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Evaluation of an internet-based intervention for mild-to-moderate depression and promotion of psychological well-being: a randomized controlled trial

Master Thesis in Health and Social Psychology

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Abstract

Background: High prevalence of minor depression and low well-being constitutes both individual and societal burden. The Internet provides a promising platform for treatment delivery.

Objective and Method: A randomized controlled trial was conducted to determine the efficacy of an internet-based self-help intervention Bedre Hverdag (BH) for mild-to-moderate depression and promotion of well-being. Long-term effects (i.e.6 months) of BH were assessed in comparison to a waiting-list control group.

Results: Of the 206 eligible participants, 112 were randomized to the experimental group and 94 to the waiting-list control group. Data from 34 participants in the experimental group and 47 from the control group were subjected to statistical analyses. Individuals assigned to BH reported significant increases in positive affect (PA) at 1 month follow-up, as measured by Positive Affect Schedual (PANAS); z = - 2.49, p = .011, r = .42 , which were significantly different from levels of PA at the same time period in the control group, U = 589, z = -2.01 , p = .044 , r = .2. Increases in PA were no longer significant at 2 and 6 month follow-ups. No statistically significant reductions in negative affect (NA) as measured by the Negative Affect Schedual (PANAS) and depressive symptoms as measured by the Center for Epidemiologic Studies Depression scale (CES-D) were observed in the experimental group as compared to the control group. Treatment x Educational attainment interaction explained 5.3% of variance in depressive symptoms, and 10.7% of variance in NA at 1 month follow-up, above and beyond the main effects. Individuals with lowest level of educational attainment reported largest reductions in both CES-D scores and NA.

Conclusion: BH produced significant increases in PA at 1 month post-treatment. No significant reductions were observed in either depressive symptoms or NA. Educational attainment moderated the intervention's effects on depressive symptoms and NA.

Depression

Depression is the most prevalent and common of all mental disorders (Kessler et al., 1994). The World Health Organization (WHO, 2000) reports that depression is the fourth leading contributor to the global burden of disease and projects that by the year 2020 the disorder will have reached second place for all ages and both genders. Close to 121million people worldwide suffer from depression and fewer than 25% of those who are affected receive treatment.

At the most general level, mood disorders can be understood as variations of depression (Ghaemi, 2008) that are characterized by change in mood and affect, change in the overall level of activity and which are usually accompanied by irritability, apathy, and anxiety in addition to or instead of feeling sad (Judd & Kunovac, 1997). The most basic types of depression are unipolar and bipolar disorders. Unipolar depression is distinguished from bipolar depression by the absence of manic or hypomanic symptoms (Ghaemi, 2008). Even though depression is seen as one single clinical entity, subtyping depression facilitates more accurate choice of treatment for a patient (Benazzi, 2006). In terms of unipolar disorders, DSM-IV makes a distinction between (a) major depressive disorder, (b) dysthymic disorder, and (c) depression not otherwise specified. They differ in terms of the number of symptoms present, their severity and durability (Judd & Kunovac, 1997). There is a lack of consensus on how to define the last category, however, the most commonly used terms are subsyndromal depression, subthreshold depression and minor depression (Kroenke, 2006).

Consequences of minor depression. Underestimating the suffering of those with minor depression would be a mistake for several reasons. First of all, they experience nearly the same degree of impairment in health status, function status, and disability as those with major depression (Wagner et al., 2000). Second, individuals with minor depression are at high risk of developing major depression within two years. Third, minor depression is associated with large economic costs and fourth, since minor depression is more prevalent than major depressive disorder (Cuijpers, de Graaf, & van Dorsselaer, 2004), it constitutes an important public health concern (Pincus, Davis, & McQueen, 1999). A literature review conducted by Cukrowicz and Joiner (2007) suggests that strategies aimed at reduction of mild and subclinical symptoms have implications for prevention science as mild and subclinical symptoms of depression increase the risk for immune deficiency, smoking, coronary heart disease and relative risk of death. As opposed to individuals with no depressive symptoms,

those who suffer from minor depression show poorer social functioning, lower quality of life, greater amount of time during which they are unable to work or carry out normal duties, and are more likely to use health services (Goldney, Fisher, Grande, & Taylor, 2004). Minor depression is furthermore associated with low levels of energy, poor emotional well-being and lower scores on physical functioning (Rapaport & Judd, 1998). Despite its high prevalence and considerable consequences, it is estimated that less than 20% of those affected receive treatment (Wagner et al., 2000).

Treatments for depression. Several types of treatment are currently available for depression. The most common distinction is made between somatic treatments and psychotherapy. Examples of somatic treatments are pharmacology, electroconvulsive therapy (Beck & Alford, 2009), transcranial magnetic stimulation (Nitsche, Boggio, Fregni, & Pascual-Leone, 2009) and vagus nerve stimulation (Daban, Martinez-Aran, Cruz, & Vieta, 2008). There are several reasons for not choosing antidepressants as the first treatment option, for example side effects of the medication, patient's preferences for nonpharmacological treatment, limited evidence in support of the notion that antidepressants change risk factors associated with subsequent relapses and reoccurrences (Hollon, Thase, & Markowitz, 2002), increased risk of relapse if medication is discontinued (Klosko & Sanderson, 1999), as well as the concern that the long-term use of antidepressant might indirectly undermine individual's use of his or her own psychological resources for coping with depression (Beck, Rush, Shaw, & Emery, 1979).

There is still uncertainty whether or not traditional psychodynamic approaches are effective in treating depression, however, a large body of research indicates that interpersonal psychotherapy as well as cognitive behavior therapy (CBT) are efficacious (Hollon et al., 2002). Results from systematic reviews suggest that CBT is particularly effective in producing long-term improvements in individuals with mild-to moderate depression(Butler, Chapman, Forman, & Beck, 2006; Kaltenthaler, Parry, Beverley, & Ferriter, 2008; Kaltenthaler, Sutcliffe, et al., 2008). In addition, continued and maintained treatment also effectively prevents relapses and possible reoccurrences (Hollon, Stewart, & Strunk, 2006). Broadly speaking, findings from previous research seem to imply that CBT is as good as, or even better than other treatments, including antidepressant medication (Hollon et al., 2002). One of the reasons behind CBT's effectiveness is that it provides patients with tools that they carry forward from treatment and are able to use after treatment termination, which is not the case with antidepressants.

Positive psychology

The World Health Organization (2001) defines mental health as "*...a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her own community*" (p. 1). This definition implies that mental health is not merely the absence of mental illness, but it also requires the presence of well-being (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009). Keyes (2002) suggests a mental health continuum which consists of complete and incomplete mental health. Those who have complete mental health are said to be *flourishing,* they experience positive emotions and appear to function well both psychologically and socially. Those who have incomplete mental health are said to be *languishing*, their life is characterized by low social, emotional and psychological well-being and could be described as empty and stagnating. Moderately mentally healthy individuals are neither flourishing nor languishing. Keyes (2000) presented two reasons why mental health professionals should be equally concerned about languishing, defined as the absence of both mental illness and mental health, as about the presence of depression. First, languishing was equally prevalent as major depression, and second, it was found to be associated with equal levels of psychosocial impairment as depression in terms of limitations of daily life activities, work cut backs and lost days of work attributed to mental health. The worst outcomes were observed in individuals who were languishing and had a comorbid episode of depression.

Emergence of positive psychology. Before World War II, psychology had three distinct missions which corresponded with the WHO's (2001) definition of mental health. The three primary endeavors were: (a) to cure mental illness, (b) make lives of all people more fulfilling, and (c) to identify and nurture high talent. However, ever since the end of the war the focus has shifted almost exclusively toward psychopathology, and the two other missions were all but forgotten (Seligman & Csikszentmihalyi, 2000). According to a metaphor (Gable & Haidt, 2005), post was psychology generates knowledge on how to bring people up from negative eight to zero, but is less concerned with how to raise people from a from a zero to a positive eight, despite the evidence that being at zero constitutes a legitimate concern (Keyes, 2002). Even when humanistic psychologists such as Carl Rogers and Abraham Maslow promised to add a new perspective to psychology in the 1960s, they did not inspire much increase in the empirical base. Instead, they inspired countless self-help movements, which may have been caused by flaws in their inherent vision (Seligman & Csikszentmihalyi, 2000).

In a response to the imbalance in mainstream psychology, Martin Seligman launched a *positive psychology* movement, and in the year 2000 the *American Psychologist* wrote for the first time about the emerging field of science which focused on positive emotion, positive character, and positive institutions. The overarching mission of positive psychology is to answer the fundamental questions of what makes life worth living and how to improve life for all people (Wong, 2011). Positive psychology can be defined as the scientific study of optimal functioning and well-being, which focuses on character traits, positive emotions and enabling institutions (Seligman & Csikszentmihalyi, 2000). Positive psychology provides us with research findings with the purpose of supplementing, rather than replacing already existing knowledge on human weaknesses, disorders and misery (Seligman, Steen, Park, & Peterson, 2005).

Benefits of positive emotions. The progression within the area of positive psychology since the year 2000 has been remarkable, and the field currently offers several promising findings and theories (Gable & Haidt, 2005). One of the most influential theories within positive psychology is Barbara Fredrickson's (2001) *broaden-and-build theory* which posits that specific positive emotions (e.g., joy, contentment, love, interest, and pride) broaden a person's momentary thought-action repertoires and build long-term intellectual, physical, social and psychological resources. From an evolutionary perspective (Fredrickson, 1998), this casual chain from positive emotions to enhanced personal resources provided our ancestors with adaptive advances (e.g., increased odds of survival and reproduction). Additionally, it has been argued that the genetically encoded ability to experience positive emotions has, through the process of natural selection, become an aspect of human nature. In the present day circumstances, positive emotions are more than a source of hedonic pleasure, they also serve several important functions: (a) they have the ability to undo the lingering effects of negative emotions, (b) improve physical health and (c) experiences of positive emotions build enduring psychological resilience (Fredrickson, 2001). Generally speaking, the broaden-and-build theory proposes an upward spiral in which positive emotions and the broadened thinking they produce, influence each other; and this process, over time, leads to considerable increases in emotional well-being.

A growing body of research illustrates the beneficial effects of positive emotions; previous research has found an association between positive *psychological well-being* (PWB) and reduced risk of coronary heart disease (Boehm, Peterson, Kivimaki, & Kubzansky, 2011). This relationship was explained by neither health behaviors nor biological risk factors.

Another study (Xu & Roberts, 2010) found that *subjective well-being* (SWB) and its positive components are associated with reduced risks of natural-cause, all-cause and unnatural-cause of mortality, and concluded that SWB significantly predicts longevity. Keyes (2005) found evidence that the absence of mental illness and presence of flourishing serve as protective factors against accumulation of chronic physical disease with age. Lyubomirsky's (2005) literature review furthermore identified additional areas of life in which happier people do better than others; they are more likely to marry and less likely to divorce, they perform better at work in terms of creativity, productivity and tend to have higher incomes.

Well-being. Well-being can be understood in terms of psychological functioning and experience. However, there is by no means agreement on what the term's precise meaning is. In this thesis the terms *well-being* and *happiness* will be used interchangeably to refer to flourishing mental health as defined by Keyes (2002). There are now two approaches to understanding well-being that are both ancient in their origins and current in contemporary research: (a) the hedonic approach and (b) the eudaimonic approach (Ryan & Deci, 2001).

The former suggests that well-being encapsulates subjective happiness and is concerned with judgments about the pleasurable and displeasurable aspects of life (Diener, Sapyta, & Suh, 1998). This approach introduces a concept of subjective well-being (SWB) which consists of affective components (e.g., positive and negative emotions), and cognitive components (i.e., cognitive evaluations of life satisfaction; Diener, Suh, Lucas, & Smith, 1999).

The eudaimonic approach postulates that happiness stems from expressing virtues, that is, from doing things that are worth doing. Within this paradigm, well-being is considered as distinct from happiness per se. Individuals might have certain desires which are pleasure producing, yet outcomes of these desires might not be good for them and thus do not promote well-being (Ryan & Deci, 2001). Waterman (1993) defines well-being as living in accordance with one's daimon, (i.e., one's true self). This approach is reflected in the concept of PWB and emphasizes the fulfillment of one's potential (Mitchell, Vella-Brodrick, & Klein, 2010). Ryff (1989) operationalizes PWB as consisting of six components: (a) personal growth, (b) self-acceptance, (c) autonomy, (d) positive relations with others, (e) purpose in life, and (f) environmental mastery.

Recently, objections have been raised against the distinction between the two approaches and several unifying models of well-being are now widely accepted (Mitchell et

al., 2009). Martin Seligman proposes that happiness can be divided into three components: (a) engagement (*the engaged life*), (b) positive emotion (*the pleasant life*), and (c) meaning (*the meaningful life*) (Seligman, Rashid, & Parks, 2006). The engaged life involves pursuing engagement, involvement and absorption in intimate relationships, work, and leisure. Csikszentmihalyi (1997) introduced the concept of *flow* to describe the psychological state people experience when they immerse themselves in a highly engaging activity which causes them to lose track of time as their full attention is focused solely on the activity itself. Seligman (2002b) suggests that this feeling of flow may be enhanced by identifying individual's highest strengths and talents, and by helping them to find opportunities to use these strengths and talents in daily life. Seligman and colleagues believe that depression is not merely correlated with lack of engagement in life, but lack of engagement may in fact cause depression (Seligman et al., 2006). The meaningful life entails using one's highest talents and strengths to become a part of and serve something bigger than the self, which he refers to as positive institutions (e.g., religion, politics, community, family). Active participation in positive institutions produces a subjective feeling of meaning, a state of mind which is strongly correlated with happiness (Seligman et al., 2006). The pleasant life (Seligman et al., 2006) can be conceptualized as (a) having positive emotions about the present (e.g., enjoying the moment and feeling immediate pleasure), (b) about the past (e.g., satisfaction, contentment, fulfillment, serenity and pride), and (c) about the future (e.g., optimism, trust, hope, faith, and confidence). Seligman (2006) argues that these emotions act as a buffer against depression, and emphasizes the need to learn skills which amplify their duration and intensity.

What determines happiness? Even though the pursuit of happiness has been a major goal for many people for centuries, a relatively small body of research has attempted to find ways of increasing and sustaining happiness. Lyubomirsky and colleagues (2005) propose a groundbreaking model which suggests that individual's chronic level of happiness is determined by three factors: (a) genetically determined set point for happiness, (b) life circumstances, and (c) happiness-related practices. Chronic level of happiness refers to individual's characteristic level of happiness during a particular period of his or her life. This definition implies that it is possible to change one's chronic level of happiness, though it is a much more challenging task than altering one's level of happiness at a particular moment. There is now enough evidence to suggest that genetic factors account for about 50% in cross-sectional well-being (Bartels & Boomsma, 2009). Genetic variance that underlies individual

differences in SWB appears to account for individual differences in personality traits such as neuroticism, extraversion, and to a lesser degree, conscientiousness. This means that subjective well-being shares a common genetic structure with personality (Weiss, Bates, & Luciano, 2008). Life circumstances account for approximately 10% (Diener et al., 1999). As opposed to life circumstances, the genetically determined set point of happiness is considered fixed, stable over time and unchangeable. The remaining 40% are accounted for by intentional activity. Lyubomirsky and colleagues (2005) propose that altering one's intentional activities provides a more promising route to lasting increases in happiness than changing one's life circumstances. The relatively small influence of life circumstances is explained by *hedonic adaptation*, a phenomenon which causes people to adapt quickly to new situations and life circumstances. Empirical data suggest that changing life circumstances might increase happiness, however, these gains are short-lived. Intentional activities contain a broad spectrum of things that people think and do in daily lives. As the term implies, these activities require certain amount of effort. They can be divided into three categories: (a) behavioral (e.g., exercising or being kind to people; Keltner & Bonanno, 1997), (b) cognitive (e.g. pausing to count one's blessings; Sheldon & Houser-Marko, 2001), and (c) volitional activities (e.g., striving for personal goals or devoting time to meaningful causes; Snyder & Omoto, 2001); and empirical data provide support for their ability to increase happiness. It is reasonable to question, however, whether these intentional activities are influenced by hedonic adaptation as changing life circumstances are. Recent studies have shown (Sheldon & Lyubomirsky, 2006) that even though intentional activities are to some degree susceptible to hedonic adaptation, they seem to be more immune to this phenomenon than life circumstances are. The authors propose that intentional activities possess several features that may protect them to a certain extent from hedonic adaptation. First of all, by their nature, intentional activities are transient and episodic; one does not spend all of his or her time doing one thing. Furthermore, intentional activities can be varied and executed differently. Frederick and Loewenstein (2003) proposed that adaptation occurs to a stimuli that is constant or repeated, not to stimuli that is shifting or can be altered. This definition highlights the protective nature of the two features that intentional activities share. Finally, intentional activities have the potential to counteract hedonic adaptation directly. For example, one of the cognitive intentional activities is to stop for a while and enjoy the positive things in one's life. This activity directly combats hedonic adaptation to constant life circumstances by redirecting attention to the aspects of life that initially caused increase in happiness and prevent them from being taken for granted. A specific example of how this may be done is the *Three good*

things exercise by Seligman (2002b). He argues that since human beings are naturally predisposed to remember negative memories of events, attend to the negative and expect the worst, daily practice of the three good thing exercise can counteract this predisposition and make people more likely to remember positive events.

Empirical research suggests that *mindfulness* plays an important role in well-being. The concept of mindfulness has roots in Buddhism and Buddhist psychology; however, it is very similar to the ideas that have been advanced within a variety of philosophical and psychological traditions, were descriptions and theories concerning the mode of being (currently referred to as mindfulness) have been commonly portrayed (Brown, Ryan, & Creswell, 2007). Brown and Ryan (2003) argue that mindfulness, which is rooted in the fundamental activities of consciousness (i.e., attention and awareness), is central to human experience. They define mindfulness as a receptive attention to and awareness of present events and experience. Furthermore, they argue that mindfulness may make it easier to experience well-being directly by adding clarity and vividness to the present experience, and by encouraging closer, more moment-to-moment sensory contact with life. Moreover, they propose that mindfulness may facilitate well-being indirectly by enhancing self-regulated functioning that comes with attention sensitivity to somatic, environmental and psychological cues.

Lyubomirsky's (2007) research efforts have identified ten happiness-enhancing exercises: (a) expressing gratitude, (b) cultivating optimism, (c) avoiding overthinking, (d) practicing acts of kindness, (e) nurturing social relationships, (f) developing strategies for coping, (g) learning to forgive, (h) increasing flow experiences, (i) savoring life's joys, and (j) committing to one's goals. Following happiness-enhancing activities have been incorporated in BedreHverdag (BH): (a) expressing gratitude, (b) cultivating optimism, (c) practicing acts of kindness, (d) developing strategies for coping, and (e) increasing flow experiences. An additional exercise, which entails identification and active use of one's character strengths to achieve flow, has been included in the intervention. As previously mentioned, flow promotes the engaged life (Seligman et al., 2006).

Promotion of well-being

Depression is a largely prevalent mental illness and even mild symptoms of depression are associated with large individual and societal costs. Well-being, on the other hand, is associated with wide range of benefits. Limited knowledge exists on the prevalence of well-

being, however, data from Keyes's study (2002) showed that only about 17% of individuals without depression were flourishing, 12% were languishing and the rest were moderately mentally healthy. It has been suggested that mental health professionals should move beyond mere prevention and treatment of mental illnesses as new findings indicate the need for mental health interventions that are aimed at both reductions of mental illnesses and enhancement of mental health (Keyes, 2007).

Throughout the human history, at least one hundred techniques aimed at increasing happiness have been proposed, however, only a few of them have been subjected to rigorous scientific testing (Seligman et al., 2005). Over the past decade, positive psychology has begun to offer evidence-based *positive psychology interventions* (PPIs), intentional activities designed to promote positive behaviors, cognitions and feelings that constitute a promising approach to increasing well-being. PPIs aim to build strengths, as opposed to traditional psychological strategies that remedy deficiencies. These strategies take various forms such as expressing gratitude, cultivating optimistic thinking, socializing etc. A meta-analysis of 51 PPIs has revealed that not only do these strategies significantly increase well-being, they also demonstrate potential to decrease depressive symptoms (Sin & Lyubomirsky, 2009).

First evidence-based PPIs. One of the first attempts to develop a happiness intervention and test its effectiveness was a program based on happiness research (Fordyce, 1977, 1983). The program was aimed at changing behaviors and attitudes of the study participants to approximate the characteristics of happy people. The training program was based on 14 happiness-relevant strategies such as development of positive thinking, keeping busy and spending more time socializing. As opposed to control groups, all treatment groups showed significant gains in happiness, and a 9-28 month follow-up of the program brought about an important finding; change in happiness is possible and can last over extended periods of time.

PPIs targeting gratitude. Gratitude is conceptualized as habitual noticing and appreciating of the positive in one's life (Wood, Froh, & Geraghty, 2010). Its association with well-being can be understood in terms of revised learned helplessness theory and attribution theory (Abramson, Seligman, & Teasdale, 1978) which state that well-being stems from the ways in which people interpret events occurring in their lives. Lyubomirsky (2007) suggests additional ways in which gratitude contributes to well-being; it increases self-worth and self-esteem, helps people to cope with losses, stimulates helping behavior, builds and strengthens

social ties, reduces comparisons with others and last but not least, it protects from hedonic adaptation. Research has found strong ties between gratitude and well-being, and there is an indication that this relationship might be causal and unique. A number of gratitude interventions aimed at increasing well-being have been developed. These interventions can be divided into 3 broad categories: (a) generating lists of things for which one is grateful (b) grateful contemplation (c) behavioral expression of gratitude (Wood et al., 2010).

Emmons and McCullough (2003) designed a series of studies based on gratitude listings which demonstrated beneficial effects of gratitude on subjective life appraisals, and changes in positive and negative effect. More specifically, in Study 1, undergraduate participants were randomly assigned to three conditions; in the gratitude interventions, they were asked to write down up to five things for which they were grateful in the past week and were instructed to do so every week for a period of 10 weeks. The remaining two groups of participants were asked to report either daily hassles or life events that impacted them during the past week. The experimental group reported to had felt better about their lives and being more optimistic about upcoming week in comparison to both control groups. In Study 2, the study participants were asked to write a gratitude diary on daily basis for about two weeks; one of the control groups was instructed to keep record of daily hassles, the other one was asked to keep a record of downward social comparison, that is, thinking of ways in which they are better off than others. Participants in the gratitude intervention experienced higher levels of positive affect and were more likely to help others in comparison to the two control groups. Emmons and McCullough's (2003) research efforts furthermore implied that gratitude mediated the intervention's effect on positive affect

Lyubomirsky and colleagues (2005) designed a 6-week intervention in which students were asked to think of things for which they were grateful, either once or three times a week, and changes in their well-being were then compared to a control group. The authors concluded that short-term increases in happiness are possible; however, optimal timing appeared to have played an important role as only those who practiced gratitude once a week benefited from the intervention. One of the short-coming of this study was that it did not test the sustainability of the increases in happiness.

Other interventions have focused on grateful contemplation, that is, thinking about things for which one is grateful in a more general fashion. For example, Watkins and colleagues (2003) assigned participants to two groups. One of them was asked to think for 5

minutes about things they did in summer which they enjoyed, the other group was asked to think about things they planned to do and did not get the opportunity to do that summer. It turned out that even a very short gratitude intervention can bring about positive changes in immediate mood.

Evaluation of 12 available gratitude increasing strategies has shown that they are effective in improving well-being, however, methodological issues surrounding them call for further research (Wood et al., 2010). Even though gratitude interventions seem to be the most successful PPIs, many of the studies in support of gratitude interventions compared experimental condition with for example daily hassles condition instead of a true control group. In many cases, gratitude interventions showed limited benefits over true control conditions (Froh, Kashdan, Ozimkowski, & Miller, 2009). In such cases, it is meaningful to explore moderators to pinpoint a group of people who might benefit from a given intervention. One intervention that was based on behavioral expression of gratitude, assigned participants to two conditions; one group was asked to write a letter to someone to whom they were grateful, while the control group was instructed to write about daily events (Froh et al., 2009). It turned out that in comparison to those in the control condition, participants in the experimental condition who were initially low in positive affect, reported increases in gratitude and positive affect post-treatment assessment, and sustained the change in positive affect at 2-months follow-up.

PPIs targeting kindness. Even though previous research established correlations between helping behavior and happiness (Lyubomirsky, 2007), Lyubomirsky and colleagues (2005) attempted to gain deeper understanding of the relationship by designing an intervention in which participants were assigned to two treatment conditions and one non-treatment control group. In the two treatment conditions, participants were asked to do five acts of kindness per week over a period of six weeks, either all five on one day or anytime throughout the week. Over the course of the 6-week period, control group participants reported reductions in happiness, while participants in the experimental condition reported significant increases in happiness. However, only the group that performed all acts of kindness in one day, benefited from the intervention. Extension of this study (Lyubomirsky, 2007; Tkach, 2006) introduced low variety and high variety condition. The former allowed participants to vary three acts of kindness each week, while the latter instructed them to do the same acts of kindness three times a week for a period of ten weeks. The high variety condition was more effective in increasing well-being as happiness-enhancing activities should be

meaningful and fresh. Levels of happiness were also assessed at 1-month post intervention and the authors concluded that performing acts of kindness make people happy for extended periods of time.

PPIs targeting mindfulness. Shapiro and her colleagues (2008) examined two spiritually based interventions called *Mindfulness Based Stress Reduction* (MBSR; Kabat-Zinn, 1990) and Easwaran's *Eight Point Program* (EPP; 1991) to determine if mindfulness could be cultivated and if cultivating mindfulness would lead to positive well-being outcomes. Previous research suggests that these two interventions mediate several beneficial health effects, many of which have been attributed to the cultivation of mindfulness (Brown & Ryan, 2003). Both the MBSR and the EPP involve meditation and exercises that encourage attitudes that support meditative/mindful attention (e.g., kindness).

Internet-based interventions

E-health is an emerging field which is concerned with health information and services delivered through the Internet or other communication technologies. Internet-based interventions aim to reduce costs, and improve quality and accessibility in health care (Eysenbach, 2001).

Barak and colleagues (2008) conducted a comprehensive review and a meta-analysis of 92 studies to examine the effectiveness of internet-based interventions. They concluded that internet-based interventions are just as effective, or nearly as effective, as face-to-face therapy. However, effectiveness of an intervention may vary as a function of the problem that it deals with. Internet-based interventions appear to be more effective in treatment of problems that are more psychological in nature (e.g., anxiety) than in treatment of somatic issues such as body weight.

A large number of internet-based interventions have been developed over the past decade (Barak et al., 2008) to deal with a variety of physical or mental health issues such as smoking cessation (Brendryen, Drozd, & Kraft, 2008), physical activity (Van Den Berg, Schoones, & Vlieland, 2007), weight loss and maintenance (Neve, Morgan, Jones, & Collins, 2010), eating disorders (Zabinski et al., 2001), chronic headache (Devineni & Blanchard, 2005), alcohol abuse (Linke, Murray, Butler, & Wallace, 2007), insomnia (Ström, Pettersson, & Andersson, 2004), panic disorder (Richards, Klein, & Carlbring, 2003), post-traumatic

stress disorder (Knaevelsrud & Maercker, 2007), depression (Andersson et al., 2005) and anxiety (Spek et al., 2007).

There are several factors along which internet-based interventions can be differentiated (Barak et al., 2008). First, a distinction is made between e-therapy, an intervention which includes human communication, and self-help which takes form of a web-based therapy. Second, an intervention can be delivered synchronously (in real time), or asynchronously (with delay). Third, communication can take various forms such as text, audio or video. Fourth, an internet-based intervention can have either individual or group mode. And finally, internet-based interventions can differ in terms of therapeutic approach which they deploy.

Internet-based interventions for treatment and prevention of depression. A meta-analysis (Andersson & Cuijpers, 2009) of 12 studies was conducted to assess the effect of internet-based and computerized treatments for depression, and it was concluded that these interventions hold potential to be evidence-based treatments for depression. Interventions in which therapist support was provided to users appeared to be more effective; however, it remains unclear whether various forms of automated support could improve effectiveness of interventions that do not provide therapist support.

Cognitive behavioral therapy (CBT) is the most common therapeutic approach used in internet-based interventions aimed at prevention or treatment of depression. However, other approaches such as problem-solving therapy, interpersonal psychotherapy and psychoeducation have been utilized. Given the strong over-representation of CBT in existing internet-based intervention targeting depression, it cannot yet be settled whether other therapeutic approaches can be just as effectively transferred to the Internet (Andersson & Cuijpers, 2009).

Christensen and colleagues (2004) conducted a RCT to compare two internet-based interventions based on different therapeutic approaches with a control group (Christensen et al., 2004). The first intervention was MoodGYM (http://moodgym.anu.edu.au), an interactive program designed to prevent depression, which teaches users principles of cognitive behavioral therapy. The second intervention was a psychoeducative website called Blue Pages (http://bluepages.anu.edu.au/) that offers evidence-based information on depression and its treatments. Both MoodGYM and Blue Pages were more effective than control intervention in reduction of depressive symptoms. MoodGYM, compared to the control intervention,

significantly improved dysfunctional thinking and literacy in CBT. Of the three interventions, Blue Pages website was most effective in increasing knowledge of various treatments for depression.

Internet-based promotion of well-being. There is now sufficient evidence for the efficacy of internet-based interventions that are aimed at prevention and treatment of various mental disorders. However, much less is known about the ability of internet-based interventions to increase well-being (Mitchell et al., 2009) as both positive psychology and internet interventions are relatively new fields of research (Mitchell et al., 2010). Even though there is a number of well-being interventions available for the public, most of them have not been properly evaluated.

Mitchell and colleagues (2010) have in their literature review identified five RCTs of web-based well-being interventions. The first study designed five happiness and one placebo exercises that were delivered via the Internet (Seligman et al., 2005). One of the happiness exercises consisted of practicing gratitude, another was designed to help participants to identify three good things that they experienced each day, the third one was concerned with the most positive aspects of oneself, and the two remaining focused on one's strengths of character and their use. Two exercises, Using signature strengths in a new way and Three good things, appeared to increase well-being and decrease depressive symptoms for period of 6 months. Gratitude visit also created large positive effects; however, the changes lasted only for a month. The remaining exercises, including placebo control, lead to positive changes as well, but they were short-lived.

The second RCT was an extension of the previous study (Mitchell et al., 2009). The RCT involved one 3 week web-based signature strengths intervention, one problem solving intervention and a placebo control. The signature strength intervention appeared to significantly improve the cognitive component of SWB; however, it did not affect its affective component. In addition, in contrast to Seligman's (2005) study, the intervention did not bring about reductions in depression, anxiety and stress scores. However, participants in this study were more mentally healthy at baseline than the ones who participated in Seligman's study, which left little room for improvement (i.e., potential floor effects). The third study included in the literature review (Mitchell et al., 2010) has not been published. It tested the efficacy of a 6 week online positive psychotherapy which was based on Seligman's theory of happiness (2002a). The study participants had mild-to-moderate depression and the two main outcomes

measured were depressive symptoms and SWB. At 3 month follow-up, the experimental group demonstrated significant decreases in depressive symptoms in comparison to the control group, however, no changes in positive direction were observed for SWB.

The fourth RCT tested whether an internet-based resilience program was effective in increasing well-being, psychological health and work performance in Australian sales managers (Abbott, Klein, Hamilton, & Rosenthal, 2009). In comparison to control group, the program did not appear to be effective in improving any of the three outcomes measured.

The last study included in the literature review compared a placebo control with two exercises which were designed to help the study participants to experience self-compassion and optimism (Shapira & Mongrain, 2010). Both exercises lead to increases in happiness at 6 month follow-up, and decreases in depression at 3 month follow-up.

Mitchell and colleagues (2010) conclude that three of the five studies brought about increases in well-being and those whose participants had mild-to-moderate depressive symptoms at baseline also lead to reductions in depressive symptomatology. These findings imply that well-being interventions, whose primary goal is to increase well-being, might also be useful in prevention and treatment. In comparison to interventions administered to individuals or groups, the internet-based interventions appeared to have somewhat smaller effect sizes. The authors argue that further research might uncover the causes behind this finding and reduce the effectiveness gap between online and offline well-being interventions. The existing knowledge on online PPIs is still limited; however, available data suggest that they demonstrate potential. Conducting further research on online positive interventions is a worthwhile pursuit for two reasons. First of all, increased well-being is associated with many benefits at both individual and societal level, and has the potential to act as a buffer against mental illnesses. And second, the Internet appears to be a useful method of intervention delivery, especially in terms of accessibility and sustainability.

Objectives of the present study

The first objective of this study was to examine the impact of Bedre Hverdag (BH), an internet-based self-help intervention developed by Changetech AS, on several well-being related outcome variables. It was expected to find increases in positive affect and decreases in negative affect and depressive symptoms in the experimental group, as compared to waiting-list control group.

Furthermore, gratitude was examined as a possible explanatory mechanism behind these anticipated findings. This was expected as BH is comprised of several exercises, such as Three good things, gratitude letter and learning to accept compliment, which specifically aim to increase gratitude.

And finally, it was expected that BH would not be equally effective for every individual. Self-efficacy, measured at baseline, and several demographic variables such as gender, age and highest level of education achieved, were examined as potential moderators of the intervention's effect on the three well-being related outcome variables mentioned above. The strength of one's perceived self-efficacy has impact on whether one initiates the behavior, how much effort one expands and how long one persists in the face of difficulties (Bandura, 1977). It was therefore expected that those with higher levels of self-efficacy at baseline would gain more benefits from the intervention than those with lower levels of self-efficacy.

In summary, the present study's objective was to examine following hypotheses:

Main effects

H1: *BH produces long-term (i.e. 6months) increases in positive affect and decreases in negative affect and depressive symptoms, as compared to the waiting-list control group.*

Indirect effects

H2: *The effects of BH on positive affect, depressive symptoms and negative affect at two months follow-up are mediated through gratitude, as measured at one month follow-up in the experimental group.*

Moderators

H3: *The effects of BH on positive affect, depressive symptoms and negative affect at one month follow-up are moderated by the following-pre-treatment characteristics: (a) age, (b) gender, (c) highest level of education achieved, and (d) self-efficacy.*

Method

Trial design

This study was a randomized controlled trial consisting of a 4-week intervention and 6 month follow-up. Participants were randomly assigned to either the experimental group which gained access to the BH intervention immediately, or the waiting-list control group whose members were offered access to the intervention after data collection had been terminated. This type of no-treatment comparison design allows researchers to compare the change produced by the intervention to the change caused by unrelated variables (Behar & Borkovec, 2003)

Participants

Participants were recruited via two of the researchers' (LM & BN) social networks at Facebook and their personal email contact lists. The researchers sent an invitation (see Appendix A) to their social networks and their email contacts, and encouraged the first degree recipients to invite their social networks, the second degree recipients were encouraged to invite their social networks, and so forth (i.e., viral recruitment). The invitation contained a hyperlink which redirected participants to an external website with study information and informed consent (see below: Ethics and informed consent). Of the two-hundred and sixty-five participants at baseline measurements, fifty-nine were excluded from the study due to not meeting inclusion criteria which consisted of: (a) computer and Internet literacy, (b) minimal age for participation (18 years or older), and (c) submitting a valid email address. The last inclusion criterion not only was a prerequisite for access to the intervention, but also a safety mechanism that prevented participants from having multiple identities. Two-hundred and six participants, who were eligible for the study, were randomly assigned to either the treatment or the control group. At baseline, the experimental group contained 112 participants, leaving the control group with 94 participants. At subsequent data analysis, those who missed out on minimal one occasion of measurement, those who did not respond to demographic questions and those whose scores were deemed outliers, were excluded from the analysis. Before any hypothesis testing was conducted, the experimental group consisted of 34 participants and the control group contained 47 participants. Allocation ratio was thus 1.38.

Access

Registered participants gained access to the intervention through an email which was sent upon registration. The email contained a hyperlink which directed users to the program. A new email with access to a new session was thereafter sent regularly three times a week (on Mondays, Wednesdays and Fridays) for a period of 4 weeks. These emails served as prompts that encouraged use of the intervention. A new email was sent to participants at 1, 2 and 6 month follow-up which contained hyperlink to follow-up assessments. The study allowed participants to access the program from any location (e.g., home computer). The intervention was provided free of charge. Participants were not financially rewarded for participation, however, one participant was randomly drawn after data collection had been terminated and was given lottery tickets worth 500 Norwegian crowns. The incentive was incorporated in the study to facilitate recruitment and to serve as a strategy to reduce attrition since only those who participated in all follow-up measurements were included in the drawing.

Mode of delivery

Given the advantages associated with the use of the Internet and its widespread availability in Norway, email and the Internet were chosen to deliver the intervention. BH consists of 13 program days, designated as Day 1 – Day 13, each of which takes about 5-10 minutes to complete. Each program day is divided into two parts, the first part offers evidence-based information on a well-being related topic; the other part provides techniques and exercises related to that topic. Bibliotherapy, defined as the use of written materials, computer programs and audio/videotapes aimed at gaining understanding or solving a person's problems or needs (Marrs, 1995), was used to deliver the intervention's materials in form of written and audio messages. The organizing principle of this program is tunneling. According to Danaher and his colleagues (Danaher, McKay, & Seeley, 2005), a tunnel design is especially well-suited for multisession programs were users are given tasks to do on their own in between sessions, which was the case in BH. The users follow a step-by-step approach that eliminates access to any additional or related web pages that can be viewed as a potential distraction. The challenge with this type of design is to develop web-pages that are engaging enough to persuade the participant to have the patience necessary to become comfortable with the unfamiliar program at hand.

Program days are not tailored to individual users, meaning that the users are given access to the material in the same sequence. A ”Settings and questions” button provides users with several options such as frequently asked questions (FAQ), change of email address,

pausing the progress of the program for 1, 2, 3 or 4 weeks and possibility of terminating the program. The FAQ section contains an email address which can be used to report any technical or other issues, and an answer is provided within 24 hours by employees of Changetech AS. Feedback is given only at the end of the intervention when users are asked to complete Subjective Happiness scale (Lyubomirsky & Lepper, 1999), the same scale they completed on day 1. The program then provides them with information on whether or not their happiness level has increased as a result of the intervention.

Each of the 13 program days is divided into two parts. The former contains psychoeducational information; the latter provides users with a number of exercises and techniques related to the topic in the first part. Users are guided through the psychoeducational part by a young male agent and through the exercise part by a female agent. Both virtual agents are depicted on photographs which are accompanied by a text written in boxes designed in a comic book like style, that is, "as if they were talking" (see Appendix B and C). The majority of information is presented as on-screen-text, with the exception of a breathing exercise in which instructions are given by a recorded female voice. The dual-channel assumption (Mayer & Moreno, 2003) suggests that humans have two channels, one for processing verbal material and the other one for processing pictorial material. Each channel can only process a limited amount of material, it is therefore crucial that visual and verbal information is presented in a way that does not result in cognitive overload. For that reason, on-screen-text in BH is presented in short, understandable sentences and the amount of text shown on each slide is limited to approximately 80 words. In nearly every program day, the exercise and technique section provides an option for printing out instructions for any given exercises. On several occasions, the program also encourages users to write down their ideas of how they would complete a given exercise in a specified field on the screen and then allows them to print these out.

The choice of the virtual agents that guide users through the intervention was not arbitrary. The social agency theory (Mayer, Sobko, & Mautone, 2003) proposes that social cues such as face or voice of the agent contained in multimedia messages activate social conversation schemas. As a result, people, at least to a certain degree, utilize the same social rules in human-computer interaction as they do in human-to-human interaction. Once the interaction with computer is perceived as social, humans tend to engage in deep cognitive processing in order to understand what the computer is saying (Louwerse, Graesser, Lu, & Mitchell, 2005). Deep cognitive processing in turn leads to meaningful learning outcomes.

Empirical studies provide support for the idea that adding visual agents to computer-

based learning environments foster learning (Dunsworth & Atkinson, 2007*)*. Not only their presence, but also their appearance plays an important role (Baylor, 2009). Users prefer naturalistic agents that are human-like as opposed to cartoon-like (Louwerse et al., 2005). This intervention has therefore chosen to use photographs of human models. Research in the field of social psychology suggests that people tend to get more persuaded by people from their own in-group, for example, people of the same sex and ethnicity. Persuasion research, however, provides mixed evidence for this claim (Baylor & Ebbers, 2003). BH has been developed for Norwegian population and both agents are Caucasian, and they represent both genders. As mentioned above, the male agent guides users through the psychoeducational part, while the female agent teaches them various exercises and techniques. The rationale behind this division is evidence that the use of multiple agents facilitates learning by reducing learners' cognitive load requirements. When each agent has a clearly defined role, it becomes easier for users to compartmentalize the incoming information and make use of it as needed (Baylor & Ebbers, 2003).

Apart from presence and appearance of agents in computer-based learning environments, the manner in which they communicate with users and the relationship that emerges between them is also crucial for user satisfaction and intervention's outcome (Bickmore, Gruber, & Picard, 2005). Humans use many types of behaviors to establish and maintain relationships, and many of these can be adopted by computer agents (Bickmore & Picard, 2005), both verbal and non-verbal (Bickmore et al., 2005). The form of language that the computer application utilizes evokes relational expectations on the part of the user (Bickmore & Picard, 2005). BH communicates mostly through on-screen-text placed in boxes designed in comic book like way, indicating that the agents are “talking” to the user. The overall tone of the communication is friendly and informal, for example “..business meetings, family get-together, being with friends. These get kind of “ruined” by the person you don't like”. The intervention uses several types of relational verbal and non-verbal behaviors that decrease social distance between the program and its user (Bickmore & Picard, 2005). An example of relational verbal behavior are continuity behaviors such as greetings and saying good byes (Gilbertson, Dindia, & Allen, 1998). The male agent in BH regularly greets users in an informal manner such as “Hi! Nice to see you”, while the female agent that guides users through the second part of the program day is the one that does the parting routines such as “See you in a couple of days. Until then, take care”. The intervention's agents also display a wide range of relational non-verbal behaviors (Bickmore & Picard, 2005) such as direct gaze, forward body lean, positive facial expression, hand gestures and direct orientation of both

body and face, all of which reflect positive attitude towards the user (Argyle, 1988; Richmond, McCroskey, & Payne, 1991).

Intervention's content

BH is a fully automated, internet-based intervention based on psychological research which targets those with mild-to-moderate levels of depression and those who do not qualify for depression, but who are in need of increased well-being. The overall goal of BH is to increase individual's general level of well-being by increasing positive affect, decreasing negative affect and depressive symptoms, and by providing protection from depression. The intervention attempts to reach these subgoals by teaching users specific techniques that (a) enhance their ability to practice gratitude and acts of kindness, (b) live in the presence, (c) identify and use their character strengths and (d) develop coping strategies that can be deployed in adverse situations. The intervention's performance objectives, determinants and learning objectives are depicted in Appendix D.

Practicing gratitude (1) is associated with positive emotions, and it is also an antidote to negative emotions such as hostility, worry and irritation (Lyubomirsky, 2007; Seligman, Steen, Park, & Peterson, 2005). BH consists of three techniques that promote gratitude; the first is the Three good things exercise which instructs users to notice positive things they experience and record them at the end of each day. The second exercise encourages users to write a gratitude letter to a person who has contributed with positive and memorable experiences to their lives. However, they decide for themselves whether or not they send the letter. The third exercise teaches users to genuinely accept a compliment which enables them to achieve inner gratitude.

Previous research suggests that investing in social connections by practicing acts of kindness (2) makes people happy, even when it is unpleasant, or when one receives or expects nothing in return. The intervention encourages kindness in the form of good deeds. Participants are asked to perform three good deeds during the following week, and if possible, to write an implementation plan (Lyubomirsky, 2007; Seligman et al., 2005).

Cultivating optimism (3) can have the same effect as practicing gratitude as both strategies entail habitually trying to make the best out of a situation, by looking for the positives. A writing exercise in this intervention, designed to promote optimism, encourages people to visualize or daydream about the future, and to write down what and where they would want to be if they could choose their best possible future (Lyubomirsky, 2007; Seligman et al., 2005). Even though some people may be born optimistic, the research reviewed in the introduction suggests that optimism can be achieved by practice. People who

think pessimistically are more likely to internalize their failures, whilst those who think optimistically are more likely to attribute failures to external factors (Lyubomirsky, 2007). This is important because those who believe that their failures can be attributed to an external cause, are more likely to try again, and thus more likely to succeed (Lyubomirsky, 2007).

There are also ways of developing coping strategies (4) for life's adversities. Such strategies can help people to get relief from their troubles as they teach them how to organize their thoughts and images, and work through their issues in a constructive way. Three coping strategies are presented in this intervention: ABCDE disputation technique (Seligman, 2006) Circle Technique and expressive writing (Pennebaker, 1997). ABCDE disputation technique consists of five written elements which are done in the following order : (a) describe the problem that you are facing, (b) identify any negative beliefs evoked by this adversity, (c) write how you feel or act as a consequence of this problem, (d) challenge the negative beliefs by searching for alternative causes of the problem, and (e) considering more optimistic explanations for the problem has the potential to decrease anxiety and increase hopefulness (Seligman, 2006). ABCDE technique basically involves disputation with one's own pessimistic thoughts. The circle technique teaches users to cope with situations in which they have to deal with people they perceive as unpleasant. Participants are instructed to draw three circles on a sheet of paper and write the three most irritating things about the person of interest in each circle. Then they draw ten circles on another sheet of paper and write as many positive statements about this person as possible. The task is to memorize the latter and think about its content when interacting with the person of interest. The basic idea behind this exercise is that changing one's thoughts will alter one's behavior, which in turn will result in more positive interaction. And finally, expressive writing exercise instructs users to write for 15 minutes at least 4 days in a row about en episode in their lives that they consider painful or sad. There is large amount of empirical evidence that supports the notion that expressive writing has beneficial effects on both physical and mental health (Pennebaker, 1997).

Low well-being is often associated with inability to live in the present (5), that is, instead of savoring the here-and-now, people's minds are often some place else (Lyubomirsky, 2007). Two strategies that promote living in the present and moment-to-moment awareness are introduced in BH; the flow exercise and a meditation exercise "breath along the spine". In the flow exercise, users are instructed to plan an activity that is likely to induce flow for the upcoming day. Flow (Csikszentmihalyi, 1997; Lyubomirsky, 2007) activity should be challenging enough to fully involve one's skills, yet realistically doable, and it should provide

an immediate feedback on how well one is doing. Once immersed in an activity, the total demand on psychic energy prevents distracting thoughts and feelings from invading consciousness (i.e., one is unaware of himself/herself and loses track of time), and the activity becomes worth doing for its own sake. Flow experiences are intrinsically rewarding and associated with positive emotions (Lyubomirsky, 2007). "Breath along the spine" is a 5-minute relaxation exercise which aims to increase attention, relieve stress, and improve concentration. Step-by-step instructions are given via an audio recording.

(6) Character strengths contribute to fulfillment, strengths of the hearth, zest, gratitude, hope, love and life satisfaction (Seligman et al., 2005). In order to use one's character strengths, one has to know what they are. The intervention provides users with a complete list of character strengths and encourages them to pick 4 strengths which they think describe them best and use them actively in daily life.

Unexpected technical issues

No unexpected events occurred after the commencement of the trial during the intervention. However, there appeared to be some minor technical issues in the follow-up surveys. Three participants reported that they did not receive the email to the one month follow-up survey. All of these participants had a @hotmail.com or @hotmail.no address. This has most likely occurred either because of Hotmail's spam filter settings (a) content (i.e. words in the sender field or body text), (b) link in email, or (c) regularity of mass distribution of emails from the same sender. As a safety measure, an extraordinary email was sent from one of the researcher's email account with different content and without any links to make subjects aware that follow-up data collection has started at one, three, and six months, and they were asked to check their spam filters.

Psychological measures

All of the psychological measurements used in the study were translated into Norwegian. A back-translation technique was therefore used to verify the quality and the accuracy of the translation.

The Center for Epidemiological studies – Depression scale (CES-D; Radloff, 1977) is a self-report scale developed to measure a person's current level of depression symptomatology. The original scale contains 20 items on a 4-point system, from 0 (*rarely or*

none of the time) to 3 (*most of the time*), however the current study used a shorter version where items 1, 5, 6, 9, 10, and 15 were removed on the basis of face-validity evaluations. The scoring was also been changed to a 0 (*less than 1 day*) to 6 (*7 days*) point scale. Of the remaining 14 items, 10 represent negative symptoms such as hopelessness, fatigue, and pessimism. Four of the items are positively worded and measures positive affect. These four items were reverse coded to indicate a lack of well-being (see Appendix E). In the original scale the Cronbach alpha coefficients were reported as ranging from .85-.90 (Radloff, 1977). Results in the current study using the 14 items version, yielded Cronbach alpha coefficients of .87 at baseline, .89 at 1 month follow-up, .88 at 2 month follow-up, and .83 at 6 month follow-up.

The Positive Affect Schedual and Negative Affect Schedual (PANAS) consist of two 10-items mood scales that measure positive and negative dimensions of affect. (Watson, Clark, & Tellegen, 1988). PANAS is considered a valid, reliable and efficient tool for assessment of the two important and relatively independent dimensions of mood. Positive affect (PA) reflects the degree to which an individual is alert, active and enthusiastic. Negative affect (NA) is comprised of a variety of aversive mood states such as anger, fear, guilt and nervousness. Both scales consist of 10 different words which describe various emotions and feelings. The study participants were instructed to indicate to what extent they had felt this way during the past seven days on a scale of 1 (*very slightly or not at all*) to 5 (*extremely*) (see Appendix F and G). According to Watson and his colleagues (1988), the PA and NA scales have acceptably high alpha reliabilities, ranging from .84 to .87 for negative affect scale, and from .86 to .90 for PA scale. In the current study, the Cronbach alpha coefficient for NA scale was .89 at baseline, .92 at 1 month follow-up, .88 at 2 month follow-up, and .89 at 6 month follow-up. The Cronbach alpha coefficient for PA scale was .82 at baseline, .83 at 1 month follow-up, .86 at 2 month follow-up, and .84 at 6 month follow-up.

The General Self-efficacy scale assesses one's generalized sense of self-efficacy, more specifically, one's confidence in being able to cope effectively with variety of demanding situations (Sherer et al., 1982). In this study, Norwegian version of the General Perceived Self-Efficacy scale (Røysamb, Schwarzer, & Jerusalem, 1998) was used. The participants were asked to indicate if a series of 10 statements were in agreement with how they saw themselves. For example: I can always manage to solve difficult problems if I try hard enough. The extent to which they agreed with these statements was expressed on a scale ranging from 1 (*I strongly disagree*) to 6 (*I strongly agree*; see Appendix H). The General

Self-efficacy scale typically yields internal consistencies between alpha .75 and .91. In the current study, the Cronbach alpha coefficient was .92.

The Gratitude Questionnaire-Six Item Form (McCullough & Emmons, 2001) is a brief self-report questionnaire that measures people's disposition to experience gratitude. The six items are measured with a 1 (*strongly disagree*) to 7 (*strongly agree*) Likert response option. Two of the six items are reversed coded to avoid response bias. Previous research suggests that the questionnaire has good internal reliability (see appendix I). McCullough and Emmons (2001) reported alphas ranging from .82- .87. In the current study, the Cronbach alpha coefficient was .77 at baseline, .83 at 1 month follow-up, .79 at 2 month follow-up, and .84 at 6 month follow-up.

All participants were assessed at baseline (before randomization), at 1 month follow-up, at 2 month follow-up and at 6 month follow-up. The baseline questionnaire contained additional demographic questions pertaining to gender, age and highest level of education achieved (see Appendix J). Follow-up assessments were identical for both experimental and waiting-list control group except for the questionnaire at 1month follow-up administered to the experimental group which contained additional set of questions related to user experience of BH such as perceived usefulness, perceived ease-of-use and user satisfaction. No further qualitative feedback was obtained from participants.

All items in the online questionnaires were optional except for one that requested submission of a valid email address, which was a prerequisite for gaining access to the intervention.

At baseline the response rate was 77. 7%; 265 participants began the online survey, 206 of them completed the survey and entered their email address for registration.

Randomization

Unrestricted randomization procedure was carried out by a separate researcher (co-supervisor FD) that did not participate in recruitment. The random sequence generator on www.random.org was used to allocate eligible participants to either a waiting-list control group (n =94), or an experimental group (n = 112). Although this yields an allocation ration of 1.2, it should be noted that each individual had a 50% chance of being assigned to either of the two groups, and any differences can be ascribed to chance factors alone. Prior to randomization, none of the participants knew which group they would be assigned to.

Blinding

RCTs designed to evaluate web-based interventions do not allow the use of double-blind procedures (Eysenbach, 2002). As a result, participants in the current study knew whether they were assigned to the experimental group or the waiting-list control group. The nature of the surveys also prevented the experimenters from being blinded.

Ethics and informed consent

The participants received an online invitation to participate in the research project (see Appendix A). The invitation contained a link to a webpage with necessary information concerning the research project. The information sheet included thorough details about the study (see Appendix K), what it involved, how the data would be treated, as well as advantages and disadvantages of participating in the study. The participants were also notified that their participation was voluntary and that they could withdraw their participation at any time without having to provide any explanation. Participants who wanted to be a part of the research project had to give their consent and confirm that they had read the information sheet before they could proceed to the baseline questionnaire.

An email address was the only piece of information that was collected from each participant which could potentially lead to their identification. In order to protect participants' identities, the list with their email addresses was stored on a computer of the project manager which was protected by password and placed in an office equipped with a lock. Information that could directly lead to identification of participants was deleted when the project was terminated.

Statistical Methods

Sample calculation. A power test was conducted in order to establish how many participants should be sampled to detect program effects. It is common to use results from past research for the purpose of establishing the effect one would hope to detect in an experiment (Field, 2009). The current study utilized CES-D (Radloff, 1977) and the PANAS subscales (Watson et al., 1988) to measure main effects. However, since the CES-D scale employed in this study was altered in terms of length and scoring system (see Psychological Measures), the power calculations were based solely on previous findings from the PANAS scale (Watson et al., 1988). A statistical power calculator on www.dssresearch.com was used to generate the results. As recommended by Cohen (Cohen, 1988, 1992) the calculations were made using a .8 probability of detecting a genuine effect, along with a standard α-level of .05. By estimating a mean value of 31.31 on the PANAS scale and a standard deviation of 7.65 (as

seen in: Watson et al., 1988) the results indicated that a sample size of 42 participants in each group was recommended to detect a difference of 4 points between groups and 80 participants in each group to detect a difference of 3 points. Nevertheless, if the assumptions for parametric tests are not met (e.g., normal distribution), and non-parametric tests are performed instead, an additional 15% should be added to the sample (Lehmann, 1998). Given that this is a highly likely scenario in studies using the CES-D and PANAS scales, as indicated by previous research, sampling participants accordingly is essential.

Missing data. Prior to any statistical analysis, missing data had to be dealt with. Several types of missingness occurred in this study: (a) initial non-response (follow-up data have been collected, but baseline data are missing), (b) loss to follow-up and wave non-response (baseline data have been collected, but follow-up data either missing completely, or they have not been obtained during one or more waves of data collection), (c) item non-response which occurs when a participants skips individual questions on a measure (Blankers, Koeter, & Schippers, 2010). Participants whose data showed patterns of initial non-response, loss to follow-up and wave non-response were removed from the data set prior to any statistical analyses, as these patterns of missingness would distort any within-subject and between-subject comparisons. Participants with item non-response pattern of missingness remained in the study; however, steps had to be taken to deal with their missing values. Identifying types of missing data determines which data missing approach is most suitable (Norušis, 2010b). There are three types of missingness (Schlomer, Bauman, & Card, 2010): (a) missing completely at random (MCAR), (b) missing at random (MAR) and (c) missing not at random (MNAR). Data are said to be MCAR when missingness is not dependent on the values of variables in the data set (Little, 1988). MAR refers to the situation when the likelihood of missing data on the variable is not related to participant's score on the variable and instead is explained by values on other variables (Acock, 2005). And finally, missingness in data that are MNAR depends on unobserved data (Graham, 2009). This type of missingness is considered problematic because as opposed to MCAR and MAR, analysis of a dataset whose values are MNAR requires an explicit missing model (Jansen et al., 2006).

Little's MCAR test was conducted in SPSS to determine whether the data were missing completely at random (MCAR). The test's output suggested that not all data were MCAR, which implied that they could be either MAR or MNAR (Norušis, 2010b). There is no method, however, that can definitely test for MAR versus MNAR (Beunckens,

Molenberghs, Verbeke, & Mallinckrodt, 2008). Since not all data were MCAR, the Expectation Maximization Imputation (EM) was chosen for handling missingness (Norušis, 2010b).The EM is an iterative procedure that computes maximum likelihood estimates of unmeasured data (Dempster, Laird, & Rubin, 1977). Default settings for EM in SPSS were used to impute data for the PA and self-efficacy scores as their distributions were acceptably normal. For the NA, gratitude and CES-D scores, the missing value analysis was performed using student's t *N*-1 degrees of freedom due the skewness of their distributions (see Appendix L for overview of data distributions).

Outliers. Despite the choice of non-parametric tests (see below), steps were taken to identify and remove potential outliers as they not only directly violate assumptions of parametric tests (Pallant, 2010), but they may also reduce power of non-parametric tests (Zimmerman, 1995). 3MADe method (3 MADe Method: Median ± 3 MADe) was used to identify outliers (Olewuezi, 2011), due to the predominating non-normality of data. This method uses the median and Median Absolute Deviation (MAD; Seo, 2002) both of which are considered robust estimates of the spread and location in a data (Hampel, 1971). Consequently, MADe remains usually unaffected by extreme values (Olewuezi, 2011). A simulation study conducted by Seo (2002) suggests that when distribution of data is skewed, MADe is a more appropriate outlier labeling technique than the Standard Deviation method, as extreme values do not tend to inflate its intervals. MADe was also chosen over the box plot approach, another commonly used outlier labeling technique, because too many values are identified as outliers with increasing skewness of the data since its fences are derived from normal distribution (Hubert & Vandervieren, 2008). Given that MADe is not available in SPSS, all calculations were done manually.

Data analysis. The alpha level of .05 was chosen for all statistical tests unless otherwise specified, and all tests were two-tailed. SPSS (Statistical Package for the Social Sciences) version 19.0 was used to conduct all analyses.

Baseline differences between experimental group and control group were assed using the Mann-Whitney U test for continuous and ordinal variables, and Chi-Square test for nominal variables. The same tests were used in the attrition analyses to identify any baseline differences between participants who withdrew from the study and those who remained.

Primary outcomes. Non-parametric tests were employed due to the predominantly non-normal distribution of the data (Pallant, 2010), as application of standard parametric

significance tests on skewed distributions does not yield exact results (Radloff, 1977). Friedman test was performed separately on experimental and control group to assess whether there was a significant change in depressive symptoms, PA and NA in each group, across the four times of measurement (baseline, 1 month, 2 month, and 6 month follow-up. Post hoc testing involved Wilcoxon Signed Rank test to assess whether within-subject change in the primary outcomes occurred from baseline to 1 month follow-up, from 1 month follow-up to 2 month follow up, and 2 month follow-up to 6 month follow-up. Adjusted Bonferroni alpha value was employed to reduce the risk of Type I error (Pallant, 2010). And finally, a Mann-Whitney U test was used to estimate whether there was a statistically significant difference on the outcome variables, measured at the same time period, between experimental and control group. In all these types of tests, the Monte Carlo method which is based on repeated sampling, was used to obtain an unbiased estimate of the exact p-values. This method is particularly suitable for obtaining accurate results when data are non-normally distributed. For calculations of the Monte Carlo approximation, 50,000 samples (instead of the default 10,000 in SPSS) were used, as larger number of samples leads to more reliable estimates of the exact p-value. In addition, the Monte Carlo method generates a confidence interval within which the true p-value is located with 99% certainty (Mehta & Patel, 1996).

Secondary outcomes

Mediation. Hierarchical multiple regression was performed along with the bootstrap method to examine mediation effects. More specifically, the aim of the mediation analyses was to investigate whether gratitude measured at 1 month follow-up mediated the effect of BH on depressive symptoms, PA and NA, all measured at 2 month follow-up. The bootstrap re-sampling procedure was set to 5,000 samples to generate 95% confidence intervals to assess the size and significance of the indirect effects. This procedure was recommended by Preacher and Hayes (2004). They suggest that Sobel test, which is commonly used to test for mediation effects, is not always appropriate as it is based on the assumption of normal distribution. Bootstrapping, on the other hand accommodates asymmetry (Preacher & Hayes, 2004). In each mediation analysis, treatment condition was entered in step 1, and gratitude as measured at 1 month follow-up was entered in step 2.

Moderation. Hierarchical multiple regression was used in a series of analyses to test whether pre-treatment characteristics such as age, gender, highest level of education achieved, and self-efficacy moderated BH's effects on the three primary outcome variables: depressive

symptoms, NA and PA. When parametric assumptions are not met due to for example positively skewed dependent variables which may cause heteroscedascity, bootstrap resampling procedures are appropriate to detect moderator effects (Russel & Dean, 2000).Ten thousand bootstrap samples were chosen for all analyses as larger number of samples lead to greater precision (Guo & Peddada, 2008), 200,000 seed was set for Marsenne Twister, and bias corrected and accelerated (BCa) intervals were used due to their accuracy (Norušis, 2010a).

Prior to any analyses, all independent continuous variables were centered in order to achieve improved interpretability of the interaction effects as well as reduced risk for multicollinearity (Aiken, West, & Reno, 1991). In each analysis, a predictor and a moderator were entered in step 1, and their interaction term was entered in step 2. The purpose of each analysis was to determine whether an interaction between a predictor and a moderator significantly predicted an outcome variable, when effects of the two independent variables were controlled for (Holmbeck, 2002).

Results

Participant flow. Of the 265 persons who were assessed for eligibility, only 206 (77.7%) met the inclusion criteria. Eligible participants were randomized and allocated to either a waiting-list control group (n = 94 [45.6%]) or an experimental group (n = 112 [54.4%]).Post randomization attrition and exclusion of participants are depicted in a flow chart (see Appendix M). Of these 206 randomized participants, 112 (54.37%) in the experimental group started the intervention, and 94 (45.63%) remained in the control group. In the time period between the trial commencement and 6 month follow-up, 13 (6.3%) participants from the experimental group and 9(4.4%) from the control group actively withdrew from the study. Additional removal of individuals who missed 1 or more follow-up data collections, who did not provide demographic information and those whose data were deemed outliers, resulted in 34 (16.5%) participants in the experimental group and 47 (22.8%) in the waiting-list control group. Data collected from these 81 (39.3%) participants were subjected to statistical analyses.

Raw data processing. Prior to randomization, 59 (22.3%) ineligible participants were removed from the data set. Of the 206 randomly allocated respondents, 3 participants (2 allocated to the experimental group, 1 allocated to the control group) were removed due to not stating demographic information which was necessary for subsequent analyses.

Of the remaining 203 participants, 1 respondent (allocated to the experimental group) was removed from the data set due to initial non-response, which, in the present study, was operationalized as completely missing data on at least one baseline measure. Data from another 32 participants allocated to the control group and 56 allocated to the experimental group were removed from the data set due to loss to follow-up, wave non-response or active withdrawal

Subsequent attrition analyses revealed that there were statistically significant associations between attrition and gender, χ^2 (1, n = 203) = 3.8, p = .051, *phi* = .15; and attrition and treatment group, χ^2 (1, n = 203) = 7.5, p = .006, *phi* = -.203. The odds of dropping out of the study were 2.06 times as high if the participant was male, and 0.46 times as high if the participant was in the waiting list control group (see Appendix N for all assessed baseline variables).

Application of 3 MADe outlying labeling method to the sample of 87 participants identified 3 outliers in experimental group and 3 outliers in the control group, all of which were removed from the data set.

Of the 81 participants who were included in the analyses, 26 showed patterns of item non-response. However, levels of item non-response were at acceptable levels (Bowling, 2009); maximum percentage of item non-response was 0.6% for CES-D at baseline (for overview of item non-response see Appendix O). No specific items appeared to be systematically skipped. Item non-response was nonetheless handled by utilizing EM. Normality of the resulting data was evaluated by assessing several indicators of normality: (a) skewness and kurtosis values, (b) Shapiro-Wilk W-test, (c) box plots, (d) stem-and-leaf plots, and (e) Q-Q plots. Data in the present study were predominantly non-normally distributed, with the exception of PA and self-efficacy as illustrated by values generated by the Shapiro-Wilk W- test (see Appendix L).

Analyzes using the Mann-Whitney U test and Chi-Square test did not reveal any statistically significant differences between the experimental group (n = 34) and control group (n = 47) on any of the assessed baseline characteristics (see Appendix P).

Primary outcomes

Symptoms of depression. The results of the Friedman test indicated a statistically significant difference in CES-D scores for the experimental group across the four time points,

χ^2 (3, n = 34) = 7.77, p = .049; but not for control group, χ^2 (3, n = 47) = 3.49, p = .322. The median values of CES-D scores in the experimental group showed a notable decrease from baseline to 1 month follow-up, and then held relatively equal levels across 2 and 6 month follow-ups; (*Mdn* = 21.5), (*Mdn* =15.5), (*Mdn* = 16.5), (*Mdn* = 17.75), respectively. A Wilcoxon Signed Rank test subsequently revealed a statistically significant reduction in depressive symptoms at 1 month follow-up following participation in the BH intervention, z = - 2.80, p = .004, with a medium-to-large effect (r = .48). Changes in CES-D scores from 1 month follow up to 2 month follow-up, z = -.09, p = .930, r = .02, and from 2 month follow-up to 6 month follow-up, z = -.38, p = .716, r = .06, were not statistically significant. A Mann-Whitney test indicated, however, that there was no statistically significant difference between the experimental group (*Mnd* = 15.5, n = 34) and control group (*Mnd* = 21, n = 47) in CES-D levels at 1 month follow-up, U = 657.5, z = -1.36, p = .175, r = .2.

Additional post hoc analyses deploying the Wilcoxon Signed Rank test examined whether reductions in depressive symptoms in the experimental group were statistically significant from baseline measurements to 2 month and 6 month follow-ups. Changes in CES-D scores remained significant from baseline to 2 month follow-up with medium effect, z = -2.22. p = .025, r = 0.38. However, a Mann-Whitney test indicated that there was no statistically significant difference between the experimental group (*Mnd* = 16.5, n = 34) and control group (*Mnd* = 20, n = 47) in CES-D levels at 2 month follow-up, U = 686.5, z = -1.07, p = .281, r = .1. Reductions in symptoms of depression from baseline to 6 month follow-up were no longer significant as shown by a Wilcoxon Signed Rank test, z = -1.54, p = .128, r =0.26.

Positive affect. The result of the Friedman test indicated that there was a statistically significant difference in PA scores for the experimental group across the four time points, χ^2 (3, n = 34) = 10.66, p = .013, but not for the control group, χ^2 (3, n = 47) = 2.06, p = .562. The median values of PA in the experimental group indicated an increase in PA from baseline to 1 month follow-up and then slight and gradual decrease over 2 and 6 month follow-ups; (*Mdn* = 33.45), (*Mdn* = 36.5), (*Mdn* = 36), (*Mdn* = 35.5), respectively. The Wilcoxon Signed Rank test revealed a statistically significant increase in PA at 1 month follow-up following participation in the BH intervention, z = - 2.49, p = .011, with medium-to-large effect (r = .42). Changes in PA scores from 1 month follow-up to 2 month follow-up, z = -.91, p = .371, r = .16, and from 2 month follow-up to 6 month follow-up, z = -.78, p = .449, r = .13, were not statistically significant. The Mann-Whitney test indicated a statistically significant difference

between the experimental group (*Mnd* = 36.5, *n* = 34) and the control group (*Mnd* = 34, *n* = 47) in PA levels at 1 month follow-up, *U* = 59, *z* = -2.01, *p* = .044, *r* = .2.

Additional post hoc analyses were conducted using the Wilcoxon Signed Rank test to investigate whether increases in PA were statistically significant from baseline to 2 month and from baseline to 6 month follow-ups. Neither achieved statistical significance, with the first comparison yielding *z* = -1.91, *p* = .56, *r* = 0.32, and the second comparison, *z* = -1.12, *p* = .266, *r* = 0.19.

Negative affect. Changes in NA occurred in the hypothesized direction in the experimental group (*Mdn* = 19), (*Mdn* = 17), (*Mdn* = 12), (*Mdn* = 16.5), respectively. However, the Friedman test indicated no statistically significant change in NA over the four times of measurement for either the experimental group, χ^2 (3, *n* = 34) = 4.43, *p* = .218, or the control group, χ^2 (3, *n* = 47) = 5.6, *p* = .136.

Mediation. Given that no main effects were found for either depressive symptoms or NA, and the main effect of BH on PA was not statistically significant beyond 1 month follow-up, no mediation analyses were conducted.

Interaction effects. Multiple hierarchical regression was used to assess the interaction effects between BH and several pre-treatment variables (see Appendix Q, R and S). With respect to the three primary outcome variables (CES-D scores, PA, NA; as measured at 1 month follow-up), no interaction effects were identified for gender, age, and pre-treatment levels of self-efficacy. Educational attainment did not moderate the treatment's effects on PA, however, Treatment x Educational attainment interaction accounted for 5.3% of variance in depressive symptoms, ΔR^2 change = .05, *F*(1, 77) = 4.35, *p* = .040, and 10.7% of variance in NA, ΔR^2 change =.11, *F*(1, 77) = 9.31, *p* = .003, above and beyond the main effects. Correlation matrices for the significant interactions are displayed in Appendix T. Post hoc analyses involved examination of how the nature of the relationship between treatment group and one of the two primary outcome variables (CES-D and NA scores) changed as a function of educational level. A new variable was created in order to categorize study participants according to three levels of education: (a) low levels of education which included participants with elementary and secondary education, (b) medium levels of education consisting of individuals with 1-3 years of university or college, and (c) high levels of education containing participants who have attended university or college for 4 or more years. Simple scatterplot in

SPSS was then used to comprehend the interaction effects; an outcome variable was placed on the Y axis, treatment variable on the X axis and markers were set by the newly created variable in order to obtain three regression groups. With respect to depressive symptoms, following regression effects were obtained; (a) low levels of education, $R^2 = .32$, (b) medium levels of education, $R^2 = .05$, and (c) high levels of education, $R^2 = .02$. Subsequently, bar charts were created to depict how different levels of educational attainment influenced the treatment's effects on depressive symptoms (see Appendix U) and NA (see Appendix V). In both cases, individuals with lowest levels of education responded with greatest reductions in CES-D scores and NA, as compared to those with higher levels if educational attainment.

Discussion

Results: The primary purpose of this study was to examine whether BH produces long-term (i.e., 6-month) decreases in depressive symptoms and NA, and long-term increases in PA. Contrary to the initial hypotheses, no statistically significant changes in depressive symptoms and NA were observed in the experimental group, as compared to the waiting-list control group. As expected, participants in the experimental group reported statistically significant increases in PA following the interventions, however, the increases were no longer significant beyond 1 month follow-up. The secondary purpose of the study was twofold; first, gratitude as measured at 1 month follow-up was hypothesized to mediate the intervention's effect on the primary outcomes as measured at 2 month follow-up. However, since the BH intervention did not lead to statistically significant reductions in depressive symptoms and NA, and the increases in PA were no longer significant at 2 month follow-up, no mediation analyses were conducted. And second, several pre-treatment variables were examined as potential moderators of the intervention's effect on the three primary outcome variables, as measured at 1 month follow-up. No interaction effects were found for age, gender and baseline levels of self-efficacy. The product of treatment variable and highest level of education achieved, on the other hand, accounted for variance in both depressive symptoms and NA, above and beyond the main effects. Subsequent probing of the statistically significant interactions revealed that in both cases, the intervention brought about greatest reductions in CES-D scores and NA in the subgroup with lowest levels of educational attainment.

In contrast to Seligman's (2005) study, where Using signature strengths in a new way and Three good things exercises produced long-term (i.e., 6 month) decreases in depressive scores as measured by CES-D, BH did not bring about statistically significant reductions in either depressive symptoms or NA. On the other hand, these findings support Mitchell's study (2009) that did not find any reductions in mental illness. Three possible explanations have been identified for the differential effects of BH and Seligman's intervention on depressive symptoms. First, the sample in Seligman's study was recruited from a website created for his book called *Authentic Happiness* (2002a) which probably attracted individuals who were either interested in positive psychology, motivated to increase their happiness levels, or depressed and seeking help. The method of recruitment in the present study most likely yielded a sample of less interested and motivated participants. Second, it is possible that sample in the current study had somewhat lower levels of depressive symptoms than in Seligman's study where the sample was, on overage, mildly depressed at baseline. The mean score for CES-D at baseline in the present study was at the low end of the range, particularly after outliers had been removed. These outliers contained individuals with severe depression scores. The decision to remove them from the data set was based on two assumptions: (a) BH was designed for individuals without depression and those with mild-to-moderate depression, and (b) these particular cases were identified as outliers by the 3 MADe method and had to be removed in order to improve the power of non-parametric tests employed in the study. Consequently, the sample had somewhat lower levels of depressive symptoms which created fewer opportunities for improvement. And third, contrary to Seligman, this study employed non-parametric tests due to the predominantly non-normal distribution of the data. The distribution of CES-D scores was skewed with a larger proportion of low scores, an expected finding since the scale was designed based on symptoms of depression as seen in clinical cases (Radloff, 1977), which was not the target population for BH. Given that non-parametric tests do not always control for the probability of type II error (Zimmerman, 1995), it is possible that the present study rejected a hypothesis that was in fact true. Future research may re-investigate the intervention's effects on both depressive symptoms and NA, as despite the lack of statistical significance, the changes in both of the variables' median scores occurred in expected direction. Considerable reductions were observed at 1 month post-treatment in CES-D scores and at 2 month post-treatment in NA, and in both cases, relatively, small changes happened thereafter.

The present study has identified statistically significant increases in PA at 1 month follow-up in the experimental group, as compared to the control group. In comparison to offline PPIs which measured changes in PA, Emmons and McCullough's gratitude intervention (2003) did not detect any increases in PA at 9 week follow-up. Given that this trial employed a true control group, while the gratitude intervention used a hassle condition as a comparison only accentuates BH's efficacy to increase PA. Several studies of internet-based PPIs brought about changes in happiness that lasted up to 6 months (Seligman et al., 2005; Shapira & Mongrain, 2010), however, none of them directly measured PA, which complicates the comparison. Some theorists (Diener, Sandvik, & Pavot, 1991) suggest a strong possibility for the idea that frequent PA is sufficient to produce happiness. This viewpoint would make the comparison possible as this RCT measured frequency, rather than intensity of PA. Others (Lyubomirsky, King, & Diener, 2005) argue, however, that happiness is a product of frequently experienced PA and infrequently (but not absent) experienced NA. To complicate matters even further Fredrickson and Losada (2005) , emphasize the importance of precise positive to negative affect ratio (e.g., ≥ 2.9). Despite the encouraging finding, it must be noted that even though statistical significance is essential for assessment of changes that occur following an intervention, it is crucial to distinguish between statistical and clinical significance. Clinical significance refers to whether or not the intervention brings about meaningful changes in daily lives of the target group. Even large effects are not necessary a guarantee of clinical relevance (Rapport, Kofler, Bolden, & Sarver, 2008). Future research will need to assess whether BH brings about meaningful changes in day-to-day life.

With respect to the secondary purpose of the present study, it is a common practice in research to move beyond basic questions such as whether or not a given treatment is effective in influencing the outcomes of interest, and investigate moderators and mediators of these effects (Frazier, Tix, & Barron, 2004). Given the nature of the observed main effects, no mediation analysis was conducted. However, considering the empirically established link between gratitude and well-being, future research should continue its efforts to understand which role gratitude plays in this relationship. As for moderation analyses, no interaction effects were found for gender, age and baseline levels of self-efficacy. Even research on long-established treatments such as CBT for depression provides limited information on the moderator role of demographic variables such as age, gender and education (Driessen & Hollon, 2010).Given the relatively brief history of positive psychology, even less is known about the moderators of PPIs. However, contrary to the present study, a meta-analysis

conducted by Sin and Lyubomirsky (2009) revealed age as a moderator of PPIs; well-being benefits of PPIs were found to increase with age. It is possible that the present study failed to arrive at the same conclusion because its sample consisted of relatively young participants (see limitations below). In terms of internet-based interventions, even fewer studies exist on moderators of their effects. However, contrary to the finding that highest level of education achieved moderated the treatments' effects on depressive scores and NA as measured at 1 month follow-up, Button, Wiles, Lewis, Peters, and Kessler (2011) did not find educational attainment to moderate treatment response to online CBT for depression. The results of the present study implied that individuals with lowest levels of education benefited most from BH in terms of reductions in depressive symptoms and NA. This highlights the need to consider whether the learning style involved in the intervention is suitable for all users. For example Griffiths and Christensen (2007) found out that the learning style employed in MoodGYM was not particularly suitable for users with lower levels of literacy. Their conclusion is seemingly contradictory to the findings in the present study; however, overwhelming majority of participants from the low education subgroup attained secondary education which cannot be equaled with low levels of literacy. To the best of our knowledge, none of the evaluated internet-based interventions targeting well-being have examined the same moderators as the present study. Future research on well-being should increase its efforts to comprehend moderators of the treatments' effects in order to understand who is most likely to benefit from them. Even though a treatment may not be effective in a heterogeneous group, it might be efficacious for specific subgroups of individuals (Hirschtritt et al., 2011).

Limitations

Design: The present study suffers from several methodological issues related to design. First of all, waiting-list control group was used instead of a placebo control group. This type of design is more likely to bring about higher effect sizes than a placebo control group (Knaevelsrud & Maercker, 2007). In terms of generalizability, it is necessary to point out that participants who were randomized to the waiting-list control group might not have agreed to participate, if they were not granted access to the intervention at a later point of time. Participants willing to join a non-treatment group might differ from those who do not choose to join a study unless they receive the treatment afterward (Van Straten, Cuijpers, & Smits, 2008).When a similar treatment is available from a community clinician (Kraemer & Schatzberg, 2009), potential participants might choose to seek outside help instead of volunteering for a RCT, where a treatment might be withheld from them. This type of

situation might yield a non-representative sample. Furthermore, it is often the case that participants who have been randomized to a waiting-list control group, drop out from the study to seek an outside help which not only introduces bias, but it also brings about loss of power. Surprisingly, attrition analyses have revealed that in this trial, participants allocated to the experimental group were more likely to withdraw their participation that those assigned the control group. Similar findings have been also observed in other internet-based interventions targeting depression (e.g., Clarke et al., 2005; Clarke et al., 2002; Warmerdam, Van Straten, Twisk, Riper, & Cuijpers, 2008). Future research might obtain less biased data by conducting the study on a sample with minimal or non-systematic attrition, and by including a placebo control group in the design. Several types of placebo control groups have been used in previous research on internet-based interventions such as attention placebo (Christensen et al., 2004), or internet-based condition (Spek et al., 2007). One possible approach would be to create a psychoeducational website which would provide control group participants with limited information on depression and positive psychology.

Secondly, in this trial, neither the participants nor the researchers were blinded, which poses another methodological issue. When participants are aware of which group they have been assigned to, their perceptions of whether or not the treatment is effective may color theirs responses on outcome measures. Similarly, observer bias may be introduced when researchers are not blinded as their assessments might be influenced by the degree to which favor the treatments in question (Schulz, Chalmers, & Altman, 2002).

And thirdly, there was no way to confirm that participants assigned to the experimental group went thoroughly through the intervention's materials and performed all the tasks as instructed. Similarly, it was impossible to check whether participants in the control group had not gained access to similar materials. Future research might reduce incidence of the first issue by: (a) inquiring about the frequency of use, or (b) measuring frequency of use directly via log-files. The second issue might be dealt with either by: (a) asking participants in the control group if they accessed similar information elsewhere on the Internet, or (b) using client-side proxy software to monitor which websites they visit (Eysenbach, 2002).

Analysis. Furthermore, issues related to attrition must be addressed. Of the 206 participants who were randomized and allocated to the experimental group or the waiting list control group, 116 (56.3%) withdrew from the study by the 6 month follow-up (see flow

chart, Appendix L). Even though this figure seems to be very high, the *law of attrition* states that high drop-out rates are a common occurrence in ehealth research, particularly in ehealth trials that involve internet-based self-help applications (Eysenbach, 2005). Attrition rates in internet-based interventions typically vary from 6-95% (Mitchell et al., 2009), which places this study's attrition rate in the middle of the range. High drop-out rates in internet-based interventions have been attributed to high and anonymous accessibility, ease of enrollment, little personal and financial commitment, and ease of drop-out (Christensen, Griffiths, Mackinnon, & Brittliffe, 2006). However, this problem is not unique to web-based therapies; as many as 70% of patients are missing by third session in face-to-face treatments (Christensen, Griffiths, & Farrer, 2009).

It should be noted that attrition rates in this trial might have been influenced by the recruitment method used. Given that the first degree contacts who received an invitation to participate in the project had more or less close ties with the researchers, it is possible that these first contacts were more likely to remain in the study. Research on prosocial behavior suggests that individuals are more likely to assist a friend, because the *role relationship* (in this case the friendship or family ties) simply requires such behavior (Amato, 1990)

As mentioned earlier, attrition analyses revealed that there was a differential drop-out between the experimental and control condition, which threatens internal consistency (Kaltenthaler, Sutcliffe, et al., 2008). Furthermore, a priori calculations were conducted in order to sample a sufficient number of participants to detect a 3 point difference between groups, however, since the sample size was considerably reduced as a result of the relatively high attrition rates, the study had less statistical power than what is recommended to detect a genuine effect (Cohen, 1988, 1992). This resulted in heightened likelihood of making a type II error, or in other words, increased risk of falsely rejecting the hypothesized main effects. Broadly speaking, attrition is a considerable threat to external and internal validity, and future research should utilize available tools to reduce attrition rates (for discussion see: Karlson & Rapoff, 2009).

Secondly, objections can be raised to outlier detection in the present study. Outliers were identified with 3MADe method. Even though this method is preferred over the SD method when the data are skewed, it is not an entirely flawless method for detecting outliers in non-normal distributions (Seo, 2002). The most precise method for detecting outliers appears to be adjusted box plots technique, which takes into account the skewness of the data

by incorporating a robust measure of skewness (medcouple) into the definition of whiskers, used to calculate regular box plots (Hubert & Vandervieren, 2008). An imprecise identification of outliers, which might have been the case in the current study, may have impacted results of the statistical analyses by weakening the power of non-parametric tests used.

Another methodological issue is related to the multiplicity problem which occurs when (a) many hypotheses are tested on the same data set, or (b) when a study has two or more primary outcomes (Ette, Godfrey, Ogenstad, & Williams, 2003). When multiple assessments are conducted, the probability of detecting a significant finding due to chance alone increases (Koch & Gansky, 1996). In order to reduce the risk for type I error, observed p-values should be adjusted (Ette et al., 2003). In the present study, no steps were taken to deal with the multiplicity problem except for the use of Bonferroni adjusted alpha levels in Wilcoxon Signed Rank tests. Consequently, this study may suffer from increased risk of declaring false significance.

Furthermore, multiple regression was used to assess interaction effects. Even though this method is a preferred approach to moderation testing (Aguinis & Stone-Romero, 1997), it is not without its flaws. Aguinis'(1995) literature review reveals that there is a number of factors that have detrimental effects on statistical power in moderation testing when multiple regression is used. In low power situations, type II error rates are high and researchers are likely to incorrectly reject theoretical models which imply moderating effects. Several factors that negatively impact the power of multiple regression in moderation testing have been identified in this study. First of all, one of the most important factors that affect power is the size of the sample on which the analysis is performed. Generally, moderating effects can often go undetected unless a sample size of at least 120 is used (Stone-Romero & Anderson, 1994). The current study's sample size was only 81, which suggests that it was underpowered with regards to detecting interaction effects. Second, it has been shown (Aguinis, 1995) that the power to detect a categorical variable, whose categories differ in sample size as a moderator variable, is considerably reduced. This was the case for all categorical moderators in the present study. For example, the variable "gender" consisted of men (n = 14) and women (n = 67). To sum up, given the small total sample size and the unequal sample sizes across moderator-based subgroups, moderator effects were likely to be dismissed in the present study as a result of increased type II error rates.

Additionally, some questions arose during the moderation testing. The interaction term

between treatment group and highest level of education achieved accounted for both depressive symptoms (model 1) and NA (model 2), as measured at 1 month follow up, above and beyond the main effects. Even though the incremental variance explained was significant in both cases, a question arose whether or not these interaction terms were interpretable. In one of the analyses, the overall regression equation (*F* test) which contained the interaction term failed to reach statistical significance. Bedeian and Mossholder (1994)'s literature review suggests that any significant effects should be dismissed when the overall R^2 fails to reach significance. However, this recommendation is valid only when independent variables are entered simultaneously into the model. This does not apply to moderated multiple regression in which independent variables are entered in step 1 and their interaction term is entered in step 2, particularly if an a priori interaction hypothesis is tested. Furthermore, SPSS output suggested excessively high VIF (variance inflation factor) in the interaction term in both analyses. For both models *VIF* = 14.452 which is above the commonly used cut-off point of 10 (Pallant, 2010). A question arose whether these models could be accepted since multicollinearity in multiple regression bring about a range of problems (Cohen, Cohen, West, & Aiken, 2003). According to Jaccard and Turrisi (2003) multicollinearity between an interaction term and one of its components parts is not problematic. High multicollinearity between the two components on the other hand, leads to serious complications (Jaccard & Dodge, 2009), but that was not the case in the present study. Consequently, both interaction terms were accepted and subjected to further analyses in order to understand the structure of these relations.

Measurements. Some limitation can be mentioned with respect to the measures used. To the best of our knowledge, none of the psychological measures used in the present study have been validated for online use. It has been argued (Buchanan, 2002) that web-based assessment instruments might not necessarily measure the same constructs as their pen-and-paper versions, and their use requires rigorous validation. However, validation of psychological measures for online use have yielded similar psychometric properties as pen-and-paper versions and have not raised any questions of concern this far (Spek, Nyklíček, Cuijpers, & Pop, 2008). Moreover, the fact that only self-report questionnaires were used poses another methodological problem. Including other types of independent assessment into the design would have increased the validity and clinical value of the results (Knaevelsrud & Maercker, 2007). And finally, specific issues have been identified for some of the measurement instruments. In relation to the PANAS, it has been proposed that this scale is

unable to capture deactivated emotions (e.g., contented, calm, sad, bored), that it is merely limited to capturing activated emotions (e.g., guilty, distressed, excited, enthusiastic), which if true, could have had an effect on the results of the study (Mitchell et al., 2009; Russell, 1980). Consequently, it has been suggested that studies could benefit from measuring both activated and deactivated emotions (Mitchell et al., 2009).

Contributions of the study

The importance of the present study is anchored in the relative lack of RCTs of web-based interventions targeting well-being. Improving well-being in general population is equally critical as dealing with depression, and has the potential to bring about positive changes at both individual and societal plane. Despite the modest size of the present trial, the finding that BH leads to increases in PA provides support for the small body of research that promotes the importance and meaningfulness of web-based interventions targeting well-being. Additionally, it can serve as a starting point for further research that may develop new interventions of similar nature and test their efficacy. Furthermore, future research might employ larger and more heterogeneous samples to gain deeper understanding of the beneficial effects of BH, or alternatively, researchers may refine the current intervention by incorporating several additional features that are known to improve efficacy of internet-based treatments. Previous findings imply that outcomes for internet therapy is partially predicted by participant characteristics (Spek, Nyklícek, Cuijpers, & Pop, 2008) which suggests that future research could benefit from tailoring treatment to personality types instead of a one size-fits-all solution. Sonja Lyubomirsky (2007) has developed a person-activity fit diagnostic which identifies the most suitable happiness strategies for an individual, future research might consider integrating this person-activity fit into the intervention. In addition, the program's efficacy could be improved by introducing features such as personalization and interactivity to retain and engage more participants (DiMarco et al., 2007; Neuhauser & Kreps, 2003). According to the elaboration likelihood model, people process more thoughtfully personally relevant information, and thoroughly processed information is more likely to influence individual's beliefs and behaviors (De Vries, Kremers, Smeets, Brug, & Eijmael, 2008; Petty & Cacioppo, 1986; Stanczyk, Bolman, Muris, & de Vries, 2011). The intervention may also benefit from allowing users to customize the virtual agents to represent their ideal social models. The most effective social model is one that is most similar to the user and who at the same time represents someone whom the user aspires to be like (Bandura, 1986; Baylor, 2009). And finally, BH appears to be a promising approach to promotion of well-being. It

should be acknowledged, however, that internet-based interventions without therapist input are less effective than person-directed interventions delivered through the same media (Clarke et al., 2002).Unattended psychoeducational approaches lack therapeutic alliance that is typical in traditional therapy. As such, BH is not to replace existing therapies, but it has the potential to function as a complement to traditional therapy or as a cost-effective alternative for those who would not otherwise seek treatment.

Generalizability

RCT is the most reliable method of determining the effects of a treatment, these effects are, however, often dependent on characteristics of an individual, method of application of the intervention, and treatment settings. Taking these factors into consideration has a considerable influence on external validity (Rothwell, 2005).With respect to treatment settings and the manner in which the intervention was applied, BH could be accessed from any computer connected to the Internet. The opportunity to use the intervention from any freely chosen location indeed increased external validity; however, it needs to be acknowledged that sampling bias was most likely a greater concern in this trial than in typical offline studies given the inclusion criteria of technology access and Internet/computer literacy (Ahern, 2007). Even tough internet access and Internet/computer literacy in general have increased in Norway across diverse demographic groups, differences still exist (Statistics Norway, 2010). Younger individuals, men and those with more years of formal education are more competent and frequent users of the Internet. On the other hand, women are more likely than men to use the Internet for educational purposes (Rønning, Sølvberg, & Tønseth, 2005) and show greater interest in health topics (Faughnan, 1997), which may explain the greater proportion of women recruited to the study, and the significantly greater proportion of men who withdrew from the project. Nonetheless, the study inclusion criteria of Internet/computer literacy and the existing digital divide in Norway must be taken into account when considering to whom the observed effects can be generalized.

Additional threat to external validity present in this study was the non-representativeness of the assessed sample. First, the sample in the present study differed from the general population as a whole in several ways: (a) there was a strong under-representation of men (17.3%) in comparison to women (82.7%), whereas the sex ratio in the Norwegian population is approximately 1:1(Statistics Norway, 2011a); (b) the sample in the present study had considerably higher levels of education than what is common in the general Norwegian population (Statistics Norway, 2011b).This appears to be a frequent finding in internet-based

studies (Andersson et al., 2005), (c) the median age of the sample was 28, while the median age of the Norwegian population is 40 (Central Intelligence Agency, 2011). Second, self-selection bias (Eysenbach & Wyatt, 2002) occurred in this trial. Individuals who were interested in the project and signed up to the study had most likely different characteristics than those who did not. Third, attrition rates threatened external validity of this trial as respondents and non-respondents tend to differ in various ways (Brenner, 2002). In the present study, men were significantly more likely to withdraw their participation than women. Both self-selection and attrition bias are partly related to the design of the study (see limitations above). Future research might improve external validity by including more heterogeneous samples.

Conclusion

BH produced significant increases in PA, however, the changes did not last beyond 1 month follow-up. No statistically significant reductions in depressive symptoms and negative affect were found. Given the nature of the main effects, no mediation analysis was conducted. Neither gender, age or baseline levels of self-efficacy moderated the treatment's effects on any of the three primary outcomes variables. Educational attainment moderated the treatment's effects on depressive symptoms and NA, as measured at 1 month follow-up. Individuals with lowest levels of education responded to the intervention with largest reductions in both depressive symptoms and NA, as compared to participants with medium and high levels of education.

Conflict of Interest

Finally, it should be noted that the thesis' primary supervisor Pål Kraft is a co-owner of Changetech AS and the adviser Filip Drozd is an employee in the same company, conflict of interest might have occurred.

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Appendix A

Invitation to Participate in Research Study

Hei!

Du er invitert til å være med i et forskningsprosjekt i regi av Psykologisk institutt ved Universitetet i Oslo.

Forskningsprosjektet er en del av min masteroppgave, så ditt bidrag ville vært til stor hjelp for meg.

Prosjektet går ut på å undersøke effekten av et internettbaserte selvhjelpsprogrammer for å hjelpe folk å få en bedre hverdag.

Videresend gjerne invitasjonen til dine venner og bekjente.

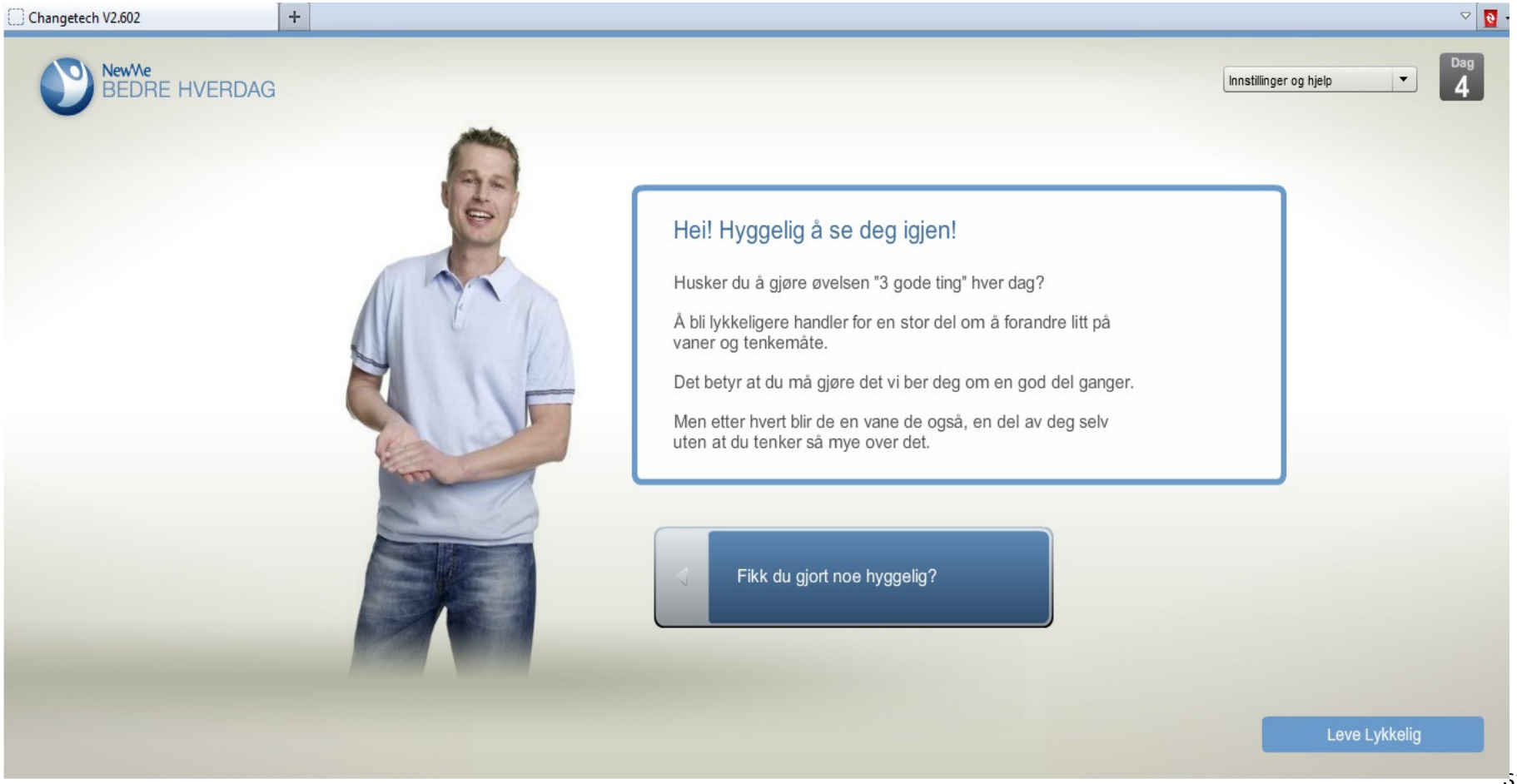
Med Vennlig Hilsen

Bettina og Lia

Om du ønsker å være med på dette, eller ønsker mer informasjon så klikk her https://www.surveymonkey.com/s/8BMNLLZ

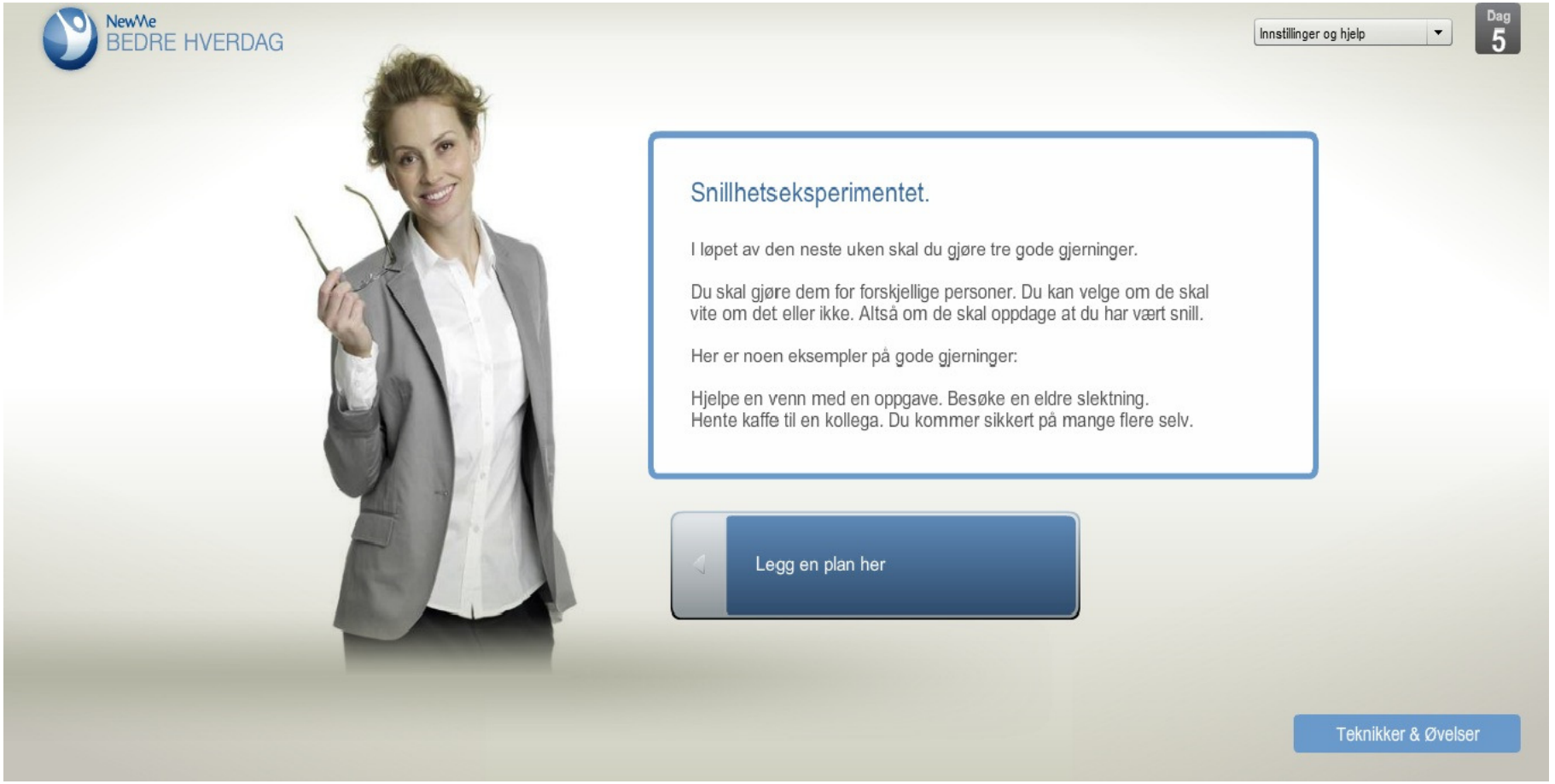
Appendix B

Male Virtual Agent in Bedre Hverdag; Psychoeducational Part



Appendix C

Female Virtual Agent in Bedre Hverdag; Techniques and Exercises



Appendix D

			Determinants			
Proximal performance objectives	Practice gratitude	Practice acts of kindness	Cultivate optimism	Developing coping strategies	Living in the present	Identify and use character strengths
Increase positive affect	Three good things exercise Gratitude letter Practice accepting compliments	Three good deeds exercise	Best possible self		Mindfulness exercise Flow exercise	Identify and use character strengths exercise
Decrease negative affect				ABCD exercise Circle exercise	Mindfulness exercise Flow exercise	
Decrease depressive symptoms				ABCD exercise		Identify and use character strengths exercise
Prevention of depression			Best possible self	ABCD exercise Expressive writing	Flow exercise	Identify and use character strengths exercise

Appendix E

Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977)

Les gjennom alle utsagnene og kryss av for det alternativet som best viser hvor ofte du har hatt det slik den siste uken. Det er ingen svar som er riktige eller gale. Ikke bruk for mye tid på et enkelt utsagn og husk å fylle ut et svar for alle utsagnene.

	Mindre enn 1 dag	1-2 dager	4 dager	5 dager	6 dager	7 dager
Jeg var lykkelig.	○	○	○	○	○	○
Jeg følte jeg ikke kunne riste av meg dårlig humør selv med hjelp fra familie og venner.	○	○	○	○	○	○
Jeg følte håp for fremtiden	○	○	○	○	○	○
Jeg følte ikke for å spise, appetitten min var dårlig.	○	○	○	○	○	○
Jeg kunne ikke komme i gang.	○	○	○	○	○	○
Jeg kunne nyte livet.	○	○	○	○	○	○
Jeg snakket mindre enn vanlig.	○	○	○	○	○	○
Jeg følte jeg var like god som andre mennesker.	○	○	○	○	○	○
Jeg hadde perioder med gråt.	○	○	○	○	○	○
Jeg følte at folk misliker meg.	○	○	○	○	○	○
Jeg følte meg ensom.	○	○	○	○	○	○
Jeg følte meg trist.	○	○	○	○	○	○
Jeg sov urolig.	○	○	○	○	○	○
Jeg følte at alt jeg gjorde var slit.	○	○	○	○	○	○

Appendix F

Positive Affect Schedual (PANAS; Watson, Clark & Tellegen, 1988)

Nedenfor ser du en ny liste med adjektiver som beskriver ulike følelser. Les hvert adjektiv og marker det alternativet som best viser hvordan du har hatt det de siste syv dagene.

	Nesten ikke i det hele tatt	Svært sjelden	Ganske sjelden	Av og til	Ganske ofte	Svært ofte	Nesten hele tiden
Oppmerksom	○	○	○	○	○	○	○
Interessert	○	○	○	○	○	○	○
Stolt	○	○	○	○	○	○	○
Bestemt	○	○	○	○	○	○	○
Sterk	○	○	○	○	○	○	○
Opplagt	○	○	○	○	○	○	○
Aktiv	○	○	○	○	○	○	○
Entusiastisk	○	○	○	○	○	○	○
Inspirert	○	○	○	○	○	○	○
Spent	○	○	○	○	○	○	○

Appendix G

Negative Affect Schedual (PANAS; Watson, Clark & Tellegen, 1988)

Nedenfor ser du en ny liste med adjektiver som beskriver ulike følelser. Les hvert adjektiv og marker det alternativet som best viser hvordan du har hatt det de siste syv dagene.

	Nesten ikke i det hele tatt	Svært sjelden	Ganske sjelden	Av og til	Ganske ofte	Svært ofte	Nesten hele tiden
Plaget	○	○	○	○	○	○	○
Fiendtlig	○	○	○	○	○	○	○
Skyldig	○	○	○	○	○	○	○
Skamfull	○	○	○	○	○	○	○
Opprørt	○	○	○	○	○	○	○
Anspent	○	○	○	○	○	○	○
Nervøs	○	○	○	○	○	○	○
Redd	○	○	○	○	○	○	○
Irritabel	○	○	○	○	○	○	○
Bekymret	○	○	○	○	○	○	○

Appendix H

General Self-Efficacy Scale (Røysamb, Schwarzer & Jerusalem, 1998)

Vennlig less alle utsagnene og vurder hvor godt hvert enkelt utsagn passer for deg generelt:

	Passer svært dårlig	Passer ganske dårlig	Passer litt dårlig	Passer litt bra	Passer ganske bra	Passer svært bra
Jeg føler meg trygg på at jeg ville kunne takle uventede hendelser på en effektiv måte.	○	○	○	○	○	○
Hvis noen motarbeider meg, så kan jeg finne måter og veier for å få det som jeg vil.	○	○	○	○	○	○
Når jeg møter et problem, så finner jeg vanligvis flere løsninger på det.	○	○	○	○	○	○
Hvis jeg er i knipe, så finner jeg vanligvis en vei ut.	○	○	○	○	○	○
Takket være ressursene mine så vet jeg hvordan jeg skal takle uventede situasjoner.	○	○	○	○	○	○
Jeg kan løse de fleste problemene hvis jeg går tilstrekkelig inn for det.	○	○	○	○	○	○
Jeg beholder roen når jeg møter vanskeligheter fordi jeg stoler på mestringsevnen min.	○	○	○	○	○	○
Samme hva som hender så er jeg vanligvis i stand til å takle det.	○	○	○	○	○	○
Jeg klarer alltid å løse vanskelige problemer hvis jeg prøver hardt.	○	○	○	○	○	○
Det er lett for meg å holde fast på planene mine og nå målene mine.	○	○	○	○	○	○

Appendix I

The Gratitude Questionnaire-Six Item Form (Emmons & Tsang, 2006)

Bruk skalaen nedenfor til å vurdere hvor enig du er i hvert enkelt utsagn.							
	Svært uenig	Ganske uenig	Litt uenig	Verken enig eller uenig	Litt enig	Ganske enig	Svært enig
Jeg er takknemlig for mange forskjellige mennesker.	○	○	○	○	○	○	○
Det går lang tid mellom hver gang jeg føler meg takknemlig for noe eller noen.	○	○	○	○	○	○	○
Hvis jeg måtte ramse opp alt jeg følte meg takknemlig for ville det vært en svært lang liste.	○	○	○	○	○	○	○
Ettersom jeg blir eldre finner jeg meg selv mer i stand til å sette pris på personer, hendelser og situasjoner som har vært en del av min livshistorie.	○	○	○	○	○	○	○
Når jeg ser verden, ser jeg ikke så mye å være takknemlig for.	○	○	○	○	○	○	○
Jeg har så mye i livet å være takknemlig for.	○	○	○	○	○	○	○

Appendix J

Demographic Questions Pertaining to Gender, Age, and Educational Attainment

Kjønn?

- ○ Mann
- ○ Kvinne

Hvor gammel er du?

Hva er din høyeste fullførte utdanning?

Appendix K

Informational Letter

Studieinformasjon

Universitetet i Oslo inviterer deg til å delta i en studie om positiv psykologi og velvære

Bakgrunn og hensikt

Du har nå en mulighet til å delta i et forskningsprosjekt ved Psykologisk institutt, Universitetet i Oslo. Prosjektet har som mål å prøve ut nye internettbaserte selvhjelpsprogrammer for å hjelpe folk å få en bedre hverdag, også for de som har det bra.

Prosjektet går ut på å undersøke effekten av internettbaserte selvhjelpsprogrammer for bedre livskvalitet, humør og optimisme. Det inngår i et doktorgradsarbeid og masterprosjekt ved Universitetet i Oslo i samarbeid med Changetech AS.

Hva innebærer forskningsprosjektet?

Alle deltakere vil få tilbud om å gjennomføre et selvhjelpsprogram gratis via Internett. Du trenger ikke å reise eller møte opp noen steder, eller snakke med noen. Alt foregår via Internett, også utfylling av spørreskjema.

Forskningsstudien har oppstart i april 2011. Du vil få tilsendt e-post med ytterligere informasjon ca. 1 uke før oppstart.

I tillegg til spørreskjemaet som følger etter studieinformasjonen og samtykkeerklæringen, vil du få tilsendt i alt tre spørreskjemaer per e-post. Disse tre spørreskjemaene vil du motta i månedsskifte april/mai, juni/juli og september/oktober i 2011.

Av alle de deltakerne som fyller ut og sender inn samtlige spørreskjema, vil en tilfeldig deltaker bli trukket ut som vinneren av 20 flaxlodd til en verdi av 500 kr. Trekningen foregår etter at datainnsamlingen er gjennomført.

For å kunne delta må du være 18 år eller eldre.

Informational Letter

Hva skjer med informasjonen og dataene om deg?

informasjonen som registreres om deg skal kun brukes slik som beskrevet her og vil bli behandlet med den strengeste konfidensialitet.

Ale opplysningene vil bli behandlet uten e-postadresse eller andre direkte gjenkjennende opplysninger. En kode knytter deg til dine opplysninger gjennom en egen e-postliste. Dette betyr at opplysningene er avidentifisert.

Vi trenger din e-postadresse kun for å få samlet inn alle nødvendige data og melde deg på selvhjelpsprogrammene. Derfor vil du bli bedt om å oppgi dette i spørreskjemaene. Det er også viktig at du oppgir den samme e-postadressen slik at vi kan kople dine data.

Når siste datainnsamling er avsluttet, ca. 6 måneder etter prosjektstart, skal kodelisten med e-postadresser slettes. Dataene vil da være anonymisert, uten mulighet for å spore disse tilbake til deg. Prosjektet avsluttes 01.05.2016 og de anonymiserte dataene vil lagres for etterprøving i 10 år etter studieslutt.

Det er kun personell knyttet til prosjektet som har adgang til kodelisten, og som kan finne tilbake til deg.

Det vil ikke være mulig å identifisere deg i resultatene av studien når disse publiseres.

Frivillig deltakelse
Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke til å delta i studien. Om du nå sier ja tit å delta, kan du senere trekke tilbake ditt samtykke. Dersom du senere ønsker å trekke deg eller har spørsmål til studien, kan du kontakte Filip Drozd på e-post fd@changetech.no.

Med vennlig hilsen

Pål Kraft
Professor
Universitetet i Oslo

Filip Drozd
Doktorgradsstudent & Direktør FoU
Universitetet i Oslo & Changetech AS

Lia Mork
Masterstudent
Universitetet i Oslo

Bettina Nielsen
Masterstudent
Universitetet i Oslo

1. Jeg er villig til å delta i studien, og jeg bekrefter å ha fått og lest informasjonen om denne studien.
○ JA

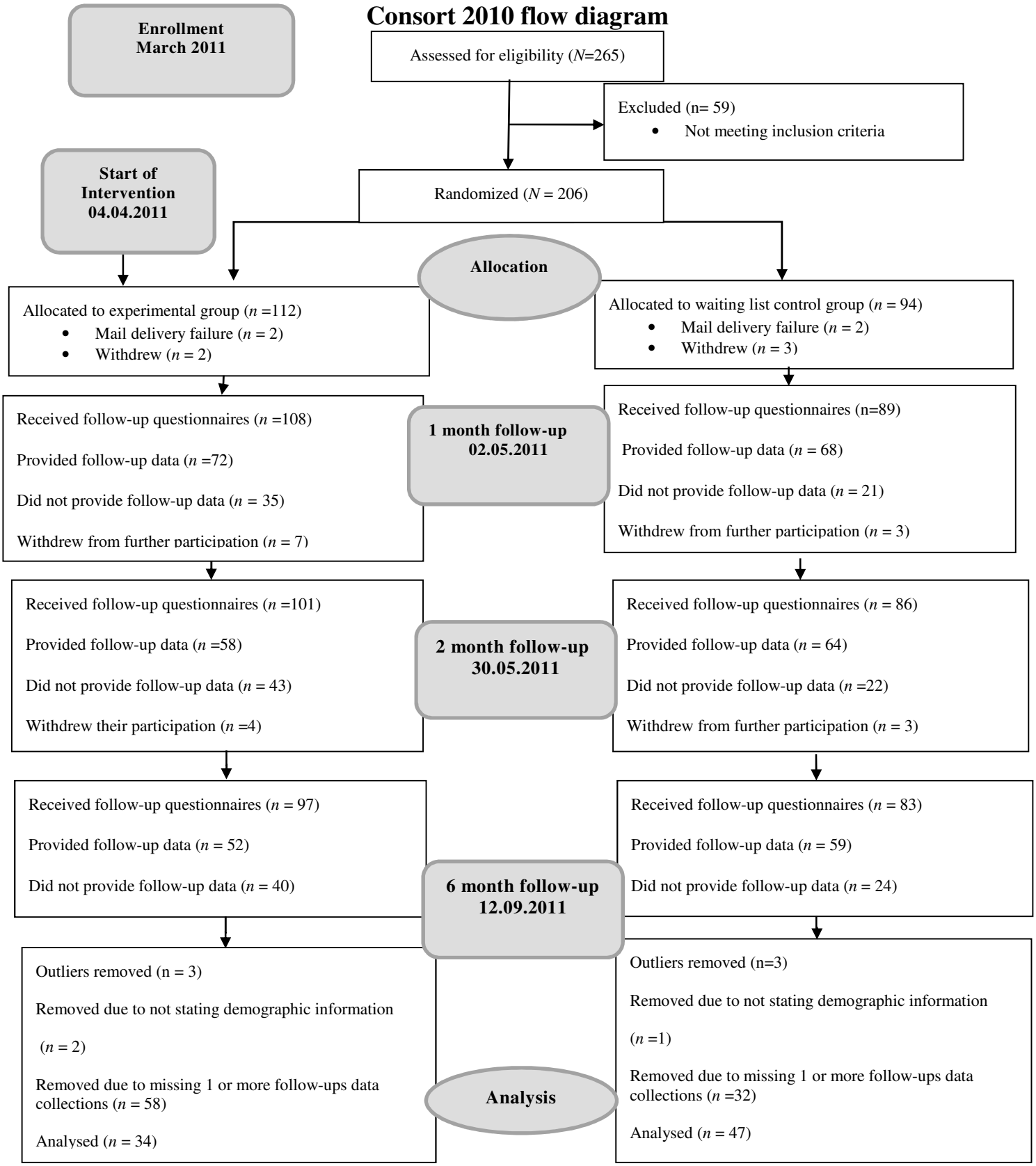
Appendix L

Data distribution

	Shapiro-Wilk significance scores	
Time of measurement	Control group (n = 47)	Experimental group (n = 34)
CES-D		
Baseline	.222	.394
1 month follow-up	.021	.005
2 month follow-up	.009	.157
6 month follow-up	.018	.389
PA		
Baseline	.689	.684
1 month follow-up	.382	.186
2 month follow-up	.210	.077
6 month follow-up	.825	.544
NA		
Baseline	.398	.369
1 month follow-up	.013	.017
2 month follow-up	.048	.048
6 month follow-up	.144	.142
GRA		
Baseline	.025	.057
1 month follow-up	.002	.006
2 month follow-up	.003	.002
6 month follow-up	.002	.003
GSE		
Baseline	.417	.207

Note. CES-D = Center for Epidemiological Studies-Depression scale; PA= Positive Affect Schedual; NA= Negative Affect Schedual; GRA = The Gratitude Questionnaire-The Six Item Form; GSE = General Self-Efficacy scale

Appendix M



Note. Participant flow chart following Consolidated Standards of Reporting Trials guidelines (Moher, Schulz, & Altman, 2001)

Appendix N

Baseline Differences Between Persisters and Drop-Outs.

Mann-Whitney U	Persist persisters	Drop-outs				
Scales	*Mdn* (*n* = 87)	*Mdn* (*n* = 116)	*U*	*z*	*p*	*r*
CES-D	22	24	4636	-.990	.323	0.07
PA	34	34	4909.5	-.330	.744	0.02
NA	20	20	4492	-1.338	-.183	0.09
GRA	35	35	5001	-.109	.914	0.01
GSE	44	43	4940	-.256	.798	0.02
Highest level of education	3	4	4742.5	-.761	.451	0.05
Age	12	14	4873.5	-.417	.677	0.03
Chi-Square	*z*	*p*	*phi*			
Gender (*N* =203)	3.8	.051	.15			
Type of treatment (*N* =203)	7.35	.006	-.203			

Note. CES-D = Center for Epidemiological Studies-Depression scale; PA= Positive Affect Schedual; NA= Negative Affect Schedual; GRA = The Gratitude Questionnaire-The Six Item Form; GSE = General Self-Efficacy scale

Appendix O

Item Non-Response

Time of measurement	Control group (n = 47)	Experimental group (n = 34)	Total (N = 81)
CES-D 14 items			
Baseline	5 (0.8)	2 (0.4)	7 (0.6)
1 month follow-up	4 (0.6)	1 (0.2)	5 (0.4)
2 month follow-up	5 (0.8)	1 (0.2)	6 (0.5)
6 month follow-up	4 (0.6)	2 (0.4)	-
PA 10 items			
Baseline	-	1 (0.3)	1 (0.1)
1 month follow-up	1 (0.3)	1 (0.3)	2 (0.2)
2 month follow-up	3 (0.6)	-	3 (0.4)
6 month follow-up	2 (0.2)	-	2 (0.2)
NA 10 items			
Baseline	2 (0.4)	-	2 (0.2)
1 month follow-up	1 (0.2)	1 (0.3)	2 (0.2)
2 month follow-up	1 (0.2)	-	1 (0.1)
6 month follow-up	-	-	-
GRA 6 items			
Baseline	-	-	-
1 month follow-up	1 (0.4)	-	1 (0.2)
2 month follow-up	-	-	-
6 month follow-up	-	1 (0.5)	1 (0.2)
GSE 10 items	-	-	-
Baseline	-	1 (0.5)	1 (0.2)

Note. Numbers represent items missing with percentage in parentheses. CES-D = Center for Epidemiological Studies-Depression scale; PA= Positive Affect Schedual; NA= Negative Affect Schedual; GRA = The Gratitude Questionnaire-The Six Item Form; GSE = General Self-Efficacy scale

Appendix P

Baseline Differences Between Waiting List Control group and Experimental Group

Mann-Whitney U	Waiting list Control group	Experimental group				
Scales	*Mdn* (n = 47)	*Mdn* (n = 34)	*U*	*z*	*p*	*r*
CES-D	21	21.5	781.5	-.168	.87	0.02
PA	34	33.45	786.5	-.12	.909	0.04
NA	20	19	757.5	-.397	-696	0.04
GRA	34	36	706.5	-.888	.375	0.05
GSE	44	45	750	-.47	.642	0.05
Highest level of education	3	4	640	-1.58	.115	0.2
Age	12	14	748.5	-.484	.632	0.05
Chi-Square	*z*	*p*	*phi*			
Gender (N =81)	.00	1.000	-.01			

Note. CES-D = Center for Epidemiological Studies-Depression scale; PA= Positive Affect Schedual; NA= Negative Affect Schedual; GRA = The Gratitude Questionnaire-The Six Item Form; GSE = General Self-Efficacy scale.

Appendix Q

Moderating Effects of Baseline Self-efficacy, Gender, Age and Educational Attainment on the Relationship Between Treatment Group and Depression scores at 1 Month Follow-up

Steps and Variables		R^2	ΔR^2	β	B	SE B
Step 1		.21	.21			
	Constant				21.13	1.90
	Treatment groups			-0.10	-2.85	2.78
	GSE			-0.44	-0.74	0.20
Step 2		.22	.01			
	Constant				21.19	1.90
	Treatment groups			-0.10	-2.70	2.83
	GSE			-0.36	-0.62	0.24
	Treatment groups x GSE			-0.13	-0.43	0.40
Step 1		.05	.05			
	Constant				9.63	5.05
	Treatment groups			0.13	-3.62	3.09
	Gender			0.18	6.47	2.87
Step 2		.05	.01			
	Constant				5.54	6.70
	Treatment groups			0.21	5.96	9.73
	Gender			0.24	8.47	3.93
	Treatment groups x Gender			0.36	-5.24	5.79
Step 1		.02	.02			
	Constant				21.47	2.10
	Treatment groups			-0.13	-3.64	3.12
	Age			-0.02	0.03	0.18
Step 2		.02	.07			
	Constant				21.46	2.12
	Treatment Conditions			-0.13	-3.62	3.16
	Age			0.04	0.07	0.25
	Treatment group x Age			0.10	0.27	0.35
Step 1		.02	.02			
	Constant				21.07	5.04
	Treatment groups			-0.13	-3.70	3.14
	HLE			0.01	0.12	1.34
Step 2		.07	.05			
	Constant				29.47	5.95
	Treatment Conditions			-0.92	-25.59	10.01
	HLE			-0.19	-2.40	1.61
	Treatment group x HLE			0.87	6.13	2.63

Note. HLE = Highest Level of Education. GSE = General Self-Efficacy scale * p <.05, ** p < .01.

Appendix R

Moderating Effects of Baseline Self-efficacy, Gender, Age and Educational Attainment on the Relationship Between Treatment Group and Positive Affect at 1 Month Follow-up

Steps and Variables		R^2	ΔR^2	β	B	SE B
Step 1		.24	.24			
	Constant				33.40	1.10
	Treatment Groups			0.22	3.59	1.54
	GSE			0.42	0.42	0.09
Step 2		.24	.00			
	Constant				33.40	1.10
	Treatment Groups			0.22	3.58	1.56
	GSE			0.42	0.41	0.12
	Treatment group x GSE			0.01	0.02	0.19
Step 1		.06	.06			
	Constant				32.54	3.25
	Treatment Groups			0.25	4.05	1.73
	Gender			0.02	0.37	1.87
Step 2		.07	.00			
	Constant				33.85	3.39
	Treatment Groups			0.06	1.00	7.52
	Gender			-0.02	0-.35	2.11
	Treatment group x Gender			0.20	1.67	4.13
Step 1		.07	.07			
	Constant				33.23	1.25
	Treatment Groups			0.25	4.01	1.73
	Age			0.11	.10	0.11
Step 2		.08	.01			
	Constant				33.22	1.26
	Treatment Groups			0.25	4.00	1.74
	Age			0.05	.05	0.20
	Treatment group x Age			0.09	.13	0.22
Step 1		.07	.07			
	Constant				31.96	2.97
	Treatment groups			0.24	3.89	1.84
	HLE			0.05	0.38	0.88
Step 2		.10	.03			
	Constant				28.22	4.19
	Treatment Conditions			0.85	13.63	6.09
	HLE			0.20	1.50	1.28
	Treatment group x HLE			-0.67	-2.73	1.67

Note. HLE = Highest Level of Education. GSE = General Self-Efficacy scale. * p <.05, ** p <.01

Appendix S

Moderating Effects of Baseline Self-efficacy, Gender, Age and Educational Attainment on the Relationship Between Treatment Group and Negative Affect at 1 Month Follow-up

Steps and Variables NA	R^2	ΔR^2	β	B	SE B
Step 1	.23	.23			
Constant				17.05	1.40
Treatment group		0	0.00	0.00	2.34
GSE			-0.48	-0.68	0.12
Step 2	.24	.01			
Constant				17.09	1.40
Treatment group			0.00	0.10	2.37
GSE			-0.42	-0.59	.14
Treatment group x GSE			-0.12	-0.30	.28
Step 1	.03	.03			
Constant				8.89	5.31
Treatment group			-0.03	-0.71	2.68
Gender			-0.15	4.63	2.96
Step 2	.07	.04			
Constant				-0.80	83.62
Treatment group			0.95	21.95	10.66
Gender			0.33	9.92	2.40
Treatment group x Gender			1.02	-12.41	5.96
Step 1	.05	.05			
Constant				17.32	1.58
Treatment group			-0.03	-0.64	2.63
Age			-0.21	-0.28	0.14
Step 2	.04	.00			
Constant				17.32	1.60
Treatment group			-0.03	-0.64	2.66
Age			-0.19	-0.25	0.20
Treatment groups x Age			-0.03	-0.06	0.30
Step 1	.01	.01			
Constant				19.69	4.52
Treatment groups			-0.02	-0.47	2.72
HLE			-0.07	-0.70	1.24
Step 2	.11	.11			
Constant				29.61	4.96
Treatment Conditions			-1.14	-26.30	9.10
HLE			-0.34	-3.67	1.36
Treatment group x HLE			-1.25	7.23	2.40

Note. HLE = Highest Level of Education. GSE = General Self-Efficacy scale. * p <.05, ** p <.01

Appendix T

Correlation Matrix for Variables Involved in Significant Interactions ($N = 81$)

Variable	1	2	3	4	- x	SD
(a)						
1. CESD	-	-.13	-.02	-.6	19.9	13.9
2. treatment group	-.13	-	.18	.94*	.42	.5
3. educational attainment	.02	.18	-	.39*	3.5	1.1
4. treatment group x educational attainment	-.06	.94*	.39*	-	1.6	2

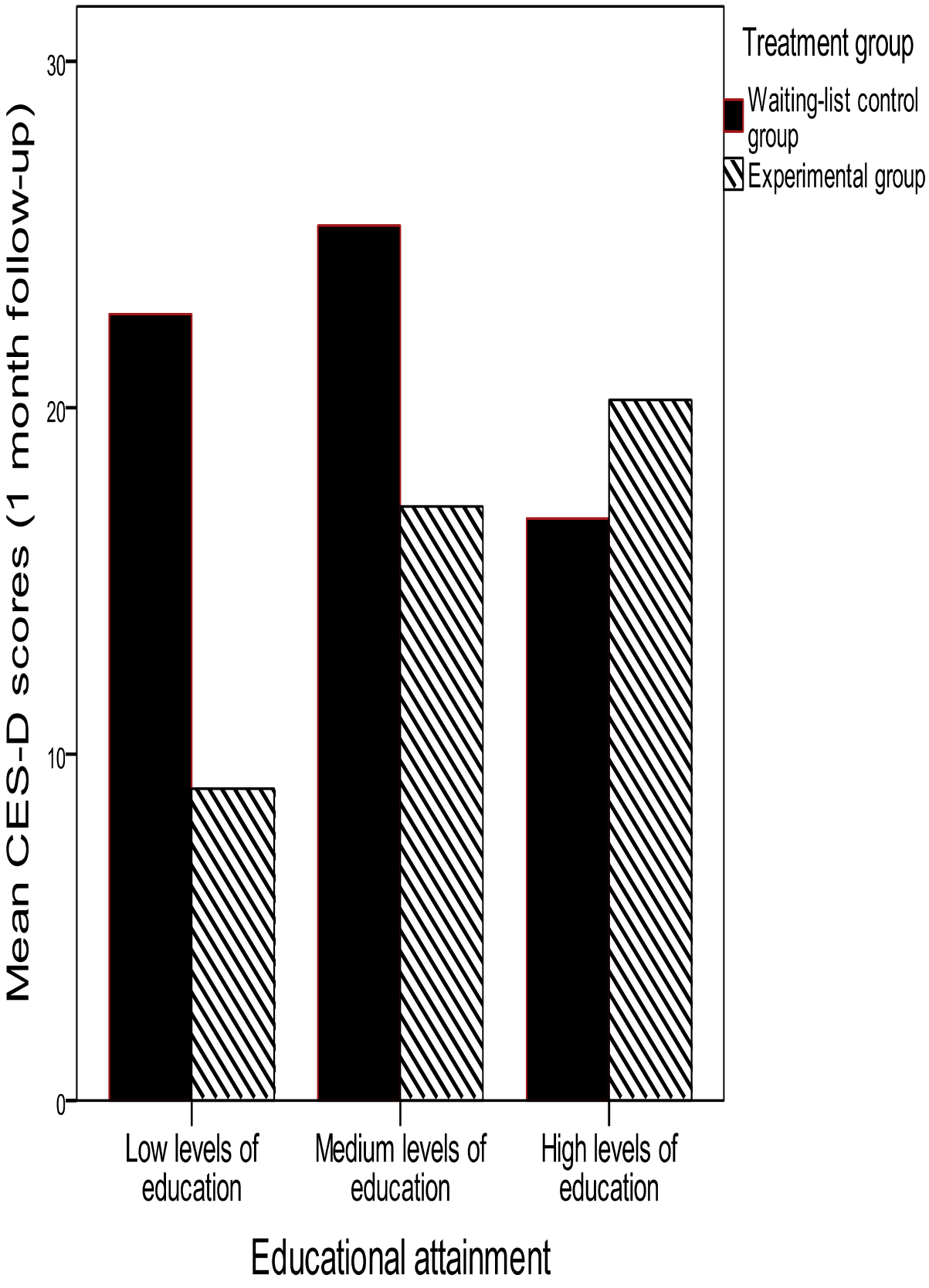
Variable	1	2	3	4	- x	SD
(b)						
1. NA	-	.03	-.70	.04	17.1	11.5
2. treatment group	-.03	-	.18	.94*	.42	.5
3. educational attainment	-.70	.18	-	.39*	3.5	1.1
4. treatment group x educational attainment	.04	.94*	.39	-	1.6	2

Note. (a) represents correlations among variables involved in significant moderating effect of educational attainment on the relationship between treatment group and depressive scores as measured at 1 month follow-up (b) represents correlations among variables involved in significant moderating effect of educational attainment on the relationship between treatment group and NA as measured at 1 month follow-up. Education was coded as 1 = elementary school , 2 = secondary school, 3 = 1-3 years of college or university, 4 = 4-5 years of college or university, 6 = more than 5 years of college or university.

* Person Correlation is significant at the 0.01 level (2-tailed).

Appendix U

Mean Depression Scores at 1-Month Follow-up by Treatment Group and Educational Attainment (interaction effects)



Appendix V

Mean Negative Affect Schedual Scores at 1-Month Follow-up by Treatment Group and Educational Attainment (interaction effects)