksi kaikki teknologialaitteet kerättiin pois. Kolmipäiväinen sykemittaus toistettiin.

Kontrolliryhmä ei saanut teknologialaitteita käyttöönsä eikä heille järjestetty kolmea ryhmätapaamista. Kontrolliryhmälle järjestettiin yksi ryhmätapaaminen sen jälkeen kun molemmille ryhmille oli suoritettu loppumittaus. Seurantamittaus koeryhmälle suoritettiin 6 kuukautta intervention päättymisen jälkeen.

Osatutkimuksissa II ja III arvioinnin kohteena oli Jyväskylän yliopiston psykologian laitoksella kehitetty verkko-ohjelma Hyvän elämän kompassi, joka oli laadittu mielialaongelmista kärsiville henkilöille. Hyvän elämän kompassi on kuuden viikon ohjelma, joka pohjautuu hyväksymis- ja omistautumisterapian periaatteille. Viikkoteemat ovat 1. *Selvitä arvoisi: Mikä on sinulle tärkeää*, 2. *Toimi arvojesi mukaan*, 3. *Ole läsnä: Elä tässä hetkessä*, 4. *Havainnoi ajatuksiasi ja tunteitasi*, 5. *Vapaudu: Et ole yhtä kuin ajatuksesi*, 6. *Hyväksy ajatuksesi ja tunteesi. Hyväksy se, mitä et voi muuttaa*. Kukin teema koostui viikon tekstistä, kuvista, vertauskuvista ja kokemuksellisista harjoituksista, jotka olivat luettavissa ja

kuunneltavissa Mp3-äänitteenä. Kolmanteen osatutkimukseen lisättiin myös jokaiseen teemaan video, jolla kerrottiin kyseisistä prosesseista. Kunkin teeman käsittelyyn oli varattu yksi viikko aikaa, jonka päätteeksi tutkittavat tekivät kotitehtävät. Kotitehtävänä oli tehdä viikkoteemassa mainitut harjoitukset, jotka oli esitetty sekä tekstinä että äänitteinä, sekä kirjoittaa pohdintaa siitä, mitä ajatuksia viikon teema herätti ja mitä kokemuksia tutkittava viikon kuluessa sai tekemistään harjoituksista. Esimerkiksi kolmannen viikon (Ole läsnä) tehtävänä oli paneutua tietoisuustaitoihin ja niiden soveltamiseen omassa arjessa: 1. Valitse viikon ajaksi yksi askare jota tekisit muutenkin, ja tee sitä tietoisesti, täysin keskittyen. 2. Kuuntele tai lue Tarkkailija-harjoitus tai Virrassa lipuvat lehdet -harjoitus mahdollisimman usein, mielellään päivittäin. Voit myös halutesasi tehdä muita tietoisien läsnäolon harjoituksia. 3. Tee ainakin yksi arvojesi mukainen teko. 4. Kerro vastauksessasi, mitä askareita päätit tehdä tietoisesti ja miten se mielestäsi onnistui. Kerro myös muiden harjoitusten kuten Tarkkailija-harjoituksen tekemisestä ja siitä, mitä ajatuksia ne herättivät.

Kunkin viikon päätteeksi tutkittava kirjoitti pohdintansa Kompassi-ohjelmassa sijaitsevaan virtuaaliseen kotitehtäväkansioon. Kunkin tutkittavan omalla tukihenkilöllä oli pääsy kyseiseen kansioon. Tukihenkilö antoi tutkittavalle muutaman päivän kuluessa lyhyen kirjallisen palautteen tehtävästä kyseisen kansion kautta viikoittain.

Osatutkimuksessa II interventioon osallistui ns. verkkoryhmä (n = 19), joka sai yllä kuvatuun Hyvän elämän kompassi -verkko-ohjelman käyttöönsä kuuden viikon ajaksi. Verkko-ohjelmaan yhdistettiin henkilökohtainen alku- ja lopputapaaminen sekä tukihenkilön viikoittain antama kirjallinen, verkon kautta annettu palaute. Verkkoryhmän verrokkina oli perinteisesti kasvokkain hoitoa saava ryhmä (n = 19), joka sai saman sisältöisen hoidon kerran viikossa terapiaaistunnoissa. Tukihenkilöinä ja terapeutteina toimivat psykologian loppuvaiheen opiskelijat, joista kullakin oli yksi verkkoryhmän ja yksi kasvokkaista hoitoa saavan ryhmän tutkittava. Kumpaankin interventioon sisältyi ensimmäisen tapaamisen aikana tehty haastattelu, jonka pohjalta tukihenkilö laati tutkittavan tilanteesta tapauskuvauksen (käyttäytymisanalyysi).

Osatutkimuksessa III koeryhmä (n = 19) sai Hyvän elämän kompassi -verkko-ohjelman ja viikoittaisen kirjallisen palautteen portaalin kautta edellisen intervention tapaan. Interventiosta oli kuitenkin poistettu alku- ja lopputapaaminen ja korvattu ne puhelinkontaktilla intervention alussa. Lisäksi interventioon lisättiin automaattiset muistutukset sähköpostitse. Verkkointervention tuloksia verrattiin ei-hoitoa saavaan ryhmään (kontrolliryhmä, n = 20).

Osatutkimuksessa I kartoitettiin sitä, miten teknologia- ja HOT-pohjainen ryhmäinterventio vaikutti mielialaan, psykologisiin ja fysiologisiin oireisiin, uupumukseen, elämänlaatuun sekä yksilön voimavarojen ja työstä saatavan palkkion väliseen suhteeseen (ylisitoutuminen ja kyynisyys). Lisäksi selvitettiin sitä, miten osanottajat kokivat intervention.

Osatutkimuksen II tavoitteena oli selvittää, miten verkko-ohjelma Hyvän elämän kompassi yhdistettynä tapaamiseen intervention alussa ja lopussa sekä lyhyeen verkon kautta annettavaan kirjalliseen palautteeseen vaikutti masen-

nusoireiden ohella psykologisiin ja fysiologisiin oireisiin, elämänlaatuun, psykologiseen joustavuuteen, tietoisuustaitoihin ja depressiivisten ajatusten käsittelyyn. Strukturoitujen haastattelulomakkeiden avulla kartoitettiin myös osanottajien kokemuksia interventioista ja erityisesti sitä, miten he hyväksyivät verkkomuotoisen intervention. Arvioinnissa käytettiin kahdeksaa eri kansainvälistä itsearviointimittaria sekä haastatteluiden perusteella saatua aineistoa.

Osatutkimuksessa III tutkittiin interventiota, jossa Hyvän elämän kompassi-ohjelmaan yhdistettiin tapaamisten sijasta puhelinhaastattelu intervention alussa ja viikoittainen verkossa annettu kirjallinen palaute. Lisäksi interventioon yhdistettiin viikoittaiset automatisoidut sähköpostimuistutukset. Tutkimuksessa haluttiin selvittää, miten interventio, jossa henkilökohtaista kontaktia vähennettiin - aiempaan tutkimukseen verrattuna - vaikutti masennusoireiden ohella psykologisiin ja fysiologisiin oireisiin, psykologiseen joustavuuteen, tietoisuustaitoihin ja depressiivisten ajatusten käsittelyyn. Tämän lisäksi kartoitettiin intervention osanottajien kokemuksia strukturoidun haastattelun avulla.

Osatutkimuksen I tulokset osoittivat, että teknologiaa ja ryhmätapaamisia yhdistävä interventio vähensi masennusoireita lähes merkitsevästi verrattuna kontrolliryhmään ja positiivinen muutos säilyi puoli vuotta intervention jälkeen. Kun alkutilanteessa masennusta raportoi seitsemän tutkittavaa yhdestätoista, intervention päätyttyä masennusoireista kärsi enää yksi henkilö. Kontrolliryhmässä ei ollut tapahtunut muutosta masennusoireiden osalta. Lisäksi interventio vähensi psykologisia ja fysiologisia oireita sekä paransi terveydentilaa ja työkykyä. Sillä oli myönteistä vaikutusta myös uupumuksen ja työn kuormittavuuden eri aspekteihin, kuten kyynisyyteen ja ylisitoutumiseen. Myös tutkittavien tyytyväisyys elämään kohosi edelleen seurannassa. Kaikki tutkittavat pitivät interventiota hyödyllisenä ja raportoivat stressin vähentyneen ja fyysisen aktiivisuutensa lisääntyneen. Lisäksi he kokivat intervention motivoineen heitä huolehtimaan omasta hyvinvoinnista jatkossa. Teknologialaitteet koettiin hyödyllisiksi, motivaatiota lisääviksi ja sopiviksi henkilökohtaiseen käyttöön. Yhtä lukuun ottamatta tutkittavat käyttivät vähintään yhtä tarjotuista teknologialaitteista aktiivisesti. Eniten hyödynnettiin matkapuhelimen rentoutussovellusta ja askelmittaria.

Osatutkimuksen II tulokset osoittivat, että hyväksyntä- ja arvopohjainen interventio, joka toteutettiin joko pääosin verkossa tai tarjottiin kasvokkain, vaikutti lähes kaikkiin mitattuihin oireisiin myönteisesti (depressio-oireet, elämänlaatu ja elämään tyytyväisyys). Psykologista joustavuutta, tietoisuustaitoja sekä ajatusten käsittelyä koskevat mittarit (ns. prosessimittarit) osoittivat, että kummassakin ryhmässä tapahtui merkittäviä positiivisia muutoksia, ja ryhmät muuttuivat samalla tavoin. Kuuden kuukauden seuranta osoitti, että verkko-ryhmän tulokset säilyivät ja jopa paranivat loppumittaukseen verrattuna, kun taas kasvokkaista hoitoa saaneen ryhmän tulokset heikkenivät jonkin verran kaikkien mittareiden osalta. Ryhmien välinen efektikoko kuuden kuukauden seurannassa oiremittareilla mitattuna oli keskisuuri kaikilla mittareilla paitsi psykologisten ja fysiologisten oireiden osalta, jossa efektikoko oli pieni. Puolen-toista vuoden kuluttua toistetussa seurantamittauksessa havaittiin, että ryhmi-

en väliset erot olivat pienentyneet. Ryhmien sisäiset efektikoot olivat suuret kaikilla oiremittareilla mitattuna kummankin ryhmän osalta Tyytyväisyys elämään -mittaria lukuun ottamatta. Tarkasteltaessa tuloksia BDI-II -mittarin perusteella 18 kuukauden seurannassa, voidaan todeta, että verkkoryhmässä 84,2 % tutkittavista ei ollut enää luokiteltavissa masentuneeksi (BDI = < 14) ja kolmella tutkittavalla (15,8 %) oli lievä masennus. Kasvokkaista hoitoa saaneessa ryhmässä puolella (50 %) tutkittavista ei ollut masennusta, neljällä (25 %) oli havaittavissa lievää masennusta ja neljä (25 %) kärsi edelleen keskivaikeasta masennuksesta. Tutkittavat olivat tyytyväisiä sekä verkkohoitoon että perinteisesti kasvokkain annettuun hoitoon ja suosittelivat sitä myös muille. Tyytyväisyydestä kertoo myös se, että koko intervention ja puolentoista vuoden seurannan aikana vain kolme henkilöä keskeytti hoidon tai ei osallistunut mittauksiin. Kaikki keskeyttäneet kuuluivat kasvokkaista hoitoa saaneeseen ryhmään.

Osatutkimuksen III tulokset osoittivat merkitsevästi suurempia muutoksia verkkoryhmässä sekä loppumittauksessa että 12 kuukauden seurantamittauksessa verrattuna kontrolliryhmään, joka ei saanut hoitoa. Tarkasteltaessa kliinistä merkitsevyyttä interventoryhmän osalta intervention päättyessä voitiin havaita, että yhdeksän (50 %) verkkoryhmän tutkittavista oli toipunut masennuksesta, kahden tutkittavan tila (11,1 %) oli parantunut ja seitsemän tutkittavan (38,9 %) tila pysynyt ennallaan. Vertailuryhmässä 80 % tutkittavista oli edelleen masentuneita eli tilanne oli pysynyt ennallaan. Huolimatta siitä, etteivät tutkittavat interventoryhmässä saaneet kasvokkain annettua tukea, suurin osa tutkittavista oli tyytyväisiä hoitoon ja suositteli sitä muille.

Yhteenvetona voidaan todeta, että sekä teknologialaiteilla tuettu hyväksymis- ja omistautumisterapiaan pohjautuva ryhmäinterventio että yksilöhoitoina toteutetut verkkointerventiot, joissa hyödynnettiin hyväksymis- ja omistautumisterapian menetelmiä, vähensivät masennusoireita merkitsevästi tai lähes merkitsevästi ja paransivat yleistä hyvinvointia. Merkittävää on myös se, että tutkimuksiin osallistuneet henkilöt hyväksyivät kyseiset interventiot ja olivat valmiita suosittelemaan vastaavanlaista hoitoa myös muille masennuksesta tai uupumuksesta kärsiville. Näin ollen teknologian yhdistäminen psykologisiin hoitoihin antaa vaihtoehtoja perinteisesti tarjottavien psykologisten hoitojen rinnalla ja joustavia mahdollisuuksia tarjota hoitoa useammille sitä tarvitseville.

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## ORIGINAL PAPERS

### I

#### **FEASIBILITY OF A PERSONAL HEALTH TECHNOLOGY-BASED PSYCHOLOGICAL INTERVENTION FOR MEN WITH STRESS AND MOOD PROBLEMS: RANDOMIZED CONTROLLED PILOT TRIAL**

by

Päivi Lappalainen, Kirsikka Kaipainen, Raimo Lappalainen, Henna Hoffrén, Tero Myllymäki, Marja-Liisa Kinnunen, Elina Mattila, Antti P. Happonen, Heikki Rusko,  
& Ilkka Korhonen, 2013

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[Original Paper](#)

## Feasibility of a Personal Health Technology-Based Psychological Intervention for Men with Stress and Mood Problems: Randomized Controlled Pilot Trial

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### Abstract

**Background:** Work-related stress is a significant problem for both people and organizations. It may lead to mental illnesses such as anxiety and depression, resulting in increased work absences and disabilities. Scalable interventions to prevent and manage harmful stress can be delivered with the help of technology tools to support self-observations and skills training.

**Objective:** The aim of this study was to assess the feasibility of the P4Well intervention in treatment of stress-related psychological problems. P4Well is a novel intervention which combines modern psychotherapy (the cognitive behavioral therapy and the acceptance and commitment therapy) with personal health technologies to deliver the intervention via multiple channels, including group meetings, Internet/Web portal, mobile phone applications, and personal monitoring devices.

**Methods:** This pilot study design was a small-scale randomized controlled trial that compared the P4Well intervention with a waiting list control group. In addition to personal health technologies for self-assessment, the intervention consisted of 3 psychologist-assisted group meetings. Self-assessed psychological measures through questionnaires were collected offline pre- and post-intervention, and 6 months after the intervention for the intervention group. Acceptance and usage of technology tools were measured with user experience questionnaires and usage logs.

**Results:** A total of 24 subjects were randomized: 11 participants were followed up in the intervention group (1 was lost to follow-up) and 12 participants did not receive any intervention (control group). Depressive and psychological symptoms decreased and self-rated health and working ability increased. All participants reported they had benefited from the intervention. All technology tools had active users and 10/11 participants used at least 1 tool actively. Physiological measurements with personal feedback were considered the most useful intervention component.

**Conclusions:** Our results confirm the feasibility of the intervention and suggest that it had positive effects on psychological symptoms, self-rated health, and self-rated working ability. The intervention seemed to have a positive impact on certain aspects of burnout and job strain, such as cynicism and over-commitment. Future studies need to investigate the effectiveness, benefits, and possible problems of psychological interventions which incorporate new technologies.

**Trial Registration:** The Finnish Funding Agency for Technology and Innovation (TEKES), Project number 40011/08



**KEYWORDS**

stress; technology-supported mini-intervention; personal health technologies; cognitive behaviour therapy; acceptance and commitment therapy; mhealth; mobile health; smartphone; Internet

## Introduction

Work-related stress is one of the biggest health challenges that the world faces at this moment. According to the 2009 European Risk Observatory Report, stress is the second most frequently reported work-related health problem and affects 22% of working Europeans [1]. Long-term exposure to work-related stress has been linked to an increased risk of psychological problems, such as depression, anxiety, emotional exhaustion, and may lead to long-term absenteeism, work disability, and early retirement [2].

Several studies have investigated work-related mental health [3,4]. Psychological interventions based on cognitive behavioral therapies (CBT) have a proven effectiveness for a range of common mental health disorders [5-7]. CBT is also an effective intervention for occupational stress [8-11]. Besides traditional CBT methods, research suggests that stress management interventions based on the acceptance and commitment therapy (ACT) have a positive impact on employees' psychological health, well-being, and stress management skills [12-19]. Research implicates that psychological acceptance promoted by ACT is associated with not only mental health variables but also with a performance-related variable.

Lifestyle-related chronic conditions are an increasing problem in the developed world. Most existing health services do not have sufficient resources to support long-term individual interventions. The delivery of current disease prevention and management models are not feasible due to their high cost and they do not always reach those who need them. Therefore, new models of prevention and treatment measures based on self-management are needed. Personal health systems including Web-based programs, mobile devices, and other health monitoring tools may be used for self-management of chronic conditions and behavioral change [20].

Internet-based and computer-aided treatments have been shown to be effective in treating a wide range of psychological problems, and have effect sizes (ES) comparable to those found for more traditional types of psychological treatments [21-32]. Seymour and Grove [33] have pointed out that accessibility and acceptability are key issues for further research in addition to effectiveness. To address these issues, Web-based treatment programs can be complemented by mobile and wearable technologies for self-monitoring to best suit the user's needs and preferences and also to potentially enhance the effect of the intervention. In addition, technology delivered interventions may be complemented by traditional intervention methods such as individual or group face-to-face meetings and phone counseling.

P4Well is a novel CBT- and ACT-based intervention which combines personal health technologies (mobile, Web, and self-monitoring technologies) to an intervention program which

is based on group meetings [34,35]. In intervention design, our aim was to combine the cost-effectiveness of the group meetings to a personalized intervention enabled by technology tools. We designed the intervention program content and technology toolkit in parallel, matching them to each other. The P4Well intervention utilizes a variety of technology tools which allow personalization of the intervention methods and feedback. This may increase the acceptance and efficacy of the intervention by giving the users the possibility to choose appropriate self-management tools according to their personal interest.

The objective of this study was to study the feasibility and effectiveness of the developed P4Well intervention among working age males who experienced mild to moderate symptoms of stress and/or depression. We assessed the effects of the intervention using depression, psychological symptoms, and stress as primary outcome measures and compared these effects to a control group without intervention. Secondary outcome measures included quality of life, psychological flexibility, and job strain. Furthermore, we studied the acceptability and usage of the intervention and its components.

## Methods

### Recruitment and Allocation

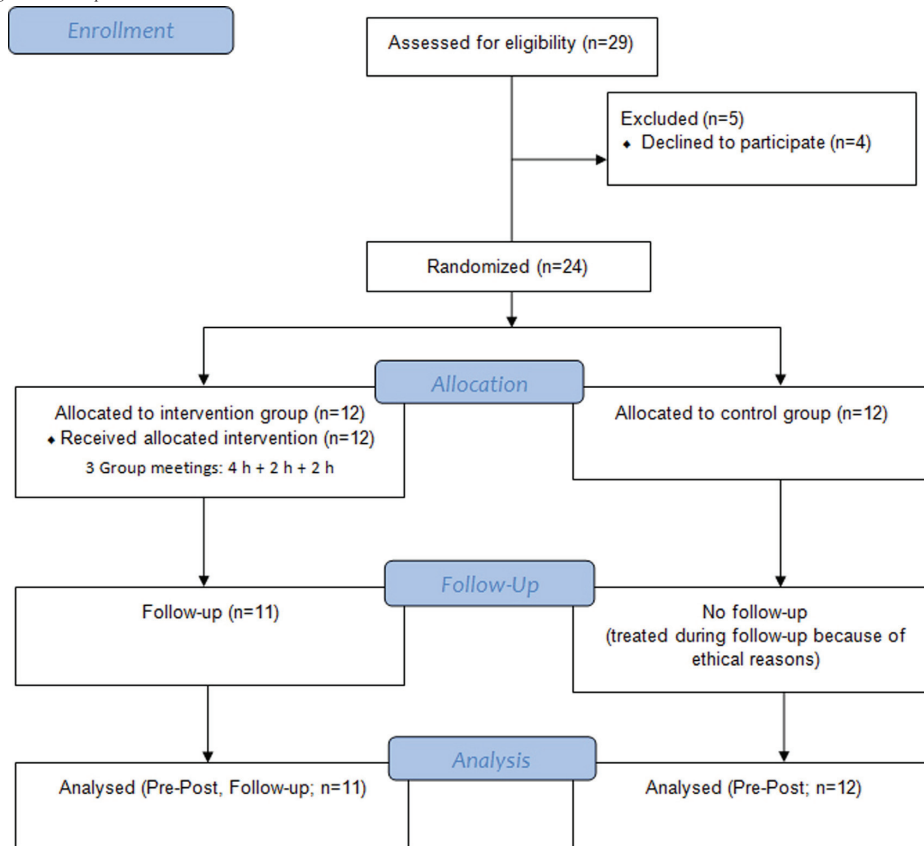
Participants were recruited through an advertisement in a local newspaper, seeking males aged 25 to 45 years old with exhaustion, stress symptoms, or sleeping problems. Other inclusion criteria were full time employment, basic computer skills, and access to Internet. Exclusion criteria included diabetes and simultaneous attendance in other stress management programs. We focused this study on male adults because men have a lower tendency to seek treatment for psychological problems compared to females [36,37]. The psychotherapy clinic of the University of Jyväskylä was contacted by 29 respondents via telephone or email. Before randomization of subjects into the research groups, 4 men dropped out. Since fewer participants responded to the advertisement than expected, we also included respondents older than 45 years of age in the study. The adjusted age range was 28 to 58 years. Of the 25 male participants, we excluded one participant from analysis because he did not fulfill the inclusion criteria (because of age and retirement) and one participant who did not participate in the follow-up measurements. One participant in the intervention group was lost at follow-up (Figure 1). Thus, the total number of participants included in the study was 23. Dropout (n=1) was treated with an intention-to-treat-analysis using the data missing principle of last observation carried forward. We then randomly allocated participants either to the intervention or the waiting list control group (intervention group=11, control group=12). The sample was first divided into pairs based on participants with similar depression scores, measured by Beck's Depression Inventory (BDI) [38]. Second, the order of pairs was randomized. Third, participants within pairs were randomly

assigned either to intervention or control group. Thus, the groups were made equal on the basis of reported depressive symptoms and the researchers generated the randomization. Consent from participants was obtained offline in paper format at pre-measurement. Participants received detailed information about the study procedure and their rights.

The study took place at the psychotherapy clinic of the department of psychology at the University of Jyväskylä, Finland, from January 2009 to October 2009. The Research

Ethics Committee of the University of Jyväskylä approved this study. The study was funded by the Finnish Funding Agency for Technology and Innovation (TEKES). The study was not registered in a public trials registry, because the study was a phase I small-scale pilot study including no participants with medical or psychiatric diagnosis. The study tested a psychological and technical intervention without any side effects. The funding of the project required that participants with diagnoses should not be included in the study.

**Figure 1.** Participant flow chart.



### Participants

The mean age of the participants was 47.1 years (SD 4.72) in the intervention group and 39.4 (SD 7.96) in the control group

(Table 1). The intervention group was older,  $t_{21}=2.78$ ,  $P=.011$ , and had a lower BMI,  $t_{21}=2.42$ ,  $P=.025$ , than the control group. The groups did not differ in regard to education, type of work, shift work, or reported depressive symptoms.

**Table 1.** Participant characteristics.

Background variable	Intervention (n=11)	Control (n=12)
Age	47.1 (4.7)	39.4 (8.0) <sup>a</sup>
Body Mass Index	24.4 (3.1)	28.1 (4.2) <sup>a</sup>
Education (yrs)	7.1	7.2
Married (%)	7 (63)	10 (83)
Permanent employment (%)	9 (82)	11 (92)
Fulltime work (%)	10 (91)	12 (100)
Shift work (%)	11 (100)	11 (92)
No physical work (%)	8 (73)	8 (67)
Depressive symptoms (%) <sup>c</sup>	7 (63)	6 (50)
Medication (%) <sup>d</sup>	4 (44)	1 (8)

<sup>a</sup> $P=.011$ <sup>b</sup> $P=.025$ <sup>c</sup> score is 10 or greater in Beck's Depression Inventory<sup>d</sup> use of antidepressants and/or hypnotics

### Intervention

The P4Well intervention integrated different personal health technologies, including a Web portal, mobile phone applications, personal monitoring devices, and analysis software, with a CBT- and ACT-based intervention program which was specifically designed to utilize personal health technologies (Figure 2). The main idea behind the intervention concept was to combine cost-efficiency of group meetings, personalization and self-monitoring capabilities provided by technologies, and, technology use between the group meetings to increase the continuity and impact of the intervention. The intervention program consisted of 3 group meetings held by a psychologist. The main CBT- and ACT-based methods used in the intervention included clarification of personal values, goal setting, self-monitoring, relaxation, mindfulness, and acceptance procedures. Furthermore, regular physical activity was encouraged and emphasized as means for stress reduction, mood elevation, and improved well-being.

Participants placed in the control group did not receive any technical tools or group meetings during the study period. Pre-measurement consisting of self-assessed questionnaires in paper format and heart rate variability recording was done for both the control and intervention groups before the first group meeting. Both groups had an individual assessment meeting during the pre-measurement phase where they received questionnaires and were given a wearable beat-to-beat heart rate (HR) recording device (Suunto Memory Belt, Suunto Ltd, Vantaa, Finland) with instructions to do a 3-day HR variability (HRV) recording. One week after the assessment meeting, the questionnaires and the heart rate belts were collected and analyzed. Feedback was given to both groups by an exercise physiologist. The intervention group received feedback for the HRV recording (1 hour individual discussion of topics concerning stress, sleep and relaxation, and exercise habits) after the first group meeting. Two weeks after the intervention

group finished its third and last meeting (ie, after 3 months), both groups were measured for the second time (post-measurement). Follow-up questionnaires were sent to the intervention group 6 months after the intervention ended (intervention group follow-up, n=11). We offered the control group 1 mini-intervention meeting after the post-measurement. Feedback of the recordings for the control group was given during the mini-intervention.

The first intervention group meeting was an informative and motivating session that consisted of: (1) measurements (background information questionnaire, technology literacy and attitude questionnaire, and psychological questionnaires), (2) general background information about the P4Well intervention and introduction to the wearable technologies, and (3) the psychological mini-intervention (90 minutes). Participants were provided with credentials to the Web portal, mobile phones (Nokia E51) with preinstalled mobile applications (Wellness diary, Fitness coach, and Relaxation assistant; Figure 3), pedometers, heart rate monitors, and actigraphs. The ACT value analysis method was used to initiate the intervention by motivating behavioral changes in the participants [39,40]. Participants were asked to define their valued directions and goals, as well as actions to accomplish these goals. Additionally, a mindfulness exercise was carried out and participants were instructed to practice mindfulness and relaxation by doing exercises in the Web portal and with a mobile phone application. A self-observation worksheet was presented to encourage participants to begin their self-observations. As a homework assignment, participants were asked to further clarify their personal values and select actions based on these values and to conduct mindfulness exercises. Participants were also asked to start monitoring their sleep with the actigraph. The participants were encouraged but not required to start using one or more mobile applications and begin their self-observations after the group meeting.

The second group meeting (2 hours) was given 4 weeks later. The psychological assessment Web tool in the portal including individual problem analysis was presented and participants were asked to reflect over their situation (eg, stressors in their daily life, sleep, exercise habits, and variables affecting these factors). Participants were encouraged to continue working with the assessment tool at home. The session was ended with a mindfulness exercise. Actigraphs were collected from the participants and analysis reports about sleep and activity were sent to them through the Web portal after the meeting. The participants were encouraged to continue their self-observations with the technology tools.

The third group meeting (2 hours) took place 4 weeks after the second group meeting. The theme of the meeting was acceptance, which involves a willingness to experience all psychological events (thoughts, feelings, and physiological sensations), especially negatively evaluated events, without avoiding, changing, or controlling them [39,40]. Experiential exercises, such as metaphors and exercises related to acceptance, were carried out and discussed. At the end of the group meeting, all of the provided technology tools were collected from the participants. After the meeting, the 3-day HRV recording was repeated, accompanied by an individual stress and recovery analysis. The participants completed the final psychological and user experience questionnaires (sent through mail) 2 weeks after the last group meeting (post-measurement).

**Figure 2.** P4well intervention process.

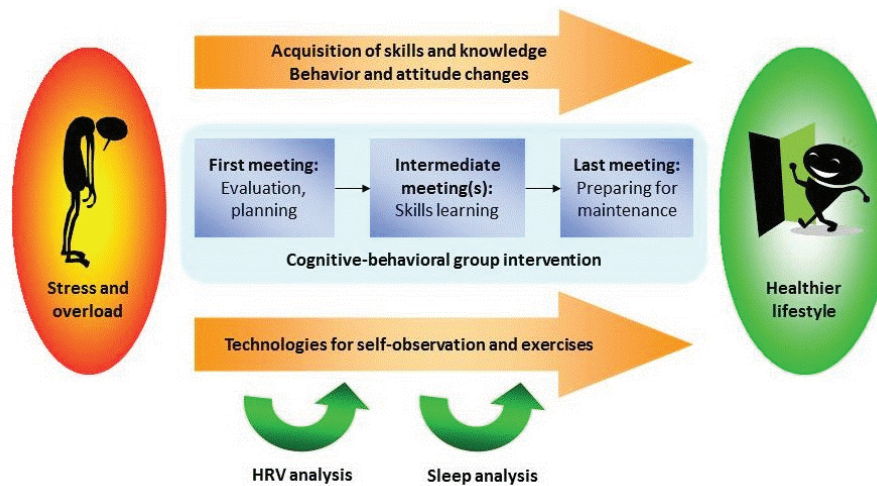


Figure 3. Screenshots of the 3 mobile applications.



### Technology Tools

The personal health technologies that were provided to the participants formed a wellness toolkit from which the participants could choose the most appropriate ones for their needs and preferences. The toolkit included a Web portal, a mobile phone with 3 preinstalled applications, a pedometer and a heart rate monitor. Additionally, the participants wore heart rate belts (Suunto Memory Belt, Suunto Ltd, Vantaa, Finland) for 3 days before and after the intervention period to obtain HRV recordings and actigraphs (Vivago Personal Wellness Manager, Vivago Ltd, Helsinki, Finland) for 4 weeks during the intervention to obtain sleep recordings. Based on these recordings, individual feedback reports were given to the participants. Full details of the P4Well technology toolkit have been described elsewhere and so only a brief outline will be provided here [34,35,41].

The secured Web portal (Figure 4) provided the participants access to information, exercises, self-assessment and self-reflection tools, Web-based wellness services, peer support, and expert consultation. The content of the portal was divided into modules focusing on different areas of well-being—sleep,

exercise, mood, stress and recovery, and good life. The modules consisted of 5 phases: information, evaluation of personal status, planning of lifestyle changes, putting the plans into action, and follow-up. In addition, the portal included a discussion forum and a messaging client for expert consultation. Mobile wellness diary entries were made available through portal interface (Nokia Wellness Diary Connected, Nokia Corp, Espoo, Finland) and access to an adaptive Web-based fitness training program was also included (Firstbeat WebTrainer, Firstbeat Technologies Ltd, Jyväskylä, Finland). Finally, the participants could utilize a library of evidence-based health-related information through the portal (Duodecim Health Library, Duodecim Medical Publications Ltd, Helsinki, Finland).

The purpose of the 3 mobile phone applications (Figure 3) was to better integrate wellness management and self-monitoring into the participants' daily lives. The first application was a mobile wellness diary (Nokia Wellness Diary (WD), Nokia, Espoo, Finland) that could be used to make daily self-observations on wellness related parameters. The second application was a mobile phone version of the fitness training program (Firstbeat Mobile Coach, Firstbeat Technologies Ltd, Jyväskylä, Finland), and the third one was a mobile phone

relaxation assistant which included personalized relaxation programs (SelfRelax, Relaxline, France).

The participants were encouraged to monitor their physical activity with a heart rate monitor (Suunto Ltd, Vantaa, Finland) or a pedometer (Omron, Kyoto, Japan). Heart rate monitors

were primarily meant for participants who were interested in fitness training, whereas pedometers were used to measure and encourage everyday activity. Participants could enter step counts and other exercise parameters manually as daily self-observations into WD.

**Figure 4.** The main screen of the P4Well web portal.



## Measures

### Primary Outcome Measures

We measured symptoms of depression using BDI, a widely used 21-item self-report measure of depression [38].

Psychological symptoms were measured using the general symptom index (GSI), which is based on the 90-item symptom checklist (SCL-90). The SCL-90 has been validated for the Finnish population. In a Finnish community sample ( $n=337$ ) [42], the mean GSI was 0.60 ( $SD=0.44$ ).

The primary stress measure was the Finnish 15-item version of the Bergen Burnout Indicator (BBI-15) [43], based on the original 25-item Bergen Burnout Indicator [44]. The BBI-15 measures 3 aspects of professional burnout: exhaustion, cynicism, and sense of inadequacy.

### Secondary Outcome Measures

Quality of life included 5 items: mood, self-rated health, life satisfaction, self-confidence, and working ability. Participants' perceptions of each item were measured using a visual analogue scale (VAS) from 0 to 100 [45-47].

We measured psychological flexibility and experimental avoidance using the Acceptance and Action Questionnaire-2 (AAQ-2), a 10-item questionnaire that involves both the ability to accept difficult thoughts and feelings as well as to engage in valued activity in their presence (a 7-point Likert-type scale). High scores indicate high psychological flexibility (range 0-70). The AAQ-2 is a revised version of the original AAQ [48].

We measured job strain and over-commitment using the effort-reward imbalance (ERI) questionnaire, which measures extrinsic effort with six items and reward with 11 items. The ratio of effort to reward (ER-ratio) expresses the amount of effort-reward imbalance. High scores indicate high job strain. The ERI questionnaire also includes 6 items that measure over-commitment [49].

### User Experiences and Usage

User experiences were measured post-intervention with a questionnaire about perceived utility and acceptance of each individual technology tool, and the perceived usefulness of different intervention components. The perceived utility of the intervention as a whole was assessed with questions about perceived benefits from participation in the study. Usage logs were collected from the portal and the mobile applications after the end of the intervention. For pedometers and heart rate monitors, usage frequency was assessed through the post-intervention questionnaire. Participants were defined as active users of a given tool if they had used it during at least half of the study weeks (based on log data) or reported having used it at least weekly (questionnaire data).

### Statistical Analyses

We performed statistical analyses using SPSS 15.0 for Windows (SPSS, Inc, Chicago, IL). A repeated-measures ANOVA evaluated the intervention effect with group (intervention vs control) as the between-subjects factor, and pre- and post-measurements as the within-subject factor. When analyzing pre-, post-, and follow-up measurements of the intervention group, a repeated-measures ANOVA was used. The level of

statistical significance was set at  $P < .05$ ; however, due to the small sample size, we took into account interactions where  $P < .10$ . The ES, measured by Cohen's  $d$ , were calculated to measure clinically significant between group differences and within group changes. We calculated the post-treatment between-group ES by dividing the difference between the treatment mean and the control mean with the pooled standard deviation of the two conditions. The within-group ES was calculated by dividing the mean change from pre- to post- with the pre-treatment SD and the mean change from pre- to follow-up with the pre-treatment SD [50,51]. Between-group ESs of 0.2, 0.5, and 0.8 were considered small, medium, and large, respectively. Within-group ESs of 0.5, 0.8, and 1.1 were treated likewise [7,52].

## Results

### Acceptance and Usage

All participants in the intervention group stated that their well-being had improved as a result of the intervention. The

**Table 2.** Usage and user experiences of technology tools.

	Web portal	Wellness diary	Exercise coaching	Relaxation application	Pedometer	Heart rate monitor
Active users (n)	3	1	4	5	4	4
Easy to use <sup>a</sup>	6	5	5	8	11	0
Useful <sup>a</sup>	5	5	7	6	7	8
Personally suitable <sup>a</sup>	5	3	7	6	8	7
Motivating <sup>a</sup>	3	5	6	7	6	6

<sup>a</sup>Values are the numbers of users who agreed or strongly agreed with the statement.

### Efficacy

Depressive symptoms, as measured by BDI, decreased more in the intervention group compared to the control group (Table 3). There was a marginally significant group by time interaction effect for BDI ( $P = .072$ ). The mean BDI value decreased with more than 8 scores (CI 4.92-11.99) in the treatment group compared to four scores (CI 0.62-7.38) in the control group. We found a medium ES ( $d = 0.57$ ) between groups in favor of the intervention group. Participants maintained positive changes at the 6-month follow-up. We found a significant within-group effect over time for the intervention group ( $P = .001$ ): both post- and follow-up measurements were significantly lower compared to the BDI pre-measurement. Pre- to follow-up BDI measurements indicated a large within-group ES ( $d = 1.11$ ). An analysis of the number of the participants who reported depressive symptoms at pre-, post-, and follow-up measurements also suggested that the intervention had a positive effect on mood. At the beginning of the study, 64% (7/11) of the participants in the intervention group and 50% (6/12) in the control group reported at least mild depression (a BDI of at least 10). Only 9% (1/11) reported depressive symptoms in the intervention group after the intervention ended. In the control

group, 50% (6/12) were still depressed at post-measurement. At follow-up, only 1 person (9%) in the intervention group reported BDI values greater than 10.

Psychological symptoms (SCL-90) decreased in the intervention group but remained at the same level in the control group (Table 3). We found a marginally significant group by time interaction effect in psychological symptoms ( $P = .053$ ). The between-group ES was small ( $d = 0.39$ ). The within-group ES from pre- to follow-up measurement was medium ( $d = 1.07$ ). Again, we found a significant within-group effect for the intervention group—both the post- and follow-up measurements were significantly lower compared to pre-measurement scores. A significant group by time interaction effect was found for health ( $P = .008$ ) and working ability ( $P = .016$ ). The between- and within-group ESs were small for both health ( $d = 0.38$  and  $0.56$ , respectively) and working ability ( $d = 0.21$  and  $0.60$ , respectively). Furthermore, for these variables we found a significant within-group effect in the intervention group. Thus, health was rated higher after treatment, and participants estimated their working ability to be higher at follow-up compared to the beginning of the treatment. As we can see from Table 3, there was some indication that life satisfaction increased from pre-measurement to follow-up, as well.

**Table 3.** Psychological symptoms and life quality for the intervention and control group.

	Pre Mean (SD)	Post Mean (SD)	95% CI for the difference		Follow-up Mean (SD)	Pre-Post group x time	Intervention within effect
			Lower	Upper			
<b>Depression BDI</b>							
Intervention	14.64 (7.61)	6.18 (3.31)	4.92	11.99	6.18 (3.28)	$F_{1,21}=3.59$ $P=.072$	$F_{2,20}=17.45$ $P=.001$
Control	13.33 (9.24)	9.33 (7.10)	0.62	7.38	-	$d=0.57$	$d=1.11$
<b>Symptom SCL</b>							
Intervention	0.64 (0.27)	0.40 (0.18)	0.11	0.37	0.35 (0.18)	$F_{1,21}=4.22$ $P=.053$	$F_{2,20}=10.28$ $P=.001$
Control	0.57 (0.30)	0.51 (0.36)	-0.07	0.18	-	$d=0.39$	$d=1.07$
<b>Psych Flex AAQ</b>							
Intervention	52.46 (10.00)	55.73 (6.25)	-7.95	1.40	55.45 (7.26)	$F_{1,21}=1.74$ $P=.201$	$F_{2,20}=0.93$ $P=.41$
Control	54.50 (7.82)	53.67 (9.60)	-3.64	5.31	-	$d=0.25$	$d=0.30$
<b>Life Satisfaction</b>							
Intervention	59.91 (15.55)	66.09 (10.51)	-14.78	2.42	69.27 (13.45)	$F_{1,21}=0.04$ $P=.838$	$F_{2,20}=5.68$ $P=.01$
Control	59.92 (17.29)	64.92 (15.50)	-13.23	3.23	-	$d=0.09$	$d=0.60$
<b>Self-rated Health</b>							
Intervention	63.27 (13.86)	74.91 (11.64)	-18.89	-4.38	71.09 (15.41)	$F_{1,21}=8.57$ $P=.008$	$F_{2,20}=5.18$ $P=.02$
Control	72.42 (10.26)	69.92 (14.49)	-4.44	9.44	-	$d=0.38$	$D=0.56$
<b>Mood</b>							
Intervention	60.27 (17.35)	66.82 (8.34)	-14.38	1.29	66.09 (13.32)	$F_{1,21}=0.08$ $P=.783$	$F_{2,20}=1.50$ $P=.25$
Control	57.08 (16.51)	65.08 (14.18)	-15.50	-0.50	-	$d=0.15$	$d=0.34$
<b>Self-Confidence</b>							
Intervention	63.55 (15.63)	70.27 (15.85)	-15.80	2.34	74.73 (16.41)	$F_{1,21}=0.07$ $P=.788$	$F_{2,20}=2.49$ $P=.11$
Control	69.58 (13.76)	74.67 (9.21)	-13.77	3.6	-	$d=0.34$	$d=0.72$
<b>Working Ability</b>							
Intervention	64.36 (20.25)	74.00 (15.93)	-16.93	-2.34	75.45 (13.48)	$F_{1,21}=6.86$ $P=.016$	$F_{2,20}=5.48$ $P=.01$



	Pre Mean (SD)	Post Mean (SD)	95% CI for the difference		Follow-up Mean (SD)	Pre-Post group x time	Intervention within effect
			Lower	Upper			
Control	74.00 (7.79)	70.92 (12.91)	-3.9	10.07	-	d=0.21	d=0.60

We did not observe a significant group by time interaction for burnout (Table 4). However, the burnout scores decreased from pre-measurement to follow-up and showed a medium ES ( $d=0.91$ ). In the intervention group we found a significant within-group effect on cynicism, although there was no significant group by time interaction. However, we obtained a

medium (between group) ES for cynicism. There were marginally significant interaction effects on effort ( $P=.07$ ) and over-commitment ( $P=.08$ ). The scores for over-commitment were lower at follow-up compared to the beginning of treatment. The within-group ES from pre-measurement to follow-up was small for over-commitment ( $d=0.61$ ).

**Table 4.** Burnout and stress for the intervention and control group.

		Pre Mean (SD)	Post Mean (SD)	95% CI for the difference		Follow-up Mean (SD)	Pre-Post group x time	Intervention within effect
				Lower	Upper			
<b>Burnout</b>								
	Intervention	3.52 (0.70)	3.03 (0.83)	0.16	0.82	2.88 (0.73)	F <sub>1,21</sub> =1.02 P=.32	F <sub>2,20</sub> =6.67 P=.006
	Control	3.64 (0.70)	3.38 (0.64)	-0.5	0.59	-	d=0.47	d=0.91
<b>Exhaustion</b>								
	Intervention	3.96 (1.10)	3.67 (1.15)	-0.09	0.67	3.42 (1.06)	F <sub>1,21</sub> =0.01 P=.93	F <sub>2,20</sub> =3.08 P=.07
	Control	4.13 (0.67)	3.87 (0.84)	-0.10	0.63	-	d=0.20	d=0.49
<b>Cynicism</b>								
	Intervention	3.15 (0.93)	2.42 (0.96)	0.32	1.14	2.22 (0.75)	F <sub>1,21</sub> =2.63 P=.12	F <sub>2,20</sub> =10.94 P=.001
	Control	3.22 (0.78)	2.93 (0.73)	-0.11	0.68	-	d=0.60	d=1.00
<b>Sense of Inadequacy</b>								
	Intervention	3.46 (1.10)	3.00 (0.96)	-0.1	0.92	3.00 (1.02)	F <sub>1,21</sub> =0.44 P=.51	F <sub>2,20</sub> =2.04 P=.16
	Control	3.58 (1.04)	3.33 (0.95)	-0.19	0.69	-	d=0.35	d=0.41
<b>Effort</b>								
	Intervention	3.39 (0.82)	3.21 (0.95)	-0.9	0.45	3.04 (0.90)	F <sub>1,21</sub> =3.74 P=.07	F <sub>2,18</sub> =2.08 P=.15
	Control	3.26 (0.66)	3.43 (0.40)	-0.43	0.09	-	d=0.36	d=0.41
<b>Reward</b>								
	Intervention	3.69 (0.68)	3.88 (0.95)	-0.56	0.18	4.18 (0.48)	F <sub>1,21</sub> =0.59 P=.45	F <sub>2,18</sub> =2.21 P=.14
	Control	3.64 (0.89)	4.02 (0.72)	-0.73	-0.03	-	d=0.04	d=0.62
<b>Effort-reward imbalance</b>								
	Intervention	0.96 (0.29)	0.91 (0.43)	-0.10	0.19	0.74 (0.25)	F <sub>1,21</sub> =0.02 P=.89	F <sub>2,18</sub> =2.43 P=.12
	Control	0.94 (0.27)	0.89 (0.23)	-0.08	0.19	-	d=0.13	d=0.69
<b>Over commitment</b>								
	Intervention	2.92	2.64	0.05	0.53	2.48	F <sub>1,20</sub> =3.53	F <sub>2,18</sub> =4.03

	Pre	Post	95% CI for the difference		Follow-up	Pre-Post	Intervention
	Mean (SD)	Mean (SD)	Lower	Upper	Mean (SD)	group x time	within effect
	(0.64)	(0.61)			(0.57)	<i>P</i> =.08	<i>P</i> =.04
Control	2.79 (0.53)	2.80 (0.44)	-0.25	0.22	-	<i>d</i> =0.44	<i>d</i> =0.61

In the group intervention, the amount of therapist face-to-face contact time was 8 hours (4 + 2 + 2), totalling 480 minutes (including measurements). Thus, the therapist contact time used for each participant during the intervention was 44 minutes.

## Discussion

The objective of this study was to assess the feasibility of the P4Well intervention in the target population of working-age adults who experience mild psychological and stress-related symptoms. Our results confirm that the intervention was acceptable and personal health technologies were actively used by the participants. The results also suggest that the intervention had a positive effect on our primary outcome measures (depressive and psychological symptoms) as well as on self-rated health and working ability. The intervention was also cost-effective. The total professional time used during the active intervention period was less than 1 hour per person.

Before the intervention, the majority of participants reported symptoms of depression; after the intervention only 1 reported symptoms of depression. The intervention group's within-group ES (measuring clinical significance) from pre-measurement to the follow-up was large and the between-group post-treatment ES was medium. These effects are in line with other studies investigating the effects of cognitive-behavioral methods. Meta-analysis from Gloaguen et al [53] found that the between-group ES between CBT and controls was typically  $d=0.82$ . In our study, the ES was somewhat smaller ( $d=0.57$ ), however the ES was at least the same or larger compared to groups taking anti-depressant medications. Our data also indicated that the intervention might have positive effects on burnout symptoms: participants' BBI-15 scores were lower at the 6-month follow-up compared to the beginning of the treatment. Moreover, the results suggest that there were positive effects on cynicism and over-commitment related to recovery from stress and burnout.

Participants perceived the intervention as beneficial and useful, and reported reduced amount of stress, increased physical activity, and greater motivation to improve their well-being. Almost everyone took some of the technology tools into active use and each tool was considered useful, motivating, and personally suitable by several participants. These results suggest that offering several tools and techniques to support changes in multiple behaviors may be a promising approach in interventions that address psychological problems. Most interventions to this date have tailored their content to individual needs, but few have used multiple applications or delivery channels that could be freely chosen by participants based on their preferences.

There is a wealth of applications and devices available for self-monitoring of stress, mood, physical activity and sleep, and for relaxation and mindfulness skills training. Nevertheless, individuals struggling with psychological problems and stress may not be aware of the existence or usefulness of these tools. Based on the wide variety of reasons and behavioral treatment options for psychological problems, intervention outcomes and adherence may be improved by matching and recommending specific applications and/or devices to different needs and preferences of participants [54]. An intervention program should be designed with careful consideration of appropriate technology tools that best serve the purposes of the intervention.

Even though personal monitoring devices and mobile applications were received favorably and used actively, human contact was still highly valued. Personal feedback and advice based on physiological measurements was considered the most useful component of the intervention, and group meetings were also appreciated. Peer and counselor support may be crucial factors that increase participant engagement and motivation in technology-based interventions [55]. Interestingly, measurements and personal monitoring devices were evaluated as useful as group meetings. Technology can facilitate remote consultation regardless of time and place, hence reducing the costs and widening the reach and accessibility of interventions. Furthermore, leveraging technology tools in intervention delivery optimizes the use of professionals' time, since it allows participants to complete routine exercises and tasks independently with automated and personalized guidance.

There is an acute need to improve people's psychological well-being, especially depression and various stress-related problems. These problems are widespread and can lead to long-term absenteeism and work disability, which include a significant economic burden [4,56]. Our data suggest that it is possible to positively affect psychological well-being by using interventions that combine face-to-face meetings and technology. Our intervention may be a noteworthy tool for self-management, health-related prevention and general well-being in health care settings. Prevention and early intervention based on self-management are especially important given that healthcare resources are limited. In addition, our intervention offers considerable flexibility, and requires only little professional guidance. In accordance with earlier studies that have investigated the combination of technology and multimodal intervention methods to promote health, our results suggest that interventions using technologies can extend the reach of preventive care to many people at a relatively low cost [57-61]. Our findings are also in line with other studies that

show positive effects using Web-based stress management approaches [11, 62].

This study had several limitations. First of all, the number of participants was small and therefore the statistical power of the study is weak. This lack of power affects our ability to detect differences between the intervention and control group as well as our ability to generalize the results. Also, most participants reported a small number of psychological problems at the beginning of the study. Thus, the possibility for improvement was small (eg, for AAQ, BDI and SCL-90) suggesting that other measurements may have been more appropriate for observing the changes. The control group showed also some improvement that was possibly due to assessment procedures at the beginning. The effectiveness and the acceptability of this intervention need also to be investigated in other populations reporting more severe problems. Furthermore, longer follow-up periods may be needed to ensure the sustainability of the effect. Overall, because all the participants in this study were male, our results can be generalized to only middle-aged men who seek help for stress-related problems and mild to moderate depression. Additionally, participants were provided several technology tools within a short period of time, which caused cognitive load that may have hindered participants' capability and motivation to discover personally suitable tools. Some tools also had usability problems, data entered in one application was not synchronized to others, and most of self-monitoring was done manually. Since the time the study was conducted, there have been considerable advances especially in smartphone

technology, which would allow a more integrated and usable technology toolkit.

In conclusion, this study supports the idea that personal health technologies, when combined with a brief psychological group intervention program, may have a positive impact on mild psychological problems and stress-related symptoms. Our intervention provides a potential solution to the demand for accessible and affordable empirically-supported psychological treatments [63]. Our approach is potentially cost-efficient, flexible and accessible, and may help people to prevent and manage stress-related problems and to adopt a healthier lifestyle. However, due to the limitations in the design and procedure, our results may be spurious, and must be interpreted with caution. Furthermore, because the intervention included several components and it was not possible to control all of them within our design, we cannot rule out that these effects were caused by the group sessions alone. Although there are several limitations in this study, this intervention nevertheless shows promising effects. Future studies need to investigate the effectiveness, benefits, and possible problems of psychological interventions which incorporate new technologies. Our aim is to enhance and simplify the presented concept, and evaluate it in a larger, more comprehensive research study using mobile technology. A fully powered RCT using partly the same concept is under way. In the ongoing study, a brief group ACT-based intervention is compared with an ACT-based mobile intervention.

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### Conflicts of Interest

None declared.

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### Multimedia Appendix 1

CONSORT-eHealth Checklist V1.6.1 [64].

[PDF File (Adobe PDF File), 881KB - [resprot\\_v2i1e1\\_app1.pdf](#)]

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## Abbreviations

**AAQ-2:** acceptance and action questionnaire  
**ACT:** acceptance and commitment therapy  
**BBI-15:** Bergen Burnout Indicator  
**BMI:** body mass index  
**CBT:** cognitive behavioral therapies  
**ER-ratio:** effort to reward ratio  
**ERI:** effort-reward imbalance  
**ES:** effect sizes  
**GSI:** general symptom index  
**HR:** heart rate  
**HRV:** heart rate variability  
**SCL-90:** 90-item symptom checklist  
**TEKES:** Finnish Funding Agency for Technology and Innovation  
**VAS:** visual analogue scale  
**WD:** wellness diary

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## II

### **ACT INTERNET-BASED VS FACE-TO-FACE? A RANDOMIZED CONTROLLED TRIAL OF TWO WAYS TO DELIVER AC- CEPTANCE AND COMMITMENT THERAPY FOR DEPRESSIVE SYMPTOMS: AN 18-MONTH FOLLOW-UP**

by

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### **III**

## **WEB-BASED ACCEPTANCE AND COMMITMENT THERAPY FOR DEPRESSIVE SYMPTOMS WITH MINIMAL SUPPORT: A RAN- DOMIZED CONTROLLED TRIAL**

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