

FACULTY OF HEALTH SCIENCES  
DEPARTMENT OF PSYCHOLOGY

# **Unguided Internet-based self-help for symptoms of depression**

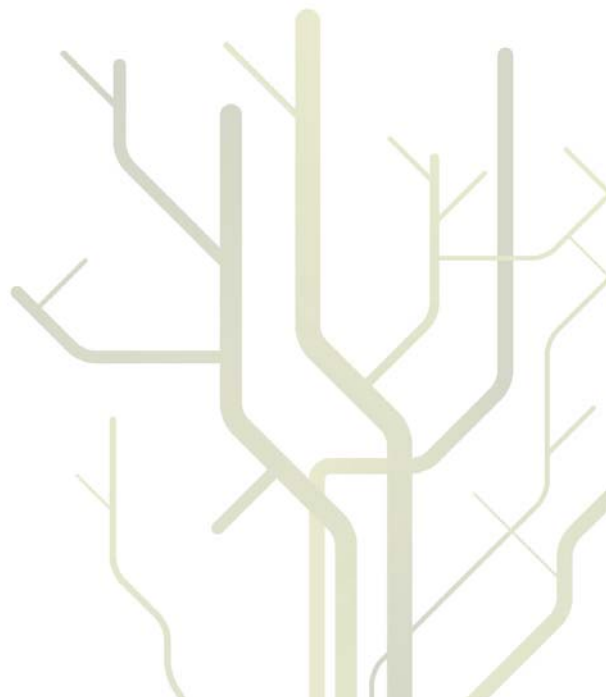
**A Translation Project: From Planning And Establishing The Efficacy To Dissemination And Cost-Benefit Evaluation.**



Ove K. Lintvedt

A dissertation for the degree of  
Philosophiae Doctor

June 2013





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**This Thesis is dedicated to my beloved family.**

Some psychotherapists thought medication would make patients less interested in psychotherapy, whereas some psychopharmacologists felt psychotherapy would undo the positive effects of medication by having patients talk about upsetting material.

**Myrna M. Weissman**

After Michael Faraday demonstrated his discovery of electromagnetism to a 19th century Royal Commission he was asked what use it was and replied:

“What use is a new-born baby?” Numerous computer self-treatment “babies” are being born. Some may well reach maturity to become everyday tools of clinical practice.

**Isaac Marks**

People are very reluctant to talk about their private lives but then you go to the Internet and they're much more open.

**Paulo Coelho**



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They have arranged it so that I could get time to summarize the research, get my latest article published and finalize my thesis. I am so grateful for all the good discussions and that they have accepted me with open arms.

Tromsø, June 2013

Ove K. Lintvedt

**LIST OF RESEARCH PAPERS**

Paper I:

Lintvedt, O. K., Sørensen, K., Østvik, A. R., Verplanken, B., & Wang, C. E. (2008).  
The need for web-based cognitive behavior therapy among university students.  
*Journal of Technology in Human Services*, 26, 239-258.

Paper II:

Lintvedt, O. K., Griffiths, K. M., Sørensen, K., Østvik, A. R., Wang, C. E. A.,  
Eisemann, M., & Waterloo, K. (2011). Evaluating the effectiveness and  
efficacy of an Internet-based self-help intervention for the prevention of  
depression: A randomised controlled trial. *Clinical Psychology &  
Psychotherapy*, 20(1), 10-27.

Paper III:

Lintvedt, O. K., Griffiths, K. M., Eisemann, M., & Waterloo, K. (2013). Evaluating  
the translation process of an Internet-based self-help intervention for  
prevention of depression: A cost-effectiveness analysis. *Journal of Medical  
Internet Research*, 15(1), e18.



**SAMMENDRAG (ABSTRACT IN NORWEGIAN)**

Depresjon har relativt høy livstidsprevalens og kan være forbundet med betydelig funksjonshemming. Uten behandling kan depresjon gi hyppige tilbakefall, et kronisk forløp og en økende grad av funksjonshemming. Mange personer med depresjon tar ikke kontakt med helsevesenet og lever med et udekket behov for hjelp. Gevinsten ved tidlig intervensjon er betydelig da den vil redusere lidelsen og bedre prognosen. Generelt vil kostnadene for forebyggende tiltak og tidlig behandling bli vesentlig lavere enn ved ikke å intervensjonere på et tidlig stadium.

Slike forebyggende tiltak kan redusere utvikling og forekomst av kronisk depresjon, de negative følgene av depresjon, tilbakefall og behovet for tid- og kostnadskrevende behandling. Evidensbasert psykologisk behandling som kognitiv atferdsterapi har vist seg å være effektiv behandling av depresjon. Tilgjengeligheten av slik behandling er imidlertid begrenset. Det er dokumentert at terapeut-guidet Internett-basert intervensjoner med kognitiv atferdsterapi kan være effektive for de som ønsker hjelp. Mange mennesker med symptomer på depresjon søker ikke hjelp. Dårlig kunnskap om psykisk helse, stigmatisering og mangel på anonymitet er fremtredende grunner til at mange unngår å søke hjelp. Der er dokumentert at Internett-baserte intervensjoner for selvhjelp kan være effektive i å redusere depressive symptomer.

Det *primære* målet med denne avhandlingen var å undersøke effekten av Internett-basert selvhjelpsprogrammer som var oversatt til norsk, når brukerne ikke mottar støtte under bruken av programmene. De *sekundære* målene med avhandlingen var 1) å undersøke den potensielle effekten av programmet når brukerne gjennomfører programmet, og 2) å undersøke om det er kostnadseffektivt å oversette eksisterende programmer. De *subsidiære* målene var a) å undersøke gjennomførbarheten av å oversette og tilby programmer på eget språk, b) å avdekke intensjonen blant potensielle brukere til å ta i bruk Internett-basert selvhjelp, samt finne forklaringer med hensyn til intensjon og c) å evaluere brukertilfredsheten etter bruk av programmene.

Denne avhandlingen gir støtte til at Internett-basert selvhjelp for unge voksne er effektiv i å redusere symptomer på depresjon og automatiske negative tanker i

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tillegg til å øke kunnskapen om depresjon. Avhandlingen viser effekten av programmene ut fra en reell setting (behandlingseffekt). Ved å estimere effekten for de som følger behandlingen, får vi et mål på den potensielle effekten for intervensjonen. Videre viser avhandlingen også at Internett-baserte intervensjoner har potensial til å nå en målgruppe med et udekket behov for hjelp. Til slutt viser avhandlingen også kostnadseffektiviteten av å oversette eksisterende Internett-baserte intervensjoner til andre språk. Til sammen gir resultatene fra denne avhandlingen støtte til å innføre Internett-basert selvhjelp som et tiltak for forebygging og tidlig intervensjon på nasjonalt nivå. Basert på den kunnskapen som finnes om effekt, kostnadsbesparelser, brukerksept og gjennomførbarhet vil det tilrås innføring av disse programmene innenfor det eksisterende psykiske helsevern samt tilby dette som åpne programmer via Internett.



**ABSTRACT**

Depression has relatively high lifetime prevalence and is associated with substantial disability. Without treatment, depression may be associated with frequent recurrences or a chronic course and an increasing level of disability. The potential benefits of early intervention are evident given that many people with depression either do not make contact with health care services or have unmet needs for treatment. It is likely, that at a national level, the costs of undertaking preventive actions and treatment will be substantially lower than those associated with not intervening at an early stage of depression. Such preventive interventions are likely to reduce the incidence of chronic depression, the deleterious sequel of depression, recurrent course and the need for time- and cost-consuming treatment later on. Evidence based psychological treatments such as cognitive behaviour therapy (CBT) have proven to be an effective treatment for depression. The availability of such treatment is, however, limited. There is evidence that therapist-guided Internet-based CBT interventions and lay-guided interventions can be effective for those seeking help for depressive symptoms. Most people with symptoms of depression do not seek help. Poor mental health literacy, stigma, lack of anonymity and lack of self-reliance are prominent reasons to avoid seeking help. There is also some evidence that unguided Internet-based interventions can be effective in reducing depressive symptoms.

The *primary* aim of this thesis was to determine the effect of translated Internet-based self-help interventions on reducing symptoms of depression, when delivered without any therapist support (unguided). The *secondary* aims of the thesis were to 1) explore the effect of unguided Internet-based self-help under ideal conditions (efficacy), and 2) examine if it could be cost-effective for other countries to translate existing Internet-based interventions into their own language (cost-effectiveness). The *subsidiary* aims were a) to consider the feasibility of providing access to Internet-based interventions in the national language versions, b) to determine the intention to use an Internet-based self-help intervention, and find

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predictors for intention, and c) to evaluate user satisfaction with the Internet-based intervention.

The present thesis provides support that unguided Internet-based self-help is effective in reducing symptoms of depression and automatic negative thoughts in addition to increase depression literacy, among young adults. Further, the thesis shows the effect of the interventions in a real life setting (effectiveness) as well as the potential effect for the intervention (efficacy). In addition, the thesis indicates that an Internet-based intervention has the potential of reaching a target group with an unmet need for help. Finally, the thesis demonstrates the cost-effectiveness of translating existing unguided Internet-based interventions into other languages. Taken together, the results support the implementation of unguided Internet-based self-help as a large-scale public intervention for treatment, early intervention and prevention of depression. Our present knowledge about efficacy, cost savings, acceptability and feasibility necessitates integration of these Internet-based services into existing mental health services as well as offering them as open access interventions.

## ABBREVIATIONS

AI	Artificial Intelligence
ANU	The Australian National University
APA	American Psychiatric Association
ATQ	Automatic Thoughts Questionnaire
BA	Behaviour Activation
CACE	Complier Average Causal Effect
CBT	Cognitive Behaviour Therapy
CCBT	Computerised Cognitive Behaviour Therapy
CER	Cost-effectiveness ratio
CES-D	Centre for Epidemiological Studies - Depression Scale
CP	Computer-aided Psychotherapy
DSM	Diagnostic and Statistical Manual of Mental Disorders
DALY	Disability Adjusted Life Years
F2F	Face-to-face
IPT	interpersonal psychotherapy
ICD	International Classification of Diseases, Injuries and Causes of Death
IoT	Internet of Things
ISO	International Organization for Standardization
ISRII	International Society for Research on Internet Interventions
ITT	Intention-to-Treat
K10	Kessler Psychological Distress Scale
MAR	Missing at random
MCAR	Missing completely at random
MDD	Major Depressive Disorder
MMRM	Mixed Model Repeated Measures
NICE	National Institute for Clinical Excellence
PD	Panic Disorder
QALY	Quality-Adjusted Life-Years
QoL	Quality of Life
RCT	Randomised Controlled Trials
SSRI	Selective Serotonin Re-uptake Inhibitors
TbI	Technology-based Interventions

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TPB	Theory of Planned Behaviour
UE	User Experience
UiT	University of Tromsø
WHO	World Health Organization

## 1. INTRODUCTION

### 1.1 Background

Doctors have struggled with the concept of depression since the beginning of Western medicine (Kramer, 2005). Ancient Greek descriptions of depression referred to a syndrome of melancholia. Aristotle discussed why melancholy was so common among heroes and artists (Northwood, 2000). Hippocrates (400 B.C.) offered the following characteristics of melancholia in his work *Aphorisms* (Section VI): "If a fright or despondency lasts for a long time, it is a melancholic affection". Depression is a condition that can affect cognitive, behavioural, emotional and physical functioning (NICE, 2012a). Depression can be episodic, chronic or recurrent (Gelenberg, Kocsis, McCullough, Ninan, & Thase, 2008).

The World Health Organization (WHO) estimates that 350 million people worldwide suffer from some form of depression (WHO, 2012). Depression has relatively high lifetime prevalence and is associated with substantial disability (Moussavi et al., 2007; Üstün, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004; Üstün & Chatterji, 2001), making depression a serious global health issue.

To reduce the burden of this psychiatric disorder, two promising approaches are widely used today. The biological approach reflects the medical model to illness and disease. Biological treatments range from administering drugs to surgical interventions, where drugs are the most frequent treatment applied (Arroll et al., 2009; Cipriani et al., 2009; Gazzaniga & Heatherton, 2003). The cognitive approach is dealing with emotional difficulties by focusing on our cognitive processes (thoughts, images, beliefs and attitudes) and how these relate to the way we behave, (Beck, 1976; Trower, Casey, & Dryden, 1988).

At the same time, most people with a mental disorder do not receive treatment (Gonzalez et al., 2010; Kessler et al., 2005; Nicholas, Huntington, Jamali, & Williams, 2007; Sawyer et al., 2007). For example, the WHO (2010) states that less than 25% of those affected have access to effective treatments. Without treatment, depression may be associated with frequent recurrences or a chronic course and an increasing level of disability (Andrews, 2001; Solomon et al., 2000). The potential benefits of early intervention are evident given that many people with depression

either do not make contact with health services or have unmet needs for treatment (Wang et al., 2007; Wells, Burnam, Rogers, Hays, & Camp, 1992). With the current limitations of resources for treatment (Hawks, Scott, & McBride, 2002), a sustainable method for reducing the burden caused by these disorders could be prevention.

Computer-aided psychotherapy (CP) is a promising way to increase accessibility to evidence-based treatment and prevention for many mental disorders, such as mood disorders (Marks, Cavanagh, & Gega, 2007a). During the last two decades, the Internet has gained an increasing focus as a medium for delivering interventions (Barak, Klein, & Proudfoot, 2009). Most of the research on Internet-based interventions for depression has focused on treatment rather than prevention and has employed human supported rather than pure self-help intervention programs. One reason for this focus could be that treatment has more immediate benefits than prevention where the benefits take longer time to emerge (WHO, 2004). However, there is evidence that Internet-based interventions can prevent depression (Calear, Christensen, Mackinnon, Griffiths, & O’Kearney, 2009; Spek, Cuijpers, et al., 2007).

The WHO has also suggested that after establishing the efficacy of Internet-based prevention interventions, they should be disseminated worldwide (WHO, 2004). The International Society for Research on Internet Interventions (ISRII) has highlighted the importance of facilitating the dissemination of Internet applications by providing translation into multiple languages (Ritterband, Andersson, Christensen, Carlbring, & Cuijpers, 2006).

## **1.2 Depression**

### *1.2.1 Diagnosis of depression*

The first edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) was published in 1952 by the American Psychiatric Association (APA) (de Matos, de Matos, & de Matos, 2005). DSM is a manual classifying mental disorders and is widely used by the mental health community as a guide for communicating about mental health conditions (APA, 2012). The first two editions (DSM-I and DSM-II) included several depressive conditions but did not include major depressive disorder (MDD) (Gruenberg, Goldstein, & Pincus, 2005). The current edition, DSM-IV TR, specifies five criteria for diagnosing MDD.

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The World Health Organization (WHO) provided the sixth revision of the International List of Causes of Death in 1948 (Gruenberg et al., 2005). They renamed it the International Classification of Diseases, Injuries and Causes of Death (ICD-6) and added a section for mental disorders (Burke, 1986). In the current version (ICD-10), there are established separate diagnostic thresholds to differentiate between mild, moderate, and severe depressive episodes. The DSM and ICD are slightly different in the structure of how the depressive episode is diagnosed (Gruenberg et al., 2005).

### *Major depressive disorder*

The first DSM-IV TR criterion states that a minimum of five of nine symptoms must be present during a two-week period. The nine depressive symptoms are: 1) Depressed mood most of the day, nearly every day, 2) Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day, 3) Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day, 4) Insomnia or hypersomnia nearly every day, 5) Psychomotor agitation or retardation nearly every day, 6) Fatigue or loss of energy nearly every day, 7) Feelings of worthlessness or excessive or inappropriate guilt nearly every day, 8) Diminished ability to think or concentrate, or indecisiveness, nearly every day and 9) Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

The two diagnostic systems differ on the DSM-IV symptom 7) “Feelings of worthlessness or excessive or inappropriate guilt...” (First, 2007). The ICD-10 has divided this item into two separate symptoms: 1) loss of confidence or self-esteem, and 2) inappropriate or excessive guilt. Further, the diagnostic systems differ regarding the structure of the diagnostic algorithms and how they specify severity (First, 2007). One study found the ICD-10 to be more sensitive to the mild depressive episode compared to the DSM-IV (Saito et al., 2010).

### *Sub-threshold depression*

Individuals with sub-threshold depression have symptoms of depression, but not enough to meet the diagnostic criteria for MDD (National Institute for Clinical Excellence [NICE], 2009). If symptoms are present for months they can be distressing

and disabling (NICE, 2009). Sub-threshold depression affects psychosocial functioning and wellbeing (Beekman et al., 2002; Lewinsohn, Solomon, Seeley, & Zeiss, 2000). People with sub-threshold forms of depression are at an increased risk of developing MDD (Cuijpers & Smit, 2004) and are more likely to have a history of episodes of depression (Rowe & Rapaport, 2006). Cuijpers and Smit (2004) found a consistent pattern indicating a substantially increased risk of a subsequent development of MDD in persons with sub-clinical depression compared to people without. Among elderly persons suffering from sub-threshold depression, almost 27% will develop MDD within three years (Beekman et al., 2002). Sub-threshold depression is prevalent, has clinical significance in terms of morbidity and functional impairment, and is associated with increased medical care cost (Gruenberg et al., 2005). Even though the public health impact of offering treatment for lesser symptom severity is highly significant, treatment is primarily targeted at those with MDD (Das-Munshi et al., 2008; Cuijpers, van Straten, Smit, Mihalopoulos, & Beekman, 2008). The large numbers with sub-clinical depression contribute to a heavier disease burden than the few with severe illness (Blazer, Kessler, McGonagle, & Swartz, 1994).

In this thesis, the term depression will be used for MDD, sub-threshold depression, depressive symptoms and elevated depressive symptoms. The specific terms will be made explicit when appropriate.

### *1.2.2 Comorbidity*

Depression is also a major comorbidity factor in several other mental disorders. There is a well-documented and strong overlap between MDD and Panic Disorder (PD) (Roy-Byrne et al., 2000). About 35% of those suffering from PD have comorbid MDD (Kessler et al., 2006). Anxiety disorders are especially commonly co-occurring with depression (Beekman et al., 2000; De Graaf, Bijl, Smit, Vollebergh, & Spijker, 2002), where more than 59% of those suffering from MDD have an anxiety disorder (Kessler et al., 2003; Kringlen, Torgersen, & Cramer, 2001). In the coming DSM-V, a new diagnosis of Mixed Anxiety Depression is proposed as a freestanding diagnosis (APA, 2010). Anxiety can influence the course of a depressive illness in terms of delayed recovery, greater disability, increased risk of relapse and suicide attempts (Hirschfeld, 2001). There are reported increased rates of alcohol and drug dependence (Grant, 1995; Satre, 2010), and about one in three with diagnosed



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attention-deficit hyperactivity disorder develops depression (Hallowell & Ratey, 2005). Post-traumatic stress disorder and depression often co-occur (Gruenberg et al., 2005). Sleep disturbances are highly related to depression (Singareddy & Uhde, 2009), for example where sleep duration of more than 8 hours and less than 6 hours are associated with more severe depression (Kaneita et al, 2006).

### *1.2.3 Prevalence*

Depression was rated as the fourth leading cause of disease burden worldwide in 2000 (Üstün et al., 2004) and currently accounts for 4.4% of total disability adjusted life years worldwide (DALYs) (Hyman, Chisholm, Kessler, Patel, & Whiteford, 2006). Predictions from WHO state that by 2030 depression will impose the single largest burden of ill health worldwide, accounting for 6.2% of DALYs (WHO, 2004). DALYs are defined as the sum of years of potential life lost due to premature mortality and years of productive life lost due to disability (WHO, 2004).

In an epidemiological study comprising six European countries, Lepine, Gastpar, Mendlewicz, and Tylee (1997) found that about 17% of the population reported some experience of depression during the last six months. Major depression was reported by 7%. These findings are comparable to rates reported in Norway, where it is estimated that every second Norwegian will experience some kind of mental disorder during their lifetime (Kringlen et al., 2001). Kringlen and colleagues reported that severe depression (18%) is the most frequent mental disorder in Norway. In the course of one year, 26–32% of the Norwegian population fulfil the diagnostic criteria for a mental disorder, with depression as the most frequent (7%). International studies of MDD in adolescents report that between 4–8% meet diagnostic criteria at a given time and between 15–20% have had a depressive episode before the age of 18 (Sund, 2004).

The majority of studies show that depression is twice as frequent among women as among men (Dalgard et al., 2006; Kessler et al., 2003). A contradictory finding from Norway, however, showed that depression was equally distributed among men and women in a large general population sample (Stordal, Bjelland, Dahl, & Mykletun, 2003). Furthermore, three times more men than women complete suicide (Norwegian Council for Mental Health, 2006). This might suggest that health services are not sufficient when it comes to detecting depression in men at an early stage

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(Norwegian Council for Mental Health, 2006). Some studies also have shown that depression rates generally are increasing in the population (Ministry of Health, 1997), and that onset occurs at an earlier stage in life than in the past (Ayuso-Mateos et al., 2001). Other studies have found no significant increase in the prevalence of mental disorders (29% in 1992 and 31% in 2003) (Kessler et al., 2005).

### *1.2.4 Unmet need and help-seeking*

A possible benefit of early intervention is evident when keeping in mind that most people suffering from depression do not make contact with health services and have unmet needs for treatment (Wells et al., 1992; Wang et al., 2007). Nearly half of depressed people never seek professional help (Christensen, Griffiths & Jorm, 2004; Meyer, 2007; NICE, 2004). The importance of reaching and engaging this group is obvious given the evidence that low level of help-seeking intentions among those with mental health problems are associated with suicidal ideation (Carlton & Deane, 2000).

Kessler and colleagues (2005) found an increase in the rate of treatment from 1990 to 2003; however, most people (66%) with a mental disorder did not receive treatment. Among those who received treatment, only about half met the diagnostic criteria for a mental disorder (Kessler et al., 2005). A number of researchers have investigated the reasons why people with mental health problems avoid help-seeking. These include a preference for solving the problem oneself, feeling that the problem is not serious enough, concern about what others might think (perceived stigma), negative experiences with help-seeking in the past, suicidal thoughts, and to what degree social support from family or friends is regarded as sufficient (Amato & Bradshaw, 1985; Griffiths, Crisp, Jorm, & Christensen, 2011; Rickwood, Deane, & Wilson, 2007). A study among Norwegian students revealed lack of anonymity to be a prominent reason among this group to avoid seeking help (Lintvedt, Sørensen, Østvik, Verplanken, & Wang, 2008).

Poor mental health literacy may be another barrier to help seeking (Jorm et al., 1997). Mental health literacy is concerned with knowledge about mental disorders, knowing how to seek mental health information, knowledge of available treatments including self-help approaches and of available professional help (Jorm et al., 1997). Increasing mental health literacy among the public may assist prevention, early intervention and facilitate effective self-help (Jorm et al., 2000). The latter could be

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directed towards developing coping skills and client-participation, thereby empowering people to deal with their own problems (Norwegian Directorate for Health and Social Affairs, 2004). The National Institute for Clinical Excellence (NICE), in the United Kingdom, recommends the use of self-help techniques in the treatment of several mental disorders (NICE, 2004, 2009). Self-help materials can be delivered in many ways such as by means of books, computer-based programs and online interventions.

### *1.2.5 Cost of depression*

Mathers and Loncar (2006) predicted that by 2030 the three leading causes of illness will be HIV / AIDS, depression and ischemic heart disease. Depression brings along high levels of service utilization and enormous economic cost (Berto, D'Ilario, Ruffo, Di Virgilio, & Rizzo, 2000; Greenberg & Birnbaum, 2005; Smit, Cuijpers, et al., 2006). Depression not only represents an immense psychological, social and economic burden to the individual and society at large, but also increases the risk of disabilities. From this, it is evident that much could be gained by focusing on preventive efforts on depression.

*Socio-economic cost.* Persons under 45 years of age are more likely to suffer from depression than those of 45 years and older (WHO, 2006). The disorder affects people during their most productive years of life. Consequently, the socio-economic cost is enormous. In Great Britain, the annual cost to society of mental disorders, is approximately 77 billion pound sterling (Deputy Prime Minister, 2004). Based on the same premises in Norway, adjusted to cost and income level, the corresponding amount is about 100 billion Norwegian Kroner annually, or approximately the cost of operating the Norwegian military defence for four years (Holte, 2006). According to WHO (2006), depression alone accounts for 44% of the total burden of mental disorders. Taken together, this suggests that the annual cost of depression to society totals about 44 billion Norwegian Kroner (Holte, 2006). Depression is associated with severe disability, long term sick leave and frequent relapse. Consequently, lost earnings account for the largest cost to society. Almost half of all disability and one third of all sick leave in Norway is due to depression (Mykletun et al., 2006). Another contributing factor to the socioeconomic cost is the fact that the age of onset of

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depression seems to be decreasing (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Ministry of Health, 1997). The effect of this on the work force is considerable (Berndt et al., 2000). The same applies to students at colleges and universities. Postponed exams and delays in the study progress are natural consequences of depression, and this could be expensive for the individual student. In Norway, a delay in study progress or a failed exam results in increased economic pressure onto the student from the Norwegian State Educational Loan Fund (Lånekassen), which is the predominant funding institution for Norwegian students (Lånekassen, 2013).

*Human cost of depression.* The human cost of depression is extensive, affecting most aspects of an individual's life. Depression is characterized by loss of interest or enjoyment in daily activities, marked sadness and severe loss of energy. Depression can manifest itself in different ways and common symptoms include sadness, irritability, sleeping difficulties, sexual dysfunction, loss of appetite, and weight fluctuations (APA, 2012; Gruenberg et al., 2005; Lewinsohn et al., 2000). In addition, diffuse bodily pain is common. Suicidal thoughts and suicide are other serious side effects of depression (Beautrais et al., 1996; Beutler, Clarkin, & Bongar, 2000; Cheng, 1995; Goldney, Wilson, Dal Grande, Fisher, & McFarlane, 2000; Goldney, Dal Grande, Fisher, & Wilson, 2003; Pirkis, Burgess, & Dunt, 2000; Stolberg, Clark, & Bongar, 2002).

*Death rate and self-inflicted injury.* Clark (1995) estimated that about 40-60% of suicides occur during a depressive episode or in the recovery phase. Depression is the most frequent of all known causes of suicide, and death by suicide is more than twice as common as death by traffic accident (total of 214 people in 2009) in Norway. WHO reported that in Norway 17.3 males and 6.5 females per 100 000 committed suicide in 2009 (WHO, 2009), a total of 573 inhabitants. Suicide is also a frequent cause of death among young people and is one of the leading causes of death before age 70 and among men (Abas, Hotopf, & Prince, 2002; Statistics Norway, 2009). Furthermore, suicide attempts are 10 -15 times more frequent than suicide (Retterstøl, 1995). Depression is an important factor in relation to self-inflicted injury and suicide attempts, although the causal relationship is somewhat undefined. Self-inflicted injury and suicide attempts represent major public health issues and a heavy burden to

family and friends (Mishara & Ystgaard, 2006). People suffering from depression run also an increased risk of physical disorders and early death (accident, natural causes and suicide), compared with the general population (Høyer, Mortensen, & Olesen, 2000; Katon et al., 2008; Üstün, 1999).

### **1.3 Treatment**

#### *1.3.1 The biological approach.*

The biological approach reflects the medical model to illness and disease. It is based on the notion that mental illnesses are due to abnormalities in neural and bodily processes, such as imbalance in different neurotransmitter levels or malfunctions in different regions of the brain (Gazzaniga & Heatherton, 2003). Biological treatments range from administering drugs and electroconvulsive therapy to surgical interventions (psychosurgery), where drugs are the most frequent treatment applied (Gazzaniga & Heatherton, 2003).

Approximately 90% of adults being treated for depression receive this treatment from their general practitioner, mainly with antidepressants (Berge et al., 2002). There exist several types of antidepressants but the most widely prescribed group of antidepressives today are the selective serotonin re-uptake inhibitors (SSRI). The SSRIs are considered to be safer, causing fewer side effects and are easier to administer than other older types of antidepressants (Gazzaniga & Heatherton, 2003).

About 50% of patients receiving antidepressant treatment for depression recover within six months while approximately 20% continue to have symptoms for more than two years (Keller et al., 1992). Without continued antidepressant treatment, 30% of the patients experiences relapse within three months, and 50% experiences a new depressive episode within two years (Judd et al., 1998). The use of medication alone may, therefore, not be ideal since drugs themselves do not cure disorders (Le Fanu, 1999). Drugs in general tend to alleviate symptoms by altering levels of neurotransmitters in the synapses in the brain. They do not help the individual to understand personal and situational factors that may be reinforcing maladaptive behaviour. Further, drugs, when discontinued, may increase the risk of relapse (Butcher, Mineka, Hooley, & Carson, 2004; Teasdale et al., 2000).

*1.3.2 The cognitive approach.*

The cognitive approach is based on the concept that interpretation of events determines our feelings, rather than the events themselves (Roseman, 1984). This approach focuses on how our thoughts, images, beliefs and attitudes (cognitive processes) relay to our behaviour and our ways of dealing with emotional problems (Beck, 1976; Beck, Rush, Shaw, & Emery, 1979).

Some suggest there are three major cognitive approaches to depression (e.g. Johnson-Laird, 1983); theories based on cognitive schemata (Beck, 1976), associative networks (Bower, 1981) and explanatory style (Peterson & Seligman, 1984).

According to Beck's cognitive theory of depression (1967, 1976), the experience of loss or adversity in childhood can lead to the development of negative self-schemata. Negative self-schemata are relatively stable over time, situations and mood, and relatively dormant during depression-free periods. These negative self-schemata can be reactivated by stressful life events (Clark & Beck, 1999; Walden, 2006), and dysphoric mood (Miranda & Persons, 1988; Miranda, Persons, & Byers, 1990; Roberts & Kassel, 1996). Negative self-schemata comprise dysfunctional attitudes that could affect individuals coping style and automatic compensatory strategies (Clark & Beck, 1999). Whenever negative self-schemata are activated they could lead to negative automatic thoughts, which in turn might result in symptoms of depression and depressive episodes (Clark & Beck, 1999). This could again induce poor coping skills. Beck's theory states that persons with depression make errors in logical thinking, a theory of explanatory style where they e.g. ignore the evidence or focus only on negative aspects of situations (Beck et al., 1979). As negative automatic thoughts are so closely linked to depressive symptoms, an important aspect of preventing depression is to offer help in identifying and learning to deal with negative automatic thoughts (Clark & Beck, 1999).

According to Bower's (1981) associative network model, basic emotions are nodes in the memory network connected by associative links, and complex emotions are connected to several nodes (i.e. basic emotions). A person with depressive mood will activate the depression node, by selectively focusing on depressive information and thoughts (Philippot & Schaefer, 2001).

One of the best-known explanatory style theories is probably the reformulated theory of learned helplessness (Abramson, Seligman, & Teasdale, 1978). For

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depression, the theory states that people perceive negative events as uncontrollable, internal, stable and global (Power & Champion, 1986). The theory is based on causal explanations (Peterson & Seligman, 1984).

Each of these major cognitive approaches to depression can be criticized on both empirical and theoretical grounds (Power & Champion, 1986). The mental model theory of reasoning was proposed to overcome some of these problems (Johnson-Laird, 1983; Johnson-Laird & Byrne, 1991). This model includes some elements of the cognitive approaches described above and assumes that reasoning is based on mental models and not on logical form. The cognitive approach has been widely applied in therapy, where it often has been combined with elements from other therapies. An example of such a combination is cognitive behavioural therapy.

### 1.3.2.1 Cognitive behavioural therapy.

The aim of *Cognitive Behaviour Therapy* (CBT) is to change negative patterns of thinking and dysfunctional attitudes in vulnerable individuals, thereby reducing or preventing depressive symptoms. This will in turn facilitate positive coping skills when faced with stressful situations (Beck et al., 1979).

Studies have shown that CBT is as effective as antidepressants for people with a mild to moderate degree of depression (Churchill et al., 2001; Hollon et al., 2005; NICE, 2009). Several studies also have shown that people with such degrees of depression have a more rapid recovery when using CBT (Churchill et al., 2001; Gloaguen, Cottraux, Cucherat, & Blackburn, 1998). CBT has no or minimal side effects and focuses on teaching people strategies that are helpful to prevent future depressive episodes. Even though CBT has its advantages, the public mental health services have neither resources nor funding to make face-to-face (F2F) cognitive behaviour therapy a more easily available treatment for depression.

### 1.3.2.2 *Bibliotherapy based on CBT*

In recent years, a common approach used in self-help books in the area of mental health, is CBT. This approach involves books about specific topics, how to overcome depression or how to improve quality of life. Meta-analyses have demonstrated that bibliotherapy is an effective treatment for depression (Cuijpers, 1997; Gregory, Canning, Lee, & Wise, 2004).

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### 1.3.3 Other therapeutic approaches

Several other therapeutic approaches are used in the treatment of depression. Some of these approaches are used in web-based interventions for depression and are described below.

#### *Interpersonal psychotherapy.*

A number of studies have demonstrated that Interpersonal Psychotherapy (IPT) helps people with mild or moderate depression (Churchill et al., 2001). IPT was called the “supportive psychotherapy” and has proven effective by helping a depressed person to solve problems with other people, such as disputes, feeling isolated or grief. It works as effective as antidepressant drugs (Weissman, 2006). A recent meta-analysis by Cuijpers and colleagues (2011) found IPT as effective as other treatments and as an effective treatment for depression compared to a control group.

#### *Behaviour Activation.*

Behaviour Activation (BA) was a component in the early work of Peter Lewinsohn (1975). The BA theory states that too much environmental punishment or too little environmental support can lead to depression (Jacobson, Martell, & Dimidjian, 2001; Martell, Addis, & Jacobson, 2001). Studies and reviews suggest that BA could be the active ingredient in the cognitive-behavioural treatment for depression (Jacobson et al., 2001; Spates, Pagoto, & Kalata, 2006). Increasing environmental reinforcement and reducing punishment is the goal of the BA intervention. In a review by Spates and colleagues (2006) they found BA for depression to have a robust effect, and Dimidjian and colleagues (2006) found BA to be more effective than cognitive therapy in a large-scale treatment study. Other studies show small differences between BA and CBT across a 2-year follow-up (Dobson et al., 2008).

#### *Mindfulness based treatments.*

Acceptance and Commitment Therapy (ACT) aim to increase psychological flexibility (Hayes, Strosahl, & Wilson, 1999). ACT is integrating mindfulness, acceptance, and behaviour change strategies into therapy (Zettle, 2005). In RCT



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studies, ACT has been found effective for treating conditions such as depression (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Ruiz, 2010). It has been stated that ACT should not be considered as an empirically validated treatment (Chambless & Ollendick, 2001). Recently, ACT has been included in the Substance Abuse and Mental Health Services Administration's (SAMHSA) list of evidence-based mental health treatment programs and mental health promotion programs (SAMHSA, 2013). Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 1994), combines mindfulness with behaviour change strategies. Meta-analysis on MBSR has found medium effect sizes (Grossman, Niemann, Schmidt, & Walach, 2004). Mindfulness-Based Cognitive Therapy (MBCT) (Segal, Williams, & Teasdale, 2002) combines mindfulness-based stress reduction and CBT to alter the cognitive processes that are fundamental for the vulnerability for depression (Lang, 2013). Several RCT studies have found MBCT effective for relapse prevention in patients with depression (Piet & Hougaard, 2011; Sipe & Eisendrath, 2012).

### *1.3.4 Self-help as a tool and treatment approach*

One of the earliest articles on self-help originates from 1937, when Menninger (William & Menninger, 1967) wrote about the 'mental hygiene literature'. As mentioned above, nearly half of depressed individuals never seek professional help (Christensen et al., 2004; Meyer, 2007; NICE, 2009). Many people prefer self-help and complementary therapies for depression (Jorm et al., 1997; Jorm et al., 2000). People who are depressed have been found to have a higher use of complementary treatments (Kessler et al., 2001; Unützer et al., 2000).

It is common to distinguish between self-organised, initiated and reinforced self-help (Høgsbro, 1992). Self-organised self-help could consist of spontaneously created groups or be organised by self-help organisations. Subjects who do not have the problem themselves can establish and initiate self-help groups. Self-help groups that are supervised by professionals are called reinforced self-help. Peer groups could be self-organised or reinforced. Peers with the same illness or complaint, who have recovered and are able to guide and help others, often head these groups (Høgsbro, 1992). This description implies that self-help occurs when people with a problem help and are aided by others. Accordingly, self-help is mutual aid. Other descriptions of self-help exclude the involvement of others, such as this from the American Heritage

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Dictionary (2013): “The act or an instance of helping or improving oneself without assistance from others”. Self-help is used synonymously with self-improvement, where the goal for the individual is to improve him/herself without assistance from anyone else (SAMHSA, 2010).

At the core of self-help lies the principle of utilising individuals’ past experiences and knowledge and to motivate people to use their resources in dealing with difficulties. The main focus of self-help is to engage people, make them identify and clarify their problems and use this as a foundation to work through the problems more efficiently. The process of mobilising people’s own resources in this way is known as “empowerment” (Bandura, 1988; Ozer & Bandura, 1990; Rappaport, Swift, & Hess, 1984; Norwegian Directorate for Health and Social Affairs, 2004).

In this thesis, the term self-help will be used for self-help run by the person themselves, self-help groups, peer groups and as a supplement and an alternative to public mental health services. A suitable description for self-help could be the one used in the Norwegian national plan for self-help (Norwegian Directorate for Health and Social Affairs, 2004):

”Self-help is to get hold of one's own possibilities, discover one's own resources, assume responsibility for one's own life and steer it in the desired direction. Self-help is to set in motion a process leading from passive recipient to active participant in one's own life”.

This approach is descriptive for a self-help trend based on what one could do for oneself with help from friends, family and professional sources. In the Norwegian national plan for self-help, the focus is directed to all areas that use self-help as a tool as well as making self-help principles known in new settings. It is emphasized that self-help is directed towards developing coping skills and client-participation, thereby empowering people to deal with their own problems. Also NICE in the United Kingdom recommends the use of self-help techniques in the treatment of several mental disorders (NICE, 2004, 2009). Self-help materials are mediated in many ways such as books, computer-based programs and online interventions.

The way people with mental health problems conceptualize self-help can be distinct from how the professional defines self-help. For many service users, self-help is synonymous with lifestyle strategies based on concepts such as wellness and

recovery (Faulkner & Layzell, 2000). Many feel that authentic self-help services should be totally directed and run by users while others accept a compromise between total autonomy and total dependency on professionals (e.g., the Fountain House self-help program; Norman, 2006).

The main focus in the present thesis will be on professionally developed material with the potential to offer individuals a treatment for their mental health problems with little or no professional support (Pratt, Halliday, & Maxwell, 2009). Cuijpers and Schuurmans (2007) give a definition of self-help that is not restricted by content, quality of the self-help material, or delivery type and amount of therapist guidance: “a psychological treatment in which the patient takes home a standardized psychological treatment protocol and works through it more or less independently”.

### *1.3.4.1 Self-help and CBT.*

The process of identifying negative automatic thoughts is central to CBT but does not necessarily require face-to-face therapy. CBT can be structured and manual based and is already applied in many forms of self-help treatments. Several studies have shown CBT effective in reducing symptoms of depression when used as bibliotherapy (Gregory et al., 2004), computer programs (Baer & Surman, 1985; Kenardy, Fried, Kraemer, & Taylor, 1992; Selmi, Klein, Greist, Johnson, & Harris, 1982) and Internet-based intervention programs (Clark et al., 2009; Christensen et al., 2004; Jaycox, Reivich, Gillham, & Seligman, 1994; Seligman, Schulman, De Rubeis, & Hollon, 1999). As shown, CBT has proven especially effective in treating people with mild to moderate depression, also with regard to preventing relapse (Fava, Rafanelli, Grandi, Conti, & Belluardo, 1998). In addition, it can be adapted to different self-help procedures. Therefore, CBT seems to be a well-suited tool for self-help interventions.

### *1.3.4.2 Self-help and support.*

Self-help interventions can be delivered with or without support by a professional therapist or coach. When self-help is guided, the support should be minimized in terms of contact and be primarily supportive in nature to help the patient working through the standardized psychological treatment (Cuijpers, Donker, van Straten, Li, & Andersson, 2010). Contact with the therapist can take place through

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face-to-face contact, email, telephone or any other media or communication method (Cuijpers, 1997; Cuijpers & Schuurmans, 2007). Support from a professional can vary widely. In a review by Newman and colleagues (2003), four levels involving therapist input are defined: 1) *Self-administered self-help* (SA; no therapist contact, or for assessment only), 2) *Predominantly Self-Help* (PSH; therapist contact [by phone or face-to-face] for assessment, periodic check-ins, teaching clients how to use the self-help tool, providing the therapeutic rationale), 3) *Minimal-Contact therapy* (MC; active involvement [by phone or face-to-face] by a therapist, but to a lesser degree than traditional therapy for this disorder, to have a more specific therapeutic effect instead of merely support), 4) *Predominantly Therapist-Administered treatment* (PTA; involving regular contact with a therapist; the use of a self-help tool augments the impact of the standard therapy).

### 1.3.4.3 Internet-based self-help.

Richards (2004) claimed that the only factor that makes any computer-based self-help treatment programs “self-help” is the absence of a professional therapist. He argued that computer-based self-help mimics the therapist in traditional therapy and that the structure is the same as in traditional therapist delivered treatments. An internet-based self-help intervention today usually combines several techniques (e.g., CBT, BA, IPT, Relaxation/Mindfulness, etc.), offering a combination of several evidence-based treatment approaches (Barak et al., 2009). Further, Internet-based self-help has the potential of tailoring the program to the users` needs and to be a supplement or an alternative to public mental health and other services. Internet-based self-help is easy to maintain, and might help people to overcome some of the barriers to seeking help for mental health problems in rural areas (Boyd, 2007; Griffiths & Christensen, 2007), stigma (Griffiths, Crisp, Jorm, & Christensen, 2011), scarcity of skilled therapists, long waiting lists, high cost, symptoms, comorbid conditions, socio-demographic factors and treatment delays (Barak et al., 2009; Jackson et al., 2007; Thompson, Hunt, & Issakidis, 2004). In general, there are potential risks involved in using some online self-help services involving other humans. These include inaccurate information, loss of privacy, disinhibited communication, online harassment and “cyber-stalking” (Finn & Banach, 2000).

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Among the advantages of self-help and internet-based self-help in particular, are the easy dissemination among the public, shortened waiting lists in mental health care settings and improved access to care for those living in remote areas (Cuijpers & Riper, 2007; Marks, Kenwright, Mcdonough, Whittaker, & Mataix-Cols, 2004). Computerized programs can be customised for each patient and do not exhibit some of the deficiencies of a human therapist such as memory problems and fatigue (Kaltenthaler et al., 2006; Titov, 2007). Self-help can offer privacy and consistency of care and the promotion of self-activation and self-motivation (Kaltenthaler et al., 2006). Furthermore, patients have more choices in which treatment they can avail of (De Graaf et al., 2009), they are able to work at their own pace to master the material and it can be used at home at a convenient time without taking time from work (Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010). All these Internet-based interventions have qualities that could represent both advantages and disadvantages: access, convenience, time delay, anonymity, to mention some (Barak et al., 2009). For example, anonymity could be an advantage when it reduces the stigma some people feel regarding seeking help from mental health services, whereas it could be a disadvantage regarding management of crisis situations.

### *1.3.4.4 Unguided Internet-based self-help treatment*

Several studies having examined unguided Internet-based self-help found a significant decrease in symptoms of depression and anxiety, compared with a waiting list (Furmark et al., 2009; Spek, Nyklicek, et al., 2007). Other studies found no difference in decreased depression symptoms between unguided self-help and treatment as usual groups (De Graaf et al., 2009). As pointed out in an editorial, this study had no waiting list control or placebo groups. Accordingly, effects from treatment could not be separated from effects of natural remission or placebo response (Andrews., 2010). In a study by Clarke and colleagues (2002) the intervention was without effect, but in a follow-up study they found a positive effect of the intervention when adding weekly telephone reminders (Clarke et al., 2005).

A meta-analysis by Gould and Clum (1993) did not find any significant difference between pure self-help and minimal contact self-help. In a more recent meta-analysis, Spek, Cuijpers and colleagues (2007), found an effect size for guided and unguided Internet-based treatment of 1.00 versus 0.26, compared to a waiting list

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condition. Also dropout rates differ greatly in studies examining the effectiveness of unguided self-help, from 22% to 64% (Clarke et al., 2002; De Graaf et al., 2009; Spek, Nyklicek, et al., 2007). One study reported differences in dropout rate between guided and unguided self-help (Spek, Nyklicek, et al., 2007); another did not (Furmark et al., 2009).

A beneficial feature of unguided Internet-based self-help is that it is easy to implement at a low cost. However, it has the serious limitation that it is often impossible to identify persons in a psychological crisis (Whitehead & Proudfoot, 2010). In research settings it would be possible to screen for signs of crisis (e.g. suicidal ideation), but in real-life usage this could be bypassed by starting over with a new user profile and underreporting symptoms. When the intervention is developed and online, there are no additional costs to unguided interventions as there are no therapists involved (Palmqvist, Carlbring, & Andersson, 2007).

### 1.4 Prevention and early intervention

Breslow (1999) stated that health is not just the absence of disease. He also made a distinction between health promotion and disease prevention. To reduce the prevalence of disorders, health care systems currently spend most of their resources on treatment (Knapp, McDaid, & Parsonage, 2011; Muñoz, 2010). Another way to reduce prevalence is to lower the number of new cases, i.e. new incidences. A meta-analysis by Muñoz and colleagues (2012) suggests that up to 40% of MDD could be prevented. To achieve this we need to focus on changes in health care policy by including prevention as a routine offering (Institute of Medicine, 2009). Although prevention is seen as distinct from treatment there is not always a clear boundary between treatment and prevention, as treatment has preventive aspects, e.g. reducing the severity of future problems (Institute of Medicine, 2009). Caplan (1964) discriminated between different types of prevention (primary, secondary, and tertiary preventions), focusing on preventing the disease itself, the severity of the disease or the associated disability. His definition influenced the development of early prevention models. A later model by Gordon (1983, 1987) was based on cost and benefits of delivering the interventions to a target population. Mrazek and Haggerty (1994) proposed a model based on risk factors. They proposed three categories of primary prevention of mental disorder: 1) *universal prevention* could be offered to the

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whole population to reduce the probability of a disorder, independent of risk factors; 2) *selective prevention* targeted at those at risk of a disorder and 3) *indicated prevention* targeting individuals who are identified as having symptoms of the condition in the absence of a diagnosable disorder. Even though there may be larger effects for individual participants in selective programs, there could be a larger number of smaller effects in universal programs (Andrews, Szabo, & Burns, 2002). This could result in huge effects on a population level. Health promotion is often considered as separate from prevention, and WHO defines it as “the process of enabling people to increase control over, and to improve their health” (WHO, 1986). WHO states that improving the quality of life is closely related to the strategies for mental health promotion (WHO, 2002). The Institute of Medicine (2009) considers health promotion as so closely related to prevention that it should be regarded as one of its components. Prevention and health promotion both focus on changing common influences on the development of individuals in order to aid them in functioning well (Herrman, 2001). Pössel (2005) suggests that it is important to decide from the outset if a program will be universal, selective or indicated because this will determine important aspects of content and delivery. For instance, a universal mental health program should aim to promote mental wellbeing as well as prevent illness (Jané-Llopis, Hosman, Copeland, & Beekman, 2005). Mental health promotion would require a focus on enhancing personal competence and/or addressing broader social and community determinants of mental health, as outlined in the WHO Ottawa Charter for health promotion (WHO, 1986).

Within somatic health care, it is usually considered that the most effective way of reducing the number of heart attacks in the population is not to prevent new heart attacks among those who already have suffered one (high risk strategy), but to offer health promoting efforts to reduce cholesterol levels and blood pressure in the whole population (Emberson, Whincup, Morris, Walker, & Ebrahim, 2004). A small reduction in blood pressure or cholesterol levels leads to reduction in both mortality rates and sickness in the population (Marks, Murray, Evans, & Willig, 2000).

Depression is a major risk factor in the development of several mental and somatic disorders. It is therefore reasonable to assume that the most important measure in reducing prevalence of depressive disorders in the population is to reduce the level of depressive symptoms in the population. Dutch researchers follow the

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same line of reasoning when investigating effective ways of reducing new episodes of depression (Smit, Ederveen, Cuijpers, Deeg, & Beekman, 2006). They have concluded that the most cost-effective way of reducing new episodes of depression is by directing preventive efforts towards individuals with a heightened score on depressive symptoms (Smit, Ederveen, et al., 2006). Few large-scale public prevention projects evaluating preventive effect on depression exist so far (Nord & Dalgard, 2006). Nevertheless, there are many valuable lessons to learn from the field of somatic health care. In lack of strong evidence, the most likely assumption would be that the same principles of prevention apply to both somatic and mental disorders.

Prevention is better than cure. On a national scale, preventive actions and treatment will probably involve considerably lower costs than not intervening at an early stage against depression (Knapp et al., 2011). Economic evaluations have found prevention of sub-threshold depression to be cost-effective (Mihalopoulos, Vos, Pirkis, Smit, & Carter, 2011; Smit, Willemse, et al., 2006). Cost-effectiveness is often estimated as direct cost (i.e. reduction in hospital admissions and other treatments) (WHO, 2002). In addition, indirect costs (i.e. work disability, family burden) should be taken into consideration as these costs could outweigh the direct costs. A prevention program targeting depression and suicide documented considerable economic savings to the society (Rutz, Carlsson, von Knorring, & Walinder, 1992), with a cost-benefit ratio of 1:30 for direct costs and 1:350 for indirect costs. Regardless of the quality of treatment, it is better to stay healthy than to become sick. Through early intervention, hopefully a chronic development, damaging side effects and subsequent time and cost consuming treatment can be prevented. Furthermore, the possible benefits of early intervention are evident when keeping in mind that many people suffering from depression do not make contact with health services (Knapp et al., 2011).

It has been known for some time that prevention programs based on CBT can be effective. For example, 18 years ago, Clarke (1995) reported that group-administered CBT reduced the onset of major depression by 50% among young people. Prevention programs targeting children, adolescents, adults and elderly people have shown promising results (Cuijpers et al., 2008; Smit, Ederveen, et al., 2006; Van Voorhees et al., 2007). The problem has been the dissemination of these effective prevention programs (Andrews et al., 2002).



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Evidence shows that science-based prevention and mental health promotion can affect risk and protective factors and decrease the incidence and prevalence of some mental disorders, including depression (WHO, 2004). Several media (such as advertising through television and radio) for conveying prevention programs to the public exist, and computers and Internet are relatively new and promising ways for dissemination. Performing RCTs to test the effectiveness of these intervention programs is a natural next step in the evaluation of the Internet as a medium for prevention of mental health (Ritterband et al., 2006). Prevention in concert with treatment will become a vital way to reduce the enormous public health burden of depression in the years to come (Cuijpers et al., 2008).

### **1.5 Computer-based Interventions**

#### *1.5.1 Background on the Internet and the World-Wide Web*

One hundred years ago, in the 1913 edition of Webster's Revised Unabridged Dictionary, technology was described as “Industrial science; the science of systematic knowledge of the industrial arts, especially of the more important manufactures, as spinning, weaving, metallurgy, etc.” (Webster, 2013). Presently, the use of the word is referred to as “... the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization, in order to solve a problem, improve a pre-existing solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function” (Wikipedia, 2013a). One of the most important interventions is the digital computer. The first of its kind was conceived in 1937, the Atanasoff–Berry Computer (Anellis, 1997). After introduction of the microprocessor in the 1970s, they were used for microcomputers from the mid 1970s (Mazor, 1995). The computer gradually became a common property after IBM introduced the personal computer (PC) in 1981 (Sandler, 1984).

For computers to share information they were connected in networks. The first computer networks started to take form in the 1950s, and the precursor to the Internet (ARPANET) was launched in 1969 (Ward, 2009). The name Internet (short for internetworking) appeared in 1974, two years after the first public demonstration of the ARPANET (Leiner et al., 2003). In 1972 the electronic mail (email) was introduced as one of the first services on the Internet (Leiner et al., 2003). The World-Wide Web (WWW, the Web, web or W3), another popular service on the Internet,

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was introduced in 1990 by Berners-Lee at CERN (Berners-Lee, 1992, 1998; Leiner et al., 2003).

The first version of the Web is today referred to as Web 1.0, and was like a library of documents (Aghaei, Nematbakhsh, & Farsani, 2012). It was primarily a source of static information that could not be changed by the recipient; a read-only version intended to deliver documents (Berners-Lee, 1992). Estimates indicate that in 1993 the world's capacity to store information in digital format was 3%, in 2000 it was 25% and in 2007 it had reached 94% (Hilbert & López, 2011). Dale Dougherty introduced the first description of Web 2.0 in 2004 (O'Reilly, 2005). In Web 2.0, the present version, the Internet can be used to connect to people (Aghaei et al., 2012). It is a read/write medium and is also called the Social Web (Cena et al., 2012), and includes social networking sites, blogs, wikis, and video sharing sites (Boulos & Wheeler, 2007). Another important trend under Web 2.0 is the use of mobile devices (Spivack, 2013), which has contributed to the growth of the Web. Berners-Lee has stated that the present function of the web (Web 2.0) is what was expected from the start, and he disputes the attempt to divide the growth and changes of the web into version numbers (Broady-Preston, 2009).

The term Health 2.0 has been used to illustrate the possibilities of Web 2.0 for e-Health and traditional health care (Joseph, 2011; Wikipedia, 2013b). It is often referred to as Medicine 2.0 (Hughes, Joshi, & Wareham, 2008) and defined as “the use of a specific set of Web tools (blogs, Podcasts, tagging, search, wikis, etc.) by actors in health care including doctors, patients, and scientists, using principles of open source and generation of content by users, and the power of networks in order to personalize health care, collaborate, and promote health education”. The new Samsung smartphone, the S4, was released in Mars 2013 with the S-Health software to help users keep track of their health (Samsung, 2013). This illustrates how users are able to monitor and manage their own health by standard technology today. The S-Health apps can connect to a variety of health-related sensors, which provide automatic measuring health indicators such as heart rate, blood sugar and weight (Computerworld, 2013).

### *1.5.2 Brief history of Computer-based interventions*

Self-help programs and treatment mediated by computers is not a new concept. The earliest attempts to make use of computer technology in psychology and medicine started in the 1960's (O'Dell & Dickson, 1984; Weizenbaum, 1966; Wright & Wright, 1997), 15 years before the invention of personal computers. One of the first and probably best-known programs was called ELIZA (Weizenbaum, 1966), which simulated a Rogerian therapist. It was originally written as an exercise in programming to explore issues in artificial intelligence (AI) rather than as a treatment tool. ELIZA was innovative but not particularly effective in treating clients. ELIZA was probably the first computer program that claimed to pass the Turing test (Weizenbaum, 1966). The Turing test (Turing, 1950) was based on the exploration of "the question of whether or not it is possible for machinery to show intelligent behaviour". The test is passed if users are unable to tell if they are communicating with a machine or a person. It is not known if Turing knew of Ayer's work from 1936 on a protocol to distinguish between man and machine (Ayer, 2001), where it was concluded that a thing is only conscious if it passes the consciousness test. In 1972 the computer program PARRY (Colby, Hilf, Weber, & Kraemer, 1972) was designed. This program was a more sophisticated version of ELIZA and tried to mimic a person with paranoid schizophrenia (Bowden, 2006). When a group of psychiatrists were shown transcripts of conversations with real patients and with the program, they made correct identifications in only 48% of the cases (Saygin, Cicekli, & Akman, 2000), and PARRY passed the Turing test. Critics of Turing test could be correct in claiming that this test does not determine if a machine can think (Searle, 1980). Nevertheless, this could be some of the underlying mechanisms to why some users of computer-based interventions find self-disclosure easier on the Internet (Leibert, Archer, Munson, & York, 2006).

Subsequent programs focused on using the unique attributes of computer technology to develop programs that apply a variety of media to educate, give feedback, and involve users in an interactive learning exercise (Wright & Wright, 1997).

The earliest hypothesis was that the use of computers could reduce the cost of treatment by cutting the number or length of sessions required by a clinician (Wright & Wright, 1997). Several RCTs documented this effect (Kenwright, Lines, & Marks,

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2001; Newman et al., 2003; Wright et al., 2001). Other possible benefits investigated in the early phases included access to treatment for people in rural areas or with mobility restrictions, increased mental health literacy, and self-help (Locke & Rezza, 1996; Wright & Wright, 1997). In the 1980s computer-based interventions were shown to be effective in several areas of mental health including coping with stress, anxiety and depression (Selmi et al., 1982; Baer & Surman, 1985; Kenardy et al., 1992). Subsequently from a technological point of view, the focus changed from computers to the Internet.

From a mental health point of view, the changes have followed the zeitgeist in schools of psychotherapy shaped by the computer technology available at that time (Cavanagh, Zack, Shapiro, & Wright, 2003). Some authors divide the attempts to utilize computers in psychotherapy into four waves: 1) *client-centred* (simulation of therapist–patient dialogue), 2) *behavioural* (training plus exposure or desensitization), 3) *psycho-educational and cognitive interventions* (e.g. programs that teach coping or problem-solving strategies, some of which employ cognitive restructuring), and 4) *cognitive-behavioural* (more advanced programs that combine methods typically employed in CBT and utilize multimedia or other contemporary technology) (Cavanagh et al., 2003).

In a systematic review of Computer-assisted Psychotherapy (CP) programs Marks, Cavanagh and Gega (2007b) found 97 CP programs described in 175 studies, of which 103 were RCTs. These studies encompassed screening, effectiveness, efficacy, cost-effectiveness and dissemination of CP within health services. Cohen's *d* effect sizes for the identified CP systems ranged from  $d = .2$  (small) to 4.3 (extremely large) (Marks et al., 2007b). For depression, Marks and colleagues identified nine programs, of which three were Internet-based programs evaluated in RCTs (Overcoming Depression on the Internet (ODIN) (Clarke et al., 2005); MoodGYM (Christensen et al., 2004); "netCBT" (Andersson, Bergström, Holländare, Ekselius, & Carlbring, 2004). In their early reviews of internet-based RCTs of mental disorders, Griffiths and her colleagues (Griffiths & Christensen, 2006; Griffiths, Farrer, & Christensen, 2006; Griffiths, Farrer, & Christensen, 2007) identified a further Internet program (Patten, 2003).

Most computer-based programs are based on CBT (Deardorff, 2012) and are used as a supplement to traditional therapy or a stand-alone intervention (Barak et al.,

2009). Some researchers argue that the use of computer programs are best utilized as a supplement to more traditional forms of therapy (Taylor, Agras, Losch, Plante, & Burnett, 1991), while others argue that computer mediated therapy by itself can be more effective than traditional therapy (Farvolden, Denisoff, Selby, Bagby, & Rudy, 2005). Furthermore, a study by Burnett, Taylor, and Agras (1992) showed that computer mediated therapy was far more cost effective than face-to-face therapy for certain problems and with a longer lasting treatment effect.

### 1.5.3 Modalities, definitions and taxonomy

In the field of technology-based interventions it would seem appropriate to differentiate between online counselling and other interventions, as the former is used to deliver individual F2F and technology-assisted distance counselling (Barak et al., 2009), e.g. videoconferencing, chat, SMS, instant messaging and e-mail.

In the course of time the available technology has influenced the definitions or descriptions of the computer-based interventions or programs. A decade ago it was said that there were three modes for delivery of computer-aided treatment: free standing computers, Internet access, and telephone-accessed interactive voice response systems (Graham, Franes, Kenwright, & Marks, 2000).

Based on research from the last decade one could also differentiate between unguided (prevention, self-help and self-treatment) interventions and guided interventions (self-help and therapy) (Barak, Hen, Boniel-Nissim, & Shapira, 2008). The guided interventions could further be delineated by the amount of therapist contact: 1) *self-administered therapy* (only assessment), 2) *predominantly self-help* (periodic check-ins), 3) *minimal contact therapy* (involvement from a therapist), and 4) *predominantly therapist-administered therapy* (therapist-administered) (Newman et al., 2003). Furthermore, systems differ in terms of their communication characteristics: synchronous communication (telephone, videoconference, face-to-face, internet-based chat) or asynchronous communication (e.g., mail, bulletin board or email). Asynchronous communication implies information that can be sent or received without having two participants' involvement at the same time (Johnson, 2007). Asynchronous learning also gives users the possibility to work at their own pace. This may be particularly beneficial for individuals with health problems as they can complete their work in a low stress environment (Barak et al., 2009).

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Synchronous activities involve the exchange of information with one or more participants during the same period of time (Johnson, 2007). An online chat session and a face-to-face discussion are each examples of synchronous communication.

It appears that most definitions and attempts to construct taxonomies are based on the available technologies and interventions. There seem to be no specific definition of computer-based interventions for mental health that incorporate preventive approaches. One would probably need to find a definition of some broader phrase that encompassed prevention and modify it to include unguided technology-based self-help interventions.

For example, Marks and colleagues (1998) defined Computer-assisted Psychotherapy (CP) as: “any computing system that aids talking treatments by using patient input to make at least some computations and treatment decisions”. This definition incorporates the requirement that interventions should delegate at least some therapy decisions to the computer, not including email consultations, chat rooms, support groups, video / phone conferencing, and some interventions delivering bibliotherapy, self-help and prevention interventions.. Even though, the definition of Marks and colleagues (1998) could be the most adequate basis for defining technology-based prevention interventions. As the field is evolving we will probably see more definitions and a classification system covering the whole field, including prevention. In this thesis, the definition from Marks and colleagues will be used as it includes most prevention interventions.

A thorough approach to define Internet-based intervention taxonomy was suggested by Barak and colleagues (2009):

1. Web-based interventions
  - a. Web-based education intervention
  - b. Web-based therapy intervention
    - i. Self-guided
    - ii. Human-guided
2. Online counselling and therapy
3. Internet-operated therapeutic software
4. Other online activity

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It appears that most definitions and attempts to construct taxonomies are based on the available technologies and interventions. There is a need for more standardized definitions of interventions (Christensen, Griffiths, & Farrer, 2009), the behaviour change techniques used (Abraham & Michie, 2008), intervention content and reporting outcomes from research (Christensen et al., 2009; Proudfoot et al, 2011). Even the definition of intervention content requires standardization, as interventions differ regarding the therapeutic approaches used, intensity of program and combination of other services (Wilson, Bouffard, & MacKenzie, 2005). Intervention characteristics need standardisation to be linked to effectiveness (Webb, Joseph, Yardley, & Michie, 2010).

A comprehensive taxonomy of behaviour change techniques is available (Abraham & Michie, 2008). Taxonomies of interventions have primarily been developed from the literature on implementation and validation studies (Walter, Nutley, & Davies, 2003). Even the thorough review by Barak and colleagues (2009) restricts the taxonomy to only include Internet-based interventions. They offer a plausible explanation for why it has been so difficult to agree upon a terminology, as the interventions differ markedly with respect to content and their use of technology (Barak et al., 2009). Another approach is required. For example, it might be possible that to define taxonomy based on the two factors that always are present, technology and interventions, combined in a threefold structure based on the work by Walter and colleagues (2003). The three categories could be 1) *intervention type* (attributes describing form and content), 2) *mechanism* (theoretical framework, behavioural change techniques), and 3) *technology* (computers, mobile devices, etc.). Such a task might best be undertaken by researchers from the disciplines of computer science, engineering, mathematics, physics, law, social and human sciences (Shadbolt, Hall, Hendler, & Dutton, 2013). Ideally such a structure would not be limited by the existing interventions, but would provide the potential to incorporate future interventions and new technology. There is a need to be innovative and open to future trends.

Recently, a model for future Internet-based intervention taxonomy has been proposed (Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick, 2009): the Internet Intervention Model. Their model is based on several theories, empirical findings and clinical experience. The nine major components in the model are 1) user

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characteristics, 2) environment, 3) website, 4) website use, 5) support, 6) mechanisms of change, 7) behavior change, 8) symptom improvement and 9) treatment maintenance. The model and scientific framework is proposed as a device for grounding Internet intervention research. Use of the model can provide valuable insight into how the use of Internet-based interventions can cause changes in behavior and reduce symptoms.

### *1.5.4 Internet-based interventions for depression*

*Internet-based programs.* Internet-based interventions may be focused on treatment, self-help, and/or prevention programs. Since these reviews of computer-aided therapy systems in the mid-2000s (Griffiths & Christensen, 2006; Griffiths et al., 2006; Griffiths et al., 2007; Marks et al., 2007b), at least 20 new Internet-based intervention programs for depression have been deployed. Several of these have been subjected to research evaluation or are in the test phase: “Alles onder controle” (van Straten, Cuijpers, & Smits, 2008); “Color your life” (Spek, Nyklicek et al., 2007); “Deprexis” (Meyer et al., 2009); “E-couch” (Griffiths, Crisp, Christensen, Mackinnon, & Bennett, 2010); “HealthSteps for Depression” (Robertson, Smith, Castle, & Tannenbaum, 2006); “Interapy Depression” (Ruwaard et al., 2009); “Living Life to The Full On-line” (Williams, 2010); “Master your Mood” (Gerrits, van der Zanden, Visscher, & Conijn, 2007); “MoodCalmer” (CCBT Ltd., 2010); “MoodHelper.org” (Clark et al., 2009); “MoodManager” (Mohr et al., 2010); “MoodMemos” (Morgan, Jorm, & Mackinnon, 2012); “myCompass” (Harrison et al., 2011); “Project Catch-it” (Van Voorhees, Fogel, Reinecke, et al., 2009); “Psyfit” (Bolier et al., 2012); “This Way Up – Depression Course” (Titov, Andrews, Kemp, & Robinson, 2010); “This Way Up - Mixed Depression and Anxiety Course” (Titov et al., 2011); “UPLIFT” (Thompson et al., 2010); “Xanthis” (McKeown & Potts, 2009a); and “Youth Mental Health” (Deitz, Cook, Billings, & Hendrickson, 2009). In addition, more than 20 other programs are being tested and thus have no published protocol or research evidence of the efficacy of the program (e.g. Beacon, 2013).

One of the unique qualities of the Internet as a medium for delivering mental health interventions is that therapeutic changes can occur in an anonymous context (Grohol, 2001). In addition, Internet-based services are usually available at all hours and can be accessed from the privacy of one’s own home (Barak et al., 2009; Marks



& Cavanagh, 2009). People who feel themselves stigmatized by their psychological problems, diagnosis or the counselling process may be more likely to seek help online where they feel less ashamed than in a personal encounter with a therapist (Rochlen, Zack, & Speyer, 2004). In turn, Internet services may have a low threshold for access and represent a low stress situation for those with mental health problems. Thus, this technology has the potential to overcome some of the barriers to help seeking for mental health problems, such as stigma, travelling time, waiting lists and treatment delays (Graham et al. 2000; Marks & Cavanagh, 2009; Rochlen et al., 2004).

There has been little research conducted on prevention of depression to date (McKeown & Potts, 2009b). In their review, McKeown and Potts, found only five papers published on the preventive use of Computerised CBT (CCBT). They found a larger body of research using CCBT as treatment for sub-clinical symptoms and prevention interchangeably. In this thesis, the use of prevention interventions includes sub-clinical interventions.

Among the computer-based interventions targeting depression, those applying CBT have been subjected to the most thorough outcome research (Kaltenthaler et al., 2002). In a meta-analysis on depression CP programs based on CBT there was an overall effect size of  $d = .41$  (Andersson & Cuijpers, 2009). The effect size for the interventions providing support was  $d = .61$  and self-guided interventions yielded  $d = .25$ . An even more recent meta-analysis of treatment CP programs by Andrews and colleagues (2010) found an overall effect size for MDD of  $g = .78$ . The most recent meta-analysis reported an overall pooled effect size of  $d = .56$ ,  $d = .78$  for therapist support, and  $d = .36$  for no support (Richards & Richardson, 2012).

*Bibliotherapy.* Self-help as bibliotherapy is effective both in book and CP form (Ghosh, Marks, & Carr, 1988). Computers can provide more interactivity and individual tailoring to the users' need. A recent study with 1- and 2-year follow-up showed good and lasting effects for bibliotherapy (Stice, Rohde, Gau, & Wade, 2010).

*Self-help.* Overall, there is evidence that Internet-based interventions can prevent depression (Calear et al., 2009; Spek, Cuijpers et al., 2007). In the meta-analysis by Andersson and Cuijpers (2009) an average effect size of  $d = .25$  was reported for unguided interventions, which is significantly lower than for guided interventions.

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### *1.5.5 Recommendations for computer-based treatment*

The National Institute of Health and Clinical Excellence recommend CCBT in their stepped care clinical guidelines for anxiety and depression (NICE, 2006). The Norwegian National guidelines for treatment of depression recommend assisted self-help for mild to moderate depression (Norwegian Directorate for Health and Social Affairs, 2009). This could be self-help books or web-based applications based on the principles of cognitive behavioural therapy. In Sweden, the National guidelines for treatment of depression and anxiety disorders (National Board of Health and Welfare, 2010) recommend implementation of CCBT for treatment of both depression and panic disorder.

### *1.5.6 Cost-effectiveness analysis*

One important problem to address is the role of self-help within the mental health systems. Stepped care systems have been suggested (Richards, 2004), but it is still unclear how much resources are needed for each step. Trials need to address cost-effectiveness for the different steps in the system (Otto, Pollack, & Maki, 2000; Scogin, Hanson & Welsh, 2003).

Cost-effectiveness analysis can be used to compare the costs and health effects of an intervention. The aim is to assess to what extent the intervention can be regarded as providing value for money (McCabe, 2009). Some claim that the Quality Adjusted Life Years (QALYs) are reflecting both the quality of life as well as the quantity of life (Sinnott, Joyce, & Barnett, 2007; Torrance & Feeny, 1989). The QALY has been criticised for not reflecting the individual's preferences (Mehrez & Gafni, 1989), and the Healthy-Years Equivalent (HYE) have been recommended as an alternative measurement. The QALY are the most common used health status index (Mehrez & Gafni, 1989) and will be used in the thesis.

Cost-effectiveness analysis is one of many approaches to economic evaluation, where the choice of technique depends on the benefits in question. For independent interventions it is essential to use average cost-effectiveness ratios and for mutually exclusive interventions the use of incremental cost-effectiveness ratios is essential (McCabe, 2009). When the costs and effects of one intervention are not affected by the introduction of other interventions, they are regarded as independent interventions

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(Phillips, 2009). The interventions are mutually exclusive when the implementation of one intervention excludes implementation of other interventions (Phillips, 2009). Introducing unguided Internet-based self-help interventions does not exclude the use of other interventions. The cost-effectiveness ratio indicates how efficiently the intervention can produce an additional QALY. In this way, the cost-effectiveness of alternative innovations can be compared. Cost-effectiveness ratios (CERs) are calculated as  $CER = \text{Costs of intervention} / \text{health gain (e.g. life-years gained)}$  (Olsen, 2009; Phillips, 2009). The Intervention with the lowest CER is preferred. Quality of Life can be used as a measure for health gain.

There has been a growing interest in applying measures of health related QoL to evaluate health care services in general (Kroeger et al., 2010; Loeffler et al., 2010). However, in the field of Internet and computer-based self-help for mental disorders, reviews have revealed that studies are missing cost-effectiveness data (Griffiths & Christensen, 2006; Tate, Finkelstein, Khavjou, & Gustafson, 2009). This is a disadvantage for the field as it precludes comprehensive evaluations of Internet interventions and services from a policy perspective. There are several QoL measures available for this purpose, some are specific to groups of diseases and others are generic measures to be applied across disease areas (Gater, Kind, & Gutex, 1995). Some produce a single measure as a health index and others assess a profile of scores in different areas of disease. Cost-effectiveness analysis is far from being a precise science, and there is often considerable uncertainty concerning the findings and a wide variation around the estimate generated (McCabe, 2009).

### *1.5.7 Dissemination.*

Recent literature on the treatment of depression using self-help therapies indicates their effectiveness for mild to moderate depression and anxiety disorders (Richards et al., 2003). There is also evidence that Internet interventions can be effective in the treatment and prevention of depression (Calear et al., 2009; Griffiths et al., 2010; Richards & Richardson, 2012; Ritterband, Thorndike, Gonder-Frederick, et al., 2009; Spek, Cuijpers et al., 2007). Research shows that users find computer responses empathic and understanding (Ghosh et al., 1988; Weizenbaum, 1976) and that computer-administered therapies can be as therapeutic as human-

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administered (Ghosh et al., 1988; Schneider, Schartz, & Fast, 1995; Selmi, Klein, Greist, Sorrell, & Erdman, 1990).

There are currently problems with access to good mental health care due to staff shortage and long waiting lists. CP interventions have the potential to bridge the gap in delivery of universal or targeted prevention programs, used within stepped care, chronic illness, occupational and prevention models (McKeown & Potts, 2009b).

There is now evidence, which at least allows us to suggest, that Internet interventions can be effective in the treatment and prevention of depression (Calear et al., 2009; Griffiths & Christensen, 2006; Ritterband, Thorndike, Gonder-Frederick, et al., 2009; Spek et al., 2008). A large number of people use Internet for self-management of health conditions (Nicholas et al., 2007).

One program which has been subjected to a number of trials and which has proven to be effective over 12 months is the English-language Internet program for depression, *MoodGYM* (Mackinnon, Griffiths, & Christensen, 2008). The third version of the program has more than 600,000 registered users (Centre for Mental Health Research, 2013a). Another program is *BluePages*, which provides information on the symptoms of depression, treatment for depression based on scientific evidence, help resources, and screening tests for depression and anxiety (Centre for Mental Health Research, 2013b). Both programs are available in English as part of a publically available e-mental health service delivered by the Australian National University (ANU) and funded by the Australian government (Bennett, Reynolds, Christensen, & Griffiths, 2010).

The International Society for Research on Internet Interventions (ISRII) has highlighted the importance of facilitating the dissemination of Internet applications by providing translations into multiple languages (Ritterband et al., 2006). The WHO has also suggested that Internet-based prevention interventions should be disseminated worldwide after establishing their efficacy (WHO, 2004).

There are to our knowledge no reports of such translation projects reporting cost and providing cost-effectiveness analysis. However, if cost-effective, translation could provide a more rapid means of bridging the gap between demand and supply for psychological services.

### *1.5.8 Ethical considerations*

The potential benefits of using the Internet to deliver mental health interventions are huge. There are ethical and legal considerations to address (Ritterband et al., 2003), such as privacy, confidentiality, credentials of professionals and potential misuse. Before dissemination Internet interventions must undergo scientific testing to document their feasibility, efficacy, effectiveness and cost-effectiveness (Proudfoot et al., 2011). Through research we need to discover what types of interventions are appropriate to this medium and the potential advantages and limitations (Childress, 2000).

The first and perhaps most fundamental issue to address is the principle of “Do no harm”. During research trials and after dissemination there should always be a self-harm risk protocol in place (Sharkey et al., 2011). This could include advice to speak to their general practitioner and a list of appropriate health professionals and emergency numbers to call (Cockayne, 2011). Furthermore, we need to provide quality ratings of Internet health programs (Christensen et al., 2010), so users can be guided to programs that are of good quality and well documented. Beacon is a new initiative where an independent panel of experts provides ratings for mental health web-sites (Beacon, 2013). Taxonomy for technology-based interventions needs to be in place, allowing users to evaluate the quality, evidence, and content in interventions. Finally, mental health professionals need to provide these services so consumers are not forced to seek online therapeutic or self-help services from unlicensed and untrained providers (Proudfoot et al., 2011).

In their Guidelines for Internet Intervention Research, Proudfoot and colleagues (2011) offer guidelines for ethical issues that cover benefits and risks, privacy protection, secure and encrypted data transmission, and information about user rights and responsibilities. In intervention and psychotherapy research it is rare to find reports that include structured analyses of negative effects (Barlow, 2010). This should be addressed in the future to increase acceptability among decision makers. In addition, before dissemination of interventions, an appropriate risk assessment should be undertaken (Whitehead & Proudfoot, 2010).

An ethical consideration not mentioned in this thesis is poverty. A review of guided face-to-face interventions showed improved mental health for the participants for all interventions (Lancet, 2011). The review stresses the importance of accessible,

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affordable, and appropriate mental health care for all populations. Other studies have found that underserved communities can benefit from web-based interventions (Muñoz, 2010). Even so, access to Internet could be limited. Some rural villages have Internet access in cafés or libraries, but limited private access to the Internet. The technology and access to broadband is not affordable for most people in poverty (Figueiredo, 2011). Tablet computers and smartphones may be part of a solution for dissemination of technology-based mental health interventions for people living in poverty (Figueiredo, 2011; Muñoz, 2010).

## 2. BACKGROUND TO THE THESIS

### 2.1 Methodological considerations

#### 2.1.1 Translation of MoodGYM and BluePages

Prior to translating the Internet-based interventions into Norwegian, a study (Paper I, see chapter 3.1) was undertaken to investigate the need for a web-based self-help intervention (Lintvedt et al., 2008). Nearly 32% of the respondents reported a perceived need for help but had not sought help and therefore had an unmet need for help. Among these respondents, 91% reported a positive attitude to using a service like MoodGYM. The intention to use an Internet-based service based on CBT (i.e., MoodGYM) was assessed by using the theory of planned behaviour. The overall regression model accounted for 49% of the variance of the intention to use an Internet-based self-help service such as MoodGYM, where “need for help” was the most powerful predictor of the intention to use MoodGYM, explaining 22% of the variance.

In February 2006, a Norwegian language version of BluePages and MoodGYM was made available (Lintvedt et al., 2011). This was done in order to evaluate the effectiveness and efficacy of the translated intervention (Paper II, see chapter 3.2). The planning of this project started in July 2004 and it was completed in June 2006. The author of this thesis led the translation procedure in Norway. The translation of BluePages was formalised in a licensing deed, specifying ANU as the intellectual property owner and with obligations for the collaborating partners. For MoodGYM, the research collaboration agreement specified a non-exclusive, non-transferable license for the translated version during the period of collaboration and joint ownership of the data from the collaboration. The translation of MoodGYM and BluePages was carried out between October 2005 and January 2006. The Norwegian version of the BluePages website was developed using a two-phase process. First, a professional translator prepared a Norwegian version of BluePages. In the second phase, the translation was adjusted by the research group at the UiT in Norway, to ensure that it was culturally appropriate for Norwegian users. The MoodGYM training program was translated in four phases. The research group conducted the first

phase of translation. In phase two, clinical professionals with formal competence in cognitive therapy, scrutinized the translation from the first phase, and made adjustments to the text when necessary. In phase three, an expert translator of English compared the Norwegian version of the program with the original Australian version and checked for inconsistencies. In the fourth phase, the research group evaluated all changes and finalised the translation.

Finally, a cost-effectiveness analysis was conducted to evaluate the translation process (Lintvedt, Griffiths, Eisemann, & Waterloo, 2013) (Paper III, see chapter 3.3). The estimated health effect was found using quality-adjusted life years (QALY).

### *2.1.2 Internet-based Interventions*

Paper II and Paper III are based on a trial where an Internet intervention was made available to Norwegian university students. The Internet intervention comprised access to the Norwegian versions of MoodGYM and BluePages. The Internet Intervention was intended to simulate a real life setting, where both programs were available for the user and the two programs refer to each other.

*MoodGYM* (<http://www.moodgym.no>) is a free, interactive self-help program based on principles of cognitive behaviour therapy (CBT), Interpersonal Therapy and relaxation techniques. MoodGYM is designed to prevent and decrease symptoms of depression. The program presents treatment information by using several multimedia formats, has a high level of automated tailored feedback and is evaluated as highly dynamic (Barak et al., 2009). The website consists of a set of five training modules: feelings, thoughts, unwarping, de-stressing, and relationships. The MoodGYM modules aim to increase the users' knowledge about their own symptoms, negative automatic thoughts, dysfunctional attitudes, emotions, and coping strategies with regard to stress and interpersonal relationships (ANU, 2011a). In addition, MoodGYM incorporates a personal workbook (containing 29 exercises and assessments) and an interactive game (see Appendix C for more details).

A brief overview of the modules in MoodGYM follows (Centre for Mental Health Research, 2013a; Christensen, Griffiths, & Korten, 2002):

Module 1, Feelings: The module introduces the concept that negative or biased thinking can directly influence feelings of anxiety, inferiority and depression. Based on self-reports the users receive feedback on areas of vulnerability.



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Module 2, Thoughts: The users learn to contest errors through examples and exercises, review their positive and negative characteristics, and learning how to improve self-esteem.

Module 3, Unwarping: The users are introduced to the idea of mental biofeedback, which involves monitoring the frequency of distorted thoughts. They go through a variety of exercises based on their highest scores from the vulnerability test in module 1.

Module 4, De-stressing: The users start learning about stress and how it works. A guide to improving relationships with parents is then introduced. The rationale and methods of relaxation are introduced. Three types of relaxation tapes are available to download from the site.

Module 5, Relationships: Broken relationships can create a lot of stress and discomfort. This module teaches one to cope with failure and how to get ahead. It also teaches effective problem-solving strategies.

Modules 1–3 are based on CBT, module 4 on BA/Mindfulness, and module 5 on IPT. MoodGYM's main aim is to help users identify problem emotions and alleviate depression symptoms. As mentioned, the program teaches users about their thoughts and feelings and how to manage them. Furthermore, they are taught to identify negative or biased thinking and develop coping skills. The modules are hierarchically organized and must be completed in sequence. Through quizzes and exercises the users are given tailored automated feedback about their responses, progression and test results. MoodGYM was originally designed to prevent depression for youth between 15–25 years of age (Christensen et al., 2002). However, MoodGYM data from more than 17,000 sessions during the first six months in 2001, found the average age of users to be 35 years with 60% female (Christensen et al., 2002). Data indicated that users had elevated anxiety and depression symptoms relative to those found in population-based surveys. This study demonstrated a significant decrease in depression scores as individuals progressed through the modules. Since then, several studies have been published that demonstrate the effectiveness of MoodGYM (e.g. Calcar et al., 2009; Christensen & Griffiths, 2002; Christensen et al., 2004; Christensen, Griffiths, Mackinnon, & Brittliffe, 2006; Farrer, Christensen, Griffiths, & Mackinnon, 2012; Mackinnon et al., 2008; Powell et al., 2012). The first RCT of MoodGYM demonstrated that relative to an attention Control

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condition, recipients of MoodGYM showed a significant decrease in symptoms of depression in a sample ( $n = 525$ ) recruited from the general community (Christensen et al., 2004). The trial had three research arms; web-based educational intervention offering depression literacy (BluePages); self-guided web-based therapeutic intervention (MoodGYM); and control group, offered weekly telephone calls with a lay interviewer, discussing lifestyle factors (intention placebo). Both interventions were effective in reducing symptoms of depression, where pre-post effect size was  $d=0.4$  for both MoodGYM and BluePages. This reduction was maintained at 12-month follow-up (Mackinnon et al., 2008). See Appendix C for more information on modules and online exercises and assessments in MoodGYM.

*BluePages* (<http://www.bluepages.no>) is a free web-based educational intervention that provides evidence-based information about depression. The webpage includes information about symptoms, sources of help, the scientific evidence of medical, psychological, and alternative treatments, and information about depression prevention. The information is extensive comprising approximately 400 pages (ANU, 2011b). Through quizzes, users are given automated feedback about their anxiety and depression levels compared to community levels. The psycho-education provided through BluePages has been shown to reduce symptoms of depression, to improve users understanding of depression and knowledge about effective treatments, and to reduce personal stigma (Christensen et al., 2004; Griffiths, Christensen, Jorm, Evans, & Groves, 2004; Mackinnon et al., 2008). This reduction was maintained at 12-month follow-up (Mackinnon et al., 2008),

### 2.1.3 Instruments

Screening questionnaires in mental health are instruments aimed at measuring symptoms of disorders and they often claim to measure the severity of the disorder (Ethel Louise Armstrong Foundation, 2003). They can give an indication of the prevalence of a mental disorder in a population and assess the probability of a mental disorder. Screening can be conducted as self-report or based on ratings made by a health professional. Questionnaires can be administered as paper and pencil, via telephone or online. The main outcome measures used in this thesis are presented here (for details see Appendix B).

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A study comparing eight self-report measures of depression using DSM-III criteria concluded that the Center for Epidemiologic Studies Depression Scale [CES-D] (Radloff, 1977; 20 items) and the Beck Depression Inventory [BDI] (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; 21 items) were the scales of choice (Gotlib & Cane, 1989). Self-report measures of depression yield a high rate of false positive and false negative results, identifying persons as depressed who do not meet the criteria for a clinical diagnosis, and failing to identify persons with a depressive disorder. Studies on the CES-D have reported false positives rates between 6-16% and false negative rates between 36-40% (Myers & Weissman, 1980; Roberts & Vernon, 1983).

Screening questionnaires that is internally consistent or give consistent results over time is reliable (Fitzpatrick, Davey, Buxton, & Jones, 1998). There are several forms of validity. Construct validity refers to whether the scale actually measures what it claims to measure. Construct validity can be measured by comparing with other screening questionnaires aimed at measuring the same theoretical construct (Fitzpatrick et al., 1998). It should not be based on correlation alone, but rather on repeated empirical findings (Cronbach & Meehl, 1955). Based on calculations of sensitivity, specificity, Area Under the Curve (AUC), Positive Predictive Value (PPV) and Negative Predictive Value (NPV) one can assess the performance of a diagnostic test (Kumar & Indrayan, 2011). The likelihood that a person who does not have a disorder is called specificity and the likelihood that a person who has a disorder is screened as positive is known as sensitivity (Centre for Evidence Based Medicine, 2009). Self-report inventories of depression are often sensitive for detecting cases of depression (sensitivity) but are not as accurate in detecting non-cases of depression (specificity). Overestimating the prevalence of depression occurs with both the BDI and CES-D, albeit to different degrees (Oliver & Simmons, 1984; Zich, Attkisson, & Greenfield, 1990).

*Centre for Epidemiologic Studies Depression scale (CES-D).* The self-report 20-item depression scale from the Center for Epidemiologic Studies (Radloff, 1977) was used for assessing symptoms of depression. Each item of the CES-D is scored on a four-point ordinal scale, possible scores ranging from 0 to 60, with higher scores indicating more symptoms of depression. A score of 16 or above has been used as a cut-off score to identify persons with clinically significant symptoms of depression.

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This criterion has some limitations (Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995).

Research on the effectiveness of various cut-off scores for CES-D in clinical samples generally supports the utility of a cut-off score of 16 (Boyd, Weissman, Thompson, & Meyers, 1982). Findings suggest that the conventional cut-off score of 16 drastically increases the number of individuals classified as depressed in non-clinical adolescent samples (Santor et al., 1995). Findings from another study did show that 48% of high school students obtained scores of 16 or more on CES-D (Roberts, Lewinsohn, & Seeley, 1991). Higher cut-off scores (20, 22, and 27) have been found to increase sensitivities of up to 100% with improvements in false-positive rates and specificity (Zich et al., 1990). These researchers suggest that the DBI is better to discriminate between depressed or non-depressed, than the CES-D.

Fechner-Bates and colleagues (1994) reported that differences in severity of CES-D scores across the three DSM depression categories (mild, moderate and severe) did only find significant differences between the severe and mild groups. Rushton and colleagues (2002) have proposed a stratified scale for adults in the general population: 'subclinical' (0–15), 'mild/moderate' (16–23) and 'moderate/severe' ( $\geq 24$ ). CES-D has high internal consistency (general population  $\alpha = .85$ ; clinical population  $\alpha = .90$ ) (Radloff, 1977).

CES-D is positively correlated ( $r = .70$ ) with the Beck Depression Inventory (BDI; Beck, Brown, & Steer, 1996; Roberts et al., 1991). Results suggest that the CES-D may be more discriminating of individual differences in depressive severity than the BDI. CES-D may be more appropriate for assessing depressive severity in college populations, whereas the BDI may be more appropriate for identifying cases of depression. In clinical populations, both scales may discriminate individual differences in depressive severity (Santor et al., 1995).

*Kessler Psychological Distress Scale* (K10; Kessler et al., 2002) is a scale measuring psychological distress. Scores on the K10 scale range from 0 to 50, with higher scores indicating greater distress. Subjects who score under 20 are likely to be well, between 20–24 they are likely to have a mild mental disorder, between 25–29 are likely to have a moderate mental disorder and with a score 30 and over they are likely to suffer from a severe mental disorder. A Norwegian version of the K10 was used as a screening tool for identifying participants eligible for the study. The English

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language version was translated into Norwegian by the authors with subsequent back translation into English by an expert translator. The internal consistency of the Norwegian version of the scale was  $\alpha = .79$ . As participants at risk of depression were the target group, a cut-off score of 20 or above was set for eligibility for the Internet intervention study. The recommended intervention for people scoring between 16 and 29 on the K10 is self-help (Saunders & Daly, 2001). The K10 correlates strongly ( $r = 0.84$ ) with the CES-D.

*Automatic Thoughts Questionnaire (ATQ)*. This measure assesses the frequency of negative automatic thoughts associated with depression. The ATQ (Hollon & Kendall, 1980) consists of 30 items and has five response categories. Accordingly, scores range from 30 to 150. The Norwegian version of the ATQ had previously shown an internal consistency of  $\alpha = .83$  and has proven to discriminate between clinically depressed and non-depressed psychiatric patients and healthy controls (Chioqueta & Stiles, 2004). In this study, the internal consistency of the Norwegian version of the scale was  $\alpha = .95$ .

*Treatment Depression Literacy (TDL)*. This measure comprises a combination of four depression literacy measures previously described by Christensen and colleagues (2004) and which evaluates the participants' knowledge about the effectiveness of treatments for depression and their knowledge about cognitive behaviour therapy. The measure covers the following areas: medical literacy (scores range 0-2), psychological literacy (scores range 0-3), lifestyle literacy (scores range 0-3) and cognitive behaviour therapy (CBT) literacy (scores range 0-16). In this study, the internal consistency of the Norwegian version of the scale was  $\alpha = .87$ .

*Quality of Life (QoL)*. The report "The QALY Toolkit" has been used as a source document for determining utility values (Gudex & Kind, 1988). For a long time the toolkits suffered the limitation that they were not validated; however, since the tools have been validated they are widely used (Bryan, Parkin, & Donaldson, 1991; Gudex et al., 1990). According to Gudex and Kind (1988) there were in principle only three recommended methods for determining utility values: collecting disability-distress data using a self completed questionnaire (as in observational studies), eliciting views from selected reference groups and reprocessing data from published sources. Researchers found it difficult to use these guidelines and some

concluded that the technique, for example reprocessing, could lead to overestimated QALYs (Coast, 1992). A more recent review concluded that none of the seven leading generic instruments fully meet the criteria in QoL measurement theory, and that they produce utility values that are strikingly different from each other (Hawthorne, 2007). Study outcomes could be a function of the chosen instrument instead of the effect of the intervention. The advice is to use two measures and report results from them both, and not let the shortcomings be an obstacle (Hawthorne, 2007). In addition, it seems reasonable to assume that the outcomes from these instruments could be used to compare different interventions. The original valuation matrix was based on 70 respondents (doctors, nurses, patients, etc.) and was not a random sample of the population. The matrix has since been transformed and validated in several publications (Gudex, 1993). The Rosser valuation matrix in its present form is based on the method of Magnitude Estimation (Kind, Rosser & Williams, 1982), using findings from studies from England (Rosser & Kind, 1978), but also corresponds well with Norwegian data (Nord, 1996). “The QALY Toolkit” by Gudex and Kind (1988) did bring together all background information on measuring QALYs and documents the development of the Rosser Index.

*The Rosser Classification of Illness States scale* (Rosser Index; Rosser & Kind, 1978) offers a ratio scale based on QoL, for estimating a utility value that captures the degree of improvement in health ( $\Delta H$ ). This is a generic measure with a single index measure for health status. The  $\Delta H$  is used to calculate the gain in QALYs. The method was based on classifying outcome data from the trial into two components: Disability categories and Distress categories, which define 29 potential health states (Rosser & Kind, 1978). The process of deciding appropriate categories is according to Gudex and Kind (See Appendix B for more details about the Rosser Index).

The gain in QALYs is based on this utility value ( $\Delta H$ ), multiplied by the time interval over which the improvement occurred (T):  $\text{QALY-gain} = \Delta H \times T$  (Olsen, 2009). Rosser’s original weights were based on 70 single cases and were never intended to be representative of the general community. Kind, Rosser and Williams (1982) offers valuations from 6 different population groups, where psychiatric patients are one.

### 2.1.4 *Missing data, dropout, compliance, adherence and attrition*

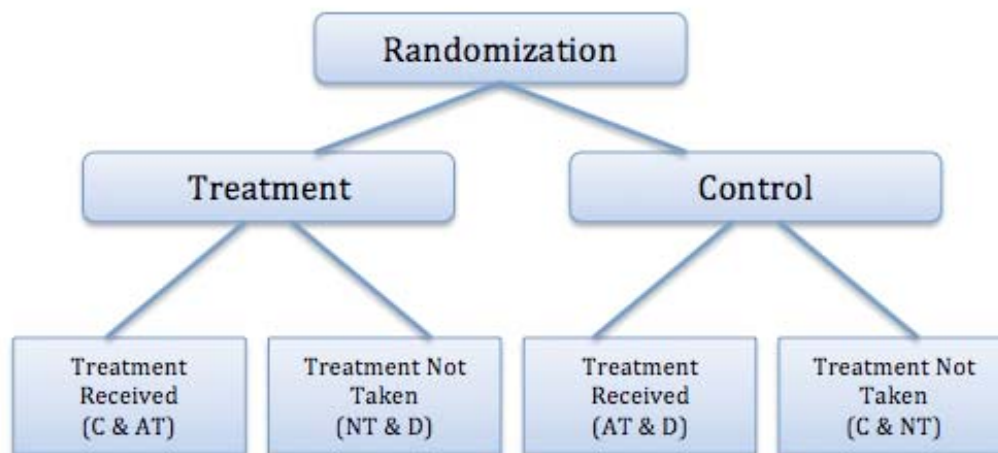
A recent review of dropout from Internet-based treatment programs for psychological disorders (Melville, Casey, & Kavanagh, 2010) found an average dropout rate of 31%. Even clinical RCTs of depression treatments, report attrition as high as 30% (DeRubeis et al., 2005; Elkin et al., 1989). In their review of attrition and adherence in Internet trials, Christensen and colleagues (2009) found that several important terms were used interchangeably (e.g. drop-out, attrition, adherence, and compliance), lack of operationalization for terms, and limited application of statistical methods to handle missing data.

The term 'dropout' is used to describe persons leaving a trial before it is completed (Davis, Hooke, & Page, 2006). They fail to complete the research trial protocol and do not complete trial assessments (Christensen et al., 2009).

Hippocrates described non-compliance as a problem more than 2000 years ago (Aronson, 2007). The terms compliance and adherence have been widely used in relation to describe the medicine-taking behaviour of the patient (Bell, Airaksinen, Lyles, Chen, & Aslani, 2007). One definition of compliance is: "The extent to which the patient's behaviour matches the prescriber's recommendations" (Haynes, Taylor, & Sackett, 1979). Adherence is often used to describe that patients has a free will regarding whether to follow the recommendations and emphasising the need for agreement, and could be defined as: "The extent to which the patient's behaviour matches agreed recommendations from the prescriber" (Horne, 2005). Adherence and compliance are two terms that in practice are often used interchangeably in the field of Internet-based intervention research, and also in this thesis they will be used in the same way.

In the field of Internet-based intervention research, compliance is concerned with whether participants are complying with their assigned treatment regimen (Christensen & Mackinnon, 2006). Compliance does not have to be either or, i.e. compliant or non-compliant (Christensen et al, 2009). Compliance could be classified as one of four types; compliers, defiers, never-takers and always-takers (Angrist, Imbens, & Rubin, 1996). Compliers are participants who would take whatever treatment is assigned, never-takers are those who would not take the treatment regardless of what condition they are assigned to, always-takers would take the active treatment regardless of what they are assigned, and defiers do the opposite of what

they are assigned (Imbens & Rubin, 1997). This is a more complex classification and its inclusion requires planning ahead of the trial. According to the classification from Angrist and colleagues (1996), the group that receives treatment in the treatment condition, will consist of both Compliers and Always Takers (Figure 1).



*Figure 1.* Complier class principal strata defined by potential outcome of treatment. Compliance: C = Complier, AT = Always Taker, D = Defier, NT = Never Taker.

Adherence is often used an indicator of how well a person implements a health related prescription (Cockayne et al., 2011; Postel et al., 2011). For example, it could function as an indicator of how much of the website the user has used the material on the website (Christensen et al., 2009). Information on adherence can be collected as by assessing duration of web exposure, number of logons, time spent on website, number of words typed, and number of modules or exercises completed (Christensen & Mackinnon, 2006; Donkin et al., 2011). All this indicates quantity, not quality. It is possible to drop out from the trial but still be adherent to the treatment (Christensen et al., 2009), as well as completing the trial but not being adherent to the treatment. Reviews on the impact of adherence on effectiveness have found a great variation in how adherence is defined, and argue that the lack of agreement regarding how to measure adherence contribute to this variation (Donkin et al., 2011).

Predictors of increased adherence to Internet-based depression interventions have been found to be associated with younger age, less knowledge of psychological



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treatments and lower baseline rates of depression (Christensen et al., 2009; DeRubeis et al., 2005), disease severity, treatment length, and chronicity (Christensen et al., 2009). Depression is also one of the most consistent determinants of poor adherence to somatic treatments (Cockayne et al., 2011).

Attrition might be an indicator of satisfaction with treatment (Hudak & Wright, 2000). In an early review of bibliotherapy, Glasgow and Rosen (1978) concluded that attrition was a primary problem in self-help studies. Since then, however, several meta-analyses have revealed no significant differences in dropout between self-help and control conditions (Gould & Clum, 1993; Hirai & Clum, 2006).

It has been claimed that discontinuation occurs more frequently in unguided online interventions than in traditional therapy with a reported occurrence of 99% in some studies (Eysenbach, 2005). This dropout can occur for different reasons, including participants not commencing the program, participants discontinuing usage and those lost to research follow-up (Eysenbach, 2005). Eysenbach refers to this as ‘the law of attrition’ and regards it as a fundamental characteristic and methodological challenge in the evaluation of Internet-based applications. In a study of Internet-based treatment of social phobia comparing guided vs. unguided delivery of the intervention, there were no group differences in dropout or adherence (Berger, Caspar, et al., 2011). In similar studies comparing unguided vs. different types of guided delivery of Internet-based self-help treatment, there were no significant differences in outcome measures or dropout between groups (Berger, Hämmerli, Gubser, Andersson, & Caspar, 2011; Farrer et al, 2012).

A result from dropout, non-compliance, low adherence and attrition, is missing data. It matters *why* data are missing (Little & Rubin, 2002; Rubin, 1987). Three types of missing data mechanisms have been described (Little & Rubin, 1989; Rubin, 1976). Missing completely at random (MCAR) implies no systematic reasons for missingness. The MAR missing mechanism allows missing data to depend on observed characteristics of the participants (e.g., age, gender, outcomes prior to withdrawal), but not on unobserved variables (Salim, Mackinnon, & Griffiths, 2008). Missing at random (MAR) implies that data are not MCAR. Under MAR the missing variables can be predicted from other measures. When missingness is related to the outcome variables then data is non-ignorable missing or missing not at random (MNAR). A fourth type was introduced by Little (1995), the covariate-dependent

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missingness (CD). In this missingness mechanism the probability of withdrawal does not depend on the outcome variables, but may still depend on the participant's fixed characteristics (e.g., age, gender, treatment group). This missingness mechanism falls between MCAR and MAR (Little, 1995).

In their review, Christensen and colleagues (2009) reported reasons for dropping out from the trial: time constraints (10 studies), lack of motivation (3 studies), technical or computer-access problems (3 studies), depressive episode or somatic illness (2 studies), the lack of face-to-face contact (1 study), preference for taking medication (1 study), perceived lack of treatment effectiveness (5 studies), improvement in condition (4 studies), and burden of the program (2 studies).

### *2.1.5 Statistical analysis*

#### *2.1.5.1 Analysis of pre-post design*

Randomized clinical trials are straightforward to analyse when all participants take the assigned treatment, and outcomes are reported without missing data (Little, Long, & Lin, 2009). Missing data is problematic as treatment effects often are evaluated by comparing change over time in outcome measures. Whether the missing data represents a problem depends on reasons for the missingness (Milliken & Johnson, 2002), i.e., missing mechanisms (Little and Rubin, 2002; Rubin, 2004; Schafer, 1997).

A common approach used to analyse incomplete longitudinal data is based on such methods as list-wise deletion, last observation carried forward (LOCF), complete case analysis (CC), or simple imputation (Jansen, Beunckens, Molenberghs, Verbeke, & Mallinckrodt, 2006). Often, the method used is chosen without considering the possible influence on the final results (Jansen et al., 2006). These analyses generally have serious deficiencies, and results can be biased when data are not MCAR (Molenberghs, Thijs, Jansen, & Beunckens, 2004). Inferences based on these deletions or imputation approaches are not biased under MCAR, but there is a loss of information in term of statistical power. It is permissible to exclude the missing observations when data are MAR but not MCAR, when a regression model controls for all the variables that affect the probability of missingness (Little, 1992). In addition, discarding cases with missing data result in reduced statistical power. He (2010) offers an example: when data are missing completely at random and the

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missingness is 5% for each of the 20 variables. The simplest analysis method is CC, where cases with missing data are excluded (He, 2010). When applying CC analysis, almost two thirds of the cases will be lost because the complete cases only accounts for about 36% (He, 2010). This method generally has major deficiencies, and when data are not MCAR results could be biased (Molenberghs et al., 2004). LOCF imputes missing data with the last observed value.

Modern missing data methods are superior to the older biased approaches based on deleting or mean substitution (Rubin, Witkiewitz, Andre, & Reilly, 2007). Schafer and Graham (2002) state the essence of the missing data problem: "When missingness is beyond the researcher's control, its distribution is unknown and MAR is only an assumption. In general, there is no way to test whether MAR holds in a data set, except by obtaining follow-up data from non-respondents or by imposing an unverifiable model".

Only methods that capture the uncertainty inherent in the process (e.g., Maximum likelihood [ML], Mixed-effect Model [MM], Multi Imputation [MI]) are acceptable (Enders, 2006). These modern methods assume that the data are at least MAR (Gueorguieva & Krystal, 2004).

Little (1988) has provided a  $\chi^2$  test for the MCAR assumption. Data are not MCAR if the test is significant (Howell, 2007). If this goodness-of-fit test is non-significant, it leaves us with data that are either MAR or MNAR. There is work in progress for developing a test that could assume MAR (Jaeger, 2006).

Studies and established theory suggest that simulation models or multi imputation models should be the methods of choice (Elobeid et al., 2009). Simulation studies suggest that the mixed model approach for trials with a high percentage of missing data is more powerful than other options (Chakraborty & Gu, 2009). A high percentage could be when more than 20% of the cases in the dataset would be excluded by list-wise deletion (Arbuckle, 1996). The mixed-effects model is able to account for correlation among repeated measurements for each participant (Topolovec-Vranic et al., 2010). The MM repeated measures (MMRM) are able to account for correlations among repeated measurements for participants and can include participants with missing data. The MMRM use all available data and gives unbiased and efficient estimates of effectiveness under missing completely at random

(MCAR) and missing at random (MAR) assumptions (Gueorguieva & Krystal, 2004). MM has features such as flexible modelling of relationships between observations over time, modelling of change at group, subgroup and individual level. In a recent systematic review, Christensen and colleagues (2009) found that most studies failed to analyse missing data by appropriate statistical techniques. Rather than using the older biased methods, Christensen and colleagues suggest the use of MMRM approaches to missingness, and concluded that even research trials that are already published could need to be re-analysed (Christensen et al., 2009). MMRM has been studied extensively in the context of neuropsychiatric clinical trials (Mallinckrodt, Clark, & David, 2001a; Mallinckrodt, Clark, & David, 2001b). MMRM was found to be more robust to biases from missing data than LOCF analysed with ANCOVA, and MMRM was found to give superior control of Type I and Type II errors. The LOCF method was shown to both underestimate and overestimate treatment group differences when data were missing.

### *2.1.5.2 Estimating the Intervention effect*

Depending on the purpose of the intervention, one can decide whether to estimate the overall intervention effect of treatment assignment for the entire sample or to estimate the intervention behavioural effectiveness when the treatment is in fact taken. Intention-To-Treat (ITT) analysis is a widely accepted method for the first purpose, whereas Complier Average Causal Effect (CACE) estimation is a relatively new method that serves the second purpose (Little et al., 2009).

One of the earliest methodological discussions in the research community that deals with what we today describe as ITT, was that by Peto and colleagues (1977), where they advocate: "...even patients who do not get the proper treatment must not be withdrawn from the treatment". Later the American Statistical Association defined ITT as "a strategy that includes all randomized patients in the groups to which they were randomly assigned, regardless of their compliance with the entry criteria" (Fisher et al., 1990). The ITT approach builds on randomization that gives protection from bias (Little et al., 2009), and analysis must be performed on the groups produced by the randomization process. Another reason for doing ITT analysis is to overcome some of the difficulties in defining compliance (Werts, 1995). However, there is a debate about the validity of excluding specific cases from an ITT analysis (Fisher et

al., 1990). Clinical effectiveness may be overestimated if an intention to treat analysis is not done (Bollini, Pampallona, Tibaldi, Kupelnick, & Munizza, 1999). ITT has been described as the causal effect of treatment assigned but not necessarily the causal effect of treatment received (Jo, 2002). If the overall purpose of the trial is to measure the effectiveness of a treatment, or the overall causal effect of treatment assignment, ITT analysis is an appropriate method. As mentioned before, attrition could be a challenge in the evaluation of Internet-based applications (Eysenbach, 2005).

In intervention studies where the aim is to assess whether the mechanism underlying the intervention itself is efficacious, the analysis necessarily focuses on those who have received at least a minimum ‘dose’ assumed to be required if not the complete treatment (Little et al., 2009). Estimation of the CACE parameter may be a useful approach to analysis. The CACE parameter is essential for understanding the potential effects of the intervention for those who received meaningful intervention doses (Little & Rubin, 2000). The analysis is based on randomization and thus protected from bias (Little et al., 2009).

Decision makers might also be interested in the CACE parameter if it is likely that the intervention implementation can be improved and the intervention adherence increased (Schochet & Chiang, 2009). When there is a small ITT effect, the CACE parameter can differentiate whether this is related to low rates of compliance or small treatment effects among compliers (Jo, 2002). Each of these scenarios implies different strategies for improving intervention effects (Schochet & Chiang, 2009).

CACE modelling produces a summary measure of individual-level treatment effects enabling comparison between observed compliers in the intervention group and the subpopulation of latent compliers among the control participants (Bellamy, Lin, & Ten, 2007; Little & Rubin, 2000). Compliance can only be observed in the treatment condition of the trial. For the control condition, the proportion of compliers must be estimated. One approach to estimating latent compliers involves using mixture modelling with maximum likelihood (ML) estimates. The Amos program (IBM, 2011) can be used for these ML estimates and builds on the assumption that data missingness is MAR. Mixture modelling is discussed in the context of structural equation modelling by Arminger, Stein and Wittenberg (1999), Hoshino (2001), and Lee (2007), amongst others. Amos ‘learns’ from the cases that are already classified as compliers in an intervention group, to classify the group of latent compliers in the

control condition. Based on these groups of compliers, traditional analysis for intervention effects can be undertaken. As mentioned above, compliance could be classified as four types: compliers, defiers, never-takers and always-takers (Angrist et al., 1996).

### 2.1.5.3 Effectiveness, efficacy and effect size (ES).

ITT analysis gives an estimate of the overall intervention effect of treatment, or the interventions effectiveness. Effectiveness refers to how well the intervention work in practice, in “real-world” conditions (Flay et al., 2005). Studies that explore effectiveness focus on quality of implementation, and whether the intervention achieves its stated goals and produces measurable outcomes. The CACE estimation is used to estimate the intervention effect under optimal conditions (efficacy) for those who complied with the treatment (Little et al., 2009). CACE analysis are based on randomized samples and thus protected from bias (Little et al., 2009). Other approaches to estimate efficacy are based on sub-samples and are prone to bias by treatment noncompliance (Little et al., 2009). In as treated (AT) analysis, participants are categorized according to treatment actually received and in per-protocol (PP) analysis are based on those complying with assigned treatment (Little et al., 2009).

CACE is considered a better alternative to AT or PP analysis. One advantage of the CACE method is that the causal effect is estimated on the basis of participants’ potential outcomes under every treatment assignment status (Angrist et al., 1996).

There are several approaches to calculate effect size (ES). The between groups ES in longitudinal studies is often calculated as the difference between the mean score before and after the intervention (change score) divided by the pooled standard deviation (SD) of the population from which the groups were sampled (Ellis, 2009), e.g. Cohen’s (1988) approach to calculate ES, Cohen’s *d*. One other often-used ES index allow for groups that are dissimilar in size, where each group's standard deviation is weighted by its sample size. This approach is used in Hedges’ *g* (Hedges, 1981). In addition, Hedges' *g* has also been found to remove small positive biases that are present in the calculation of *d* for smaller sample sizes, where the ES index has been shown to be upwardly biased (Hedges, 1981; Lipsey & Wilson, 2001).

## 2.2 Aims of the thesis

The general aim of this doctoral thesis is to evaluate and to make effective psychological prevention interventions more accessible for those in need, by implementing a Norwegian version of two Internet-based unguided self-help interventions for depression. Internet-based interventions are costly to develop and require long-term research to test and evaluate their efficacy, effectiveness, and cost-efficacy before they can be disseminated en masse. An alternative to developing these interventions is to translate existing programs that have proven effective, into Norwegian. The feasibility of such a translation project is considered. The specific aims and hypotheses are as follows:

### 2.2.1 Specific aims:

#### *Primary aim:*

1. To determine the effect of a translated Internet-based self-help intervention on reduction in symptoms of depression, when delivered without any therapist or other support (unguided). (Paper II)

#### *Secondary aims:*

2. To test intervention efficacy, the potential effects of the intervention under ideal conditions. (Paper II)
3. To determine the cost-effectiveness of the translated Internet-based interventions with regard to health benefits. (Paper III)

#### *Subsidiary aims:*

4. To determine the intention to use an Internet-based self-help intervention, and find predictors for intention. (Paper I)
5. To consider the feasibility of providing access to Internet-based interventions in the national language versions. (Paper III)
6. To evaluate user satisfaction with the Internet-based intervention. (Paper II)

### 2.2.2 Hypotheses:

#### *Primary hypothesis:*

- H1. The unguided Internet Intervention group will show a greater reduction in symptoms of depression over a 2-month period than a Waiting List Control (WLC) group.

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### *Secondary hypotheses:*

- H2. The effect for the group that complies with treatment will be greater than the effects from ITT and completers analysis.
- H3. The cost-effectiveness based on estimated health effect in QALYs, for the translation project will be beneficial and provide the highest value for money.
- H4. The Internet Intervention group will be associated with greater improvements in negative automatic thoughts and depression literacy than the WLC.
- H5. The intention to use Internet-based self-help among university students will be high.



### 3. RESULTS: SUMMARY OF RESEARCH PAPERS

The findings of the studies undertaken for this thesis have been published in three papers (see Chapter 6: Appendix A). This chapter provides a summary of the findings in each of the papers. Further details are available in the published papers.

#### **3.1 PAPER I: The need for Web-based cognitive behaviour therapy among university students**

##### *3.1.1 Aims*

This study (Lintvedt et al., 2008; see Appendix A1) investigated students' need for an Internet-based cognitive-behavioural therapy (CBT) intervention program for preventing depression. The study was conducted prior to the existence of any Internet-based self-help programs in Norway. We aimed to investigate predictors of the intention to use Internet-based prevention interventions.

##### *3.1.2 Method*

Questionnaires were handed out at various lectures to 630 students at a University and a University College in Norway. The sample represented 6.3% of the total student population. The response rate was 58% (n=367) with a clear female majority (72%). The demographic variables recorded in this study were age and gender. Depressive symptoms were assessed by the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977). Habitual negative self-thinking was assessed by the Habit Index of Negative Thinking (HINT; Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007).

The intention to use an Internet-based service based on CBT (i.e., MoodGYM) was assessed by using the theory of planned behaviour (TPB; Ajzen, 1991, 2002). The TPB questions developed for this study comprise different scales measuring perceived behavioural control, subjective norms, attitudes toward using MoodGYM, and intentions to use MoodGYM.

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Other measures used in this study were previous help seeking and mental health, assessed by asking whether the participants had felt need for help with psychological problems during the previous 12 months but refrained from seeking help. Previous use of Internet for health-related purposes during the previous year was assessed. Self-reported need for help from an Internet-based service such as MoodGYM was assessed by asking the participants if they feel the need for MoodGYM for themselves, for others they know, have other reasons for using MoodGYM, or if they are not interested in using MoodGYM. This was assumed to reflect the participant's motivation for using a service such as MoodGYM. The participants were provided with a written general description about an Internet-based self-help program based on the characteristics of MoodGYM. The description focused specifically on features such as anonymity, low threshold services (from home), availability and easy access. Finally, the purpose of MoodGYM as a program for preventing depression was elaborated.

### *3.1.3 Results*

The results show that almost 46% of the participants ( $n = 367$ ) had felt a need for help with psychological problems. This was a self-reported need they had felt within the last 12 months, without any restrictions regarding severity. The total sample could be divided into three groups according to their help-seeking behaviour. More than 54% of the participants in the sample reported no need for help (No Need), 32% had felt a need for help but refrained from seeking help and therefore had an unmet need for help (Unmet Need), and 14% have sought help for their problems (Sought Help). More than 40% of the Unmet Need group reported a CES-D score above the cut-off for depression compared to 30% in the Sought Help group and 13% in the No Need group. These findings were based on the standard cut-off score of 16 for the CES-D. The Unmet Need group and the Sought Help group reported significantly more negative thinking than the No Need group. With respect to searching for mental health information, the Sought Help group and the Unmet Need group had used the Internet to a significantly greater extent to search for mental health information than the No Need group. Finally, participants in the Unmet Need group and the Sought Help group reported significantly more need for Internet-based self-help for themselves than the No Need group.

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A hierarchical, multiple-regression analysis was conducted to investigate the effects of the psychological variables, previous help seeking, attitudes toward the Internet, and TPB variables on intention to seek internet help. The overall regression model accounted for 49% of the variance of the intention to use an Internet-based self-help service such as MoodGYM. The psychological background variable (previous help-seeking) explained 17% of the variance, TPB variable (attitude) 6% and use of Internet for health-related purposes 5%, respectively. Finally, the need for MoodGYM was the most powerful predictor of the intention to use Internet-based self-help, explaining 22% of the variance. Most of the participants (84%) reported a positive evaluation of the description of the web-based CBT program.

### *3.1.4 Discussion*

The relatively large number of participants with a felt need for help with psychological problems is not limited to clinical conditions but is reflecting a subjective need for help. Both students with a met and an unmet need for help reported symptoms of depression and negative thinking more frequently than participants with no need for help. Accordingly, offering MoodGYM, which focuses primarily on depressive symptoms and negative thinking, to the student population, may be an appropriate intervention to reduce such symptoms and alter thinking in this group of young adults.

In the empirical model of the intention to use web-based CBT we found that perceived behavioural control and subjective norms do not represent major factors in the intention to use MoodGYM. By using Internet the possibility of personal anonymity is high. Consequently, social pressure and the beliefs of others might be of less importance to users. Actually felt need for help, in this respect an unmet need for help with psychological problems, was associated with a stronger intention to use MoodGYM. Consequently, some students with a high degree of depressive symptoms or negative thinking but with no felt need for help might not use MoodGYM. MoodGYM is an alternative mental health service designed for helping people who for a variety of reasons do not seek help from other mental health services. There were a large number of students with an unmet need for help who felt positively toward the concept of using MoodGYM. This is encouraging as it suggests the potential feasibility of delivering MoodGYM to this population.

### **3.2 PAPER II: Evaluating the effectiveness and efficacy of an Internet-based self-help intervention for the prevention of depression: A randomised controlled trial.**

#### *3.2.1 Aims*

This study (Lintvedt et al., 2011; see Appendix A2) aimed to explore whether an unguided Internet-based self-help intervention could reduce symptoms of depression in a university student population with elevated levels of psychological distress (quasi ‘indicated’ prevention trial). Since the study was undertaken without any therapist support of the intervention or control groups, our specific intention was to estimate the usage and effectiveness of such sites by this age group in a real life setting. In addition, we undertook a CACE analysis for treatment effect to explore the potential effects of the intervention for those who received meaningful intervention services. A final objective was to evaluate user satisfaction with the online intervention.

#### *3.2.2 Method*

Participants were recruited among university students. A total of 215 fulfilled the eligibility criteria: access to the Internet, a score of 20 or above on the Kessler Psychological Distress Scale (K10; Kessler et al., 2002) and signed consent. All eligible participants were posted a pre-intervention questionnaire, and the 163 participants (76%) who returned this questionnaire were enrolled and randomised to one of the conditions in the trial. A total of 60% of the participants in the recruitment sample reported that they had felt a need for help with a psychological problem during the last 12 months but did not seek help for their subjectively felt need for help, thus having an unmet need for help.

The Internet intervention condition comprised access to two online websites: MoodGYM and BluePages. Participants in the control condition were informed when they received the pre-intervention questionnaire that the enrolment into the trial could last several weeks. The dropout from the trial was quite high with a mean dropout rate of 37.4%. Almost 47% of the participants in the Internet intervention condition and 28% in the control condition failed to complete the post-intervention questionnaire.

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The MoodGYM tracking data showed that 20 participants (24.7%) in the experimental condition, who did not return the post-intervention questionnaire, had used MoodGYM.

The K10 scale was used in the screening. The self-report 20-item Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was used in the pre- and post-intervention test battery for assessing symptoms of depression. The Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980) measures the frequency of negative automatic thoughts associated with depression, was also used in the pre- and post-intervention test battery. Finally, Treatment Depression Literacy (TDL), measured medical literacy, psychological literacy, lifestyle literacy, and cognitive behaviour therapy literacy. Demographic variables in this study were age, gender, marital status, previous depression, help seeking and need for mental health service, reasons for not seeking help.

### 3.2.3 Results

Among the participants in the main study, 59% in the experimental condition and 62% in the control condition reported an unmet need for help. Of the participants who returned the post-intervention questionnaire, 67% in the experimental condition and 56% in the control condition had initially reported an unmet need for help. Compared with those who dropped out, completers with an unmet need for help were more likely to report “Support from friends” and less likely to report the “Problem not serious enough” as reasons for not seeking help in the past. Participants in the Internet intervention group who dropped out had significantly higher pre-intervention CBT literacy scores than those who did not. Control group participants who dropped out had a significantly higher use of “Problem not serious enough” as a reason for avoiding help seeking than those who did not. A total of 62% of the participants remained in the trial at post-intervention including 52% of the Internet intervention participants. With respect to adherence, 27% of the intervention participants completed on average 55% of MoodGYM without any support or reminders. There was evidence of intervention effectiveness as assessed using Intention-to-Treat (ITT) analysis. The between group effect sizes were moderately high, being  $d = .57$  for depression,  $d = .50$  for automatic negative thoughts and  $d = .56$  for literacy. The intervention efficacy for compliers (pure treatment effect) was assessed by using the

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Complier Average Causal Effect (CACE) estimate. Between groups effect sizes were  $d = .74$  for CES-D and  $d = .54$  for ATQ, and  $d = .68$  for TDL. User satisfaction was high, with 83% finding the web sites useful or very useful.

### 3.2.4 Discussion

The results show that the Internet-based intervention, the combined use of the Norwegian versions of BluePages and MoodGYM, was effective in reducing symptoms of depression (CES-D) and negative automatic thoughts (ATQ) in a university student population. The intervention was also effective in increasing depression literacy. A total of 62% of the participants remained in the trial at post-intervention with higher dropout among the Internet intervention participants. With respect to adherence, the Internet intervention participants completed on average three of the five modules of MoodGYM without any support or reminders. More than half of the Internet intervention participants, who failed to complete the post-intervention questionnaire, had used MoodGYM (on average 2.4 modules). A total of 67% of the completers initially reported an unmet need for help with a psychological problem. Finally, participants were predominantly positive about the intervention.

The finding that the combination of BluePages and MoodGYM proved effective in reducing symptoms of depression and negative automatic thoughts, supports the results from the Australian studies on the effectiveness of these interventions (e.g., Calear et al., 2009; Christensen et al., 2004). The present study demonstrates the potential for Internet intervention programmes to reduce symptoms of depression with an unguided delivery method. The fact that the CES-D effect size for both completers and ITT was medium provides evidence of the effectiveness of the intervention effect regardless of compliance. The considerably higher CACE effect size shows the *potential* efficacy for this Internet based intervention. This is even clearer for the sub-groups, where the subclinical group and the mild/moderate group have high effect sizes. The increase in depression scores in the control group was unexpected, although this has been reported in one other study (Titov, Andrews, Choi, Schwencke, & Mahoney, 2008). The study also demonstrated the feasibility and successful translation of an interactive evidence-based Internet intervention into a different language and represents the first study of the use of an unguided Internet CBT program in Norway. The present trial confirmed that an unguided community-

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based Internet intervention could be effective in young adults. In addition, the findings demonstrate that the intervention has the potential to reach a target group with a perceived unmet need for help. The fact that two-thirds of the participants who completed the trial initially reported an unmet need for help with psychological problems indicates that the intervention motivated a self-help effort among a group of people who had not sought alternative or professional help.

Internet-based self-help could be a powerful tool for prevention and early treatment of depression, if it is made available and successfully promoted for those in need. Consequently, BluePages and MoodGYM should be further developed and implemented for large-scale early intervention and prevention of depression.

### **3.3 PAPER III: Evaluating the translation process of an Internet-based self-help intervention for prevention of depression: A cost-effectiveness analysis.**

#### *3.3.1 Aims*

The aims of this study (Lintvedt et al., 2013; see Appendix A3) were to evaluate the translation process of an Internet-based self-help intervention up to dissemination. Furthermore, cost and cost-effectiveness of the project were compared to the development cost of the original application in Australia. The study also considered the feasibility of creating access to Internet-based interventions in national language versions. Finally, the study provides a model and a starting point for cost-efficacy analyses for other development and translation projects.

#### *3.3.2 Method*

Historical cost from Norway and Australia were discounted based on the consumer price index into 2009 price level. The foreign currencies were converted into Euro based on real exchange rate from January 1<sup>st</sup> 2010.

From Study II, scores of the depressive symptoms and psychological distress scales were used to calculate the effect in quality-adjusted life years (QALY). QALY-gain is the improvement in health ( $\Delta H$ ) and the time interval (years) over which the improvement occurs (T):  $QALY\text{-gain} = \Delta H \times T$ . This was done by using the Rosser Classification of Illness States scale (Rosser & Kind, 1978), a ratio scale for estimating a value in QALY based on improvement of health.

#### *3.3.3 Results*

The total Norwegian cost was almost 18% of the Australian development cost. To obtain one QALY 56 subjects need to use the Internet Intervention in the same way as the group of completers did in the trial. This is equal to a gain of one year of full health for one person. Conservative estimates indicate that for every 1,000 persons treated, 16 QALYs are gained, the investment is returned nine times and the cost-efficacy ratio (CER) was 3432. The cost of the translation project comprised approximately 27% of the estimated original English-language version development cost. The cost for the translation projects is less than one QALY. To make the cost for this project to break-even the annual number needed to treat is 46 individuals. For the



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development project to break-even, the annual number needed to treat is 171 individuals (based on Norwegian savings per QALY). Annual savings for the translation project are estimated to be almost €500,000 per 1,000 persons treated.

### *3.3.4 Discussion*

This paper demonstrated the potential economical benefits of translating Internet-based interventions into another language and the feasibility of the cultural and linguistic transformation of tools developed in other countries. Our findings should encourage similar translation activities in the future. For smaller countries such as Norway with a limited number of researchers in the e-mental health field, it appears considerably more cost-effective to translate and implement existing interventions than to develop new ones from scratch. This policy should also enable a relatively rapid introduction and dissemination of new interventions to a broad spectrum of the target population. As studies show that preventive interventions can reduce the incidence of depressive disorders by 22%, this might be exactly what people with sub-threshold symptoms need.

## 4. GENERAL DISCUSSION

### 4.1 Main Findings

This thesis provides evidence that translated Internet-based interventions delivered without therapist support are effective in reducing symptoms of depression. Furthermore, it expands the current knowledge regarding translating interventions into a national language, testing its effect, its efficacy for compliers, and cost-effectiveness. Since the translated self-help programs have proven effective in reducing symptoms of depression and the effects have been tested and documented, consideration should be given to developing a plan for their national dissemination in Norway. These interventions are unguided and users can access them anonymously, so they can be disseminated as self-help interventions.

The findings from Paper I reveal a relatively high number of participants with a felt need for help with psychological problems and symptoms of depression. Offering Internet-based self-help to the participants seemed to be an optimal intervention to reduce depressive symptoms and negative thinking in this group of young adults. We found that social pressure and beliefs of others might be of less importance to users, as with the Internet as a medium the possibility of personal anonymity is high. An unmet need for help with psychological problems is associated with a stronger intention to use Internet-based self-help. Most students with an unmet need for help felt positively toward the idea of using MoodGYM.

The results from Paper II support the findings from Australian studies on the effectiveness of these interventions. The translated Internet-based intervention (MoodGYM and BluePages) was effective in reducing symptoms of depression and negative automatic thoughts, as well as in increasing depression literacy. This supports the view that offering an open public intervention for the early intervention and prevention of depression on a national scale may be beneficial. The paper provides a practical demonstration of the feasibility and successful translation of an interactive evidence-based Internet intervention into a different language and represents the first study of the use of an Internet-based self-help program targeting symptoms of depression in Norway. Furthermore, this paper illustrates how the

potential effect of the intervention can be examined using Compliers Average Causal Effect (CACE) analysis. Finally, the paper employs an appropriate approach for handling missing data. Mixed model repeated measures (MMRM) methods are superior to the older biased approaches based on deleting or mean substitution.

Finally, Paper III demonstrates the potential economic benefits of translating Internet-based interventions into another language and that the transformation of tools developed in other countries are feasible. The estimated health effect was calculated using quality-adjusted life years (QALY). The paper demonstrates the use of disease-specific scales to estimate quality of life (QoL). These findings should encourage similar translation activities in the future.

### *4.1.1 Intention to use Internet-based interventions*

The empirical model (see Figure 2) in Paper I, of the intention to use an Internet-based self-help intervention, explained almost 50% of the variance in intention. The need factor was the strongest single predictor of intention ( $R^2 = .26$ ), which included the need for help and previous experience with seeking mental health information on the Internet. Implicit is the notion that individuals who are accustomed to using the Internet as a tool for finding information are also slightly more inclined to use the Internet as a tool to diminish psychological distress. This is in line with previous research, showing that consumers more readily adopt new technologies if they have used similar technologies before (Jarvenpaa, Tractinsky, & Vitale, 2000). In addition, attitude (the TPB factor) and previous help-seeking (the factor from psychological background variables) contributed to the model ( $R^2 = .06$  and  $.17$ , respectively). An interesting finding was that social pressure and beliefs of others might be of less importance to users, as they were non-significant. At the same time, it is evident that many students with a subjectively felt need for help do not intend to use Internet-based services or other mental health services. Several factors should be taken into account to explain this. Severity of depressive symptoms, lack of motivation, lack of knowledge about effective treatment, and lack of insight into one's own problems are possible areas for exploration. Increasing the availability of information about alternative help resources such as MoodGYM might be a possible approach to reaching out to individuals who do not seek help.

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Almost 30% of the students reported a need for Internet-based self-help for themselves while nearly 40% regarded MoodGYM as a possible helping tool for others. If these latter users take part in a trial, this could contaminate the results in that their motivation is different than for those seeking help for themselves. Their motivation does not need to be an exclusion criterion, but motivation to participate should be assessed and factored into the analysis of future data.

The relatively high number of participants with an unmet need for help with psychological problems is not necessarily limited to those with clinical conditions, but rather reflects a subjectively felt need for help. Both students with a met and an unmet need for help reported symptoms of depression and negative thinking more frequently than participants with no need for help.

Roberts and colleagues (1991) reported that a standard cut-off score of 16 on the CES-D was overestimated the prevalence of depression by 48%. To explore how this rate fits data from Paper I, Table 1 shows the characteristics for the CES-D subscales. When using a cut-off score of 16, the Unmet Need, Sought Help and No Need groups have a high number of participants above the cut-off (40, 30, and 13%, respectively), 24% on average. If we apply the even higher cut-off score of 24 for non-clinical samples, the same groups have normal smaller number of participants above cut-off (16, 5, and 4%, respectively), 8% on average, which is comparable with the prevalence of depression in the population. There were no exclusion criteria in this study. Furthermore, no diagnostic assessment of clinical status was undertaken of this group of anonymous participants, but it seems plausible to assume that a cut-off score of 24 would be appropriate for this sample.

Table 1  
Centre for Epidemiologic Studies-Depression Scale (CES-D): Group size (*n*), Mean (*M*), Standard Deviations (*SD*) of three Help-Seeking Groups.

Group Scale	Unmet Need			Sought Help			No Need		
	<i>n</i>	<i>M</i>	( <i>SD</i> )	<i>n</i>	<i>M</i>	( <i>SD</i> )	<i>n</i>	<i>M</i>	( <i>SD</i> )
CES-D	104	14.8	(9.4)	43	12.4	(7.9)	186	9.0	(6.4)
- <i>CES-D Subclinical</i>	62	8.5	(2.2)	30	8.4	(4.3)	161	7.0	(3.7)
- <i>CES-D Mild/Moderate</i>	25	19.7	(2.2)	11	19.7	(2.2)	17	19.2	(2.3)
- <i>CES-D Moderate/Severe</i>	17	31.0	(6.4)	2	33.5	(6.4)	8	27.6	(2.5)

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From the normal P-P plots and positive values for skewness for both CES-D and HINT, the data appears positively skewed with scores clustered around the low end of the scale. However, as the sample size is large we can assume that the sampling distribution is normal (Field, 2009) even if we are not sure that the distribution of the variable in the population is normal. The Central Limit Theorem states that in large samples the effects of non-normality on the probabilities of making errors are minimized (Rice, 1995).

Providing help to people with symptoms of depression may be of functional significance. It seems appropriate to provide a program that may prevent the exacerbation of these symptoms, particularly to a group at high risk of significant life stressors such as exams.

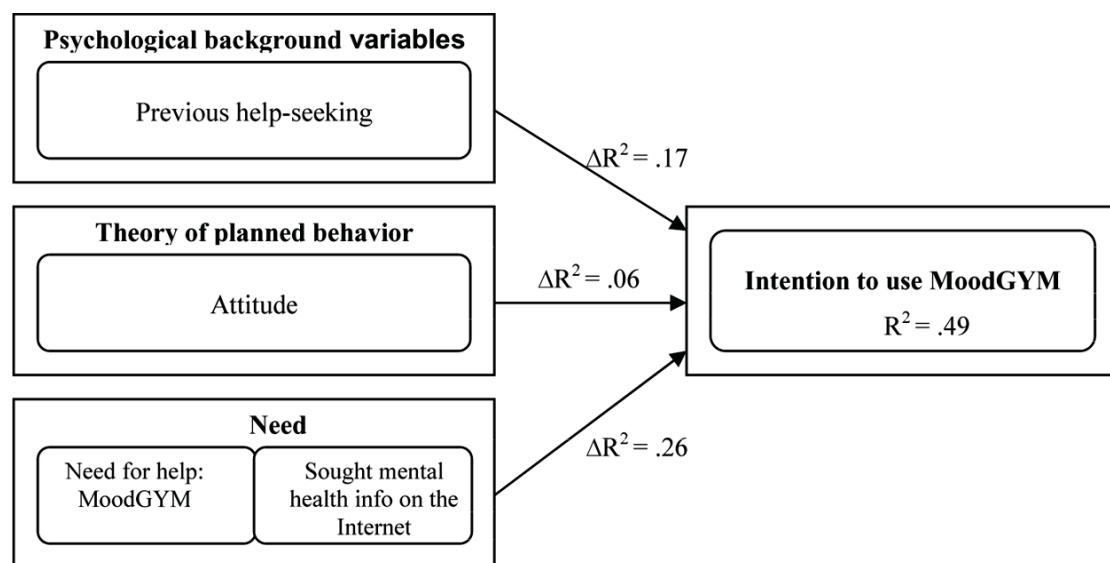


Figure 2. Empirical model of the intention to use Internet-based self-help

### 4.1.2 Feasibility of translating existing interventions

From Paper I, we know that an intention to use Internet-based self-help was related to previous history of depression, present symptoms of depression, and an optimistic attributional style. These factors could also predict treatment outcome. In Paper II, we have established the effectiveness and efficacy for the intervention. Paper III addresses the cost-effectiveness for a project that translates Internet interventions. All these steps are required before dissemination. We have investigated both efficacy

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(evaluate the potential effect) and effectiveness (real world effect) in one trial. The study provides one possible template for the design and use of statistical methods to translate existing interventions, evaluate efficacy, effectiveness and cost-effectiveness, and make the intervention ready for dissemination. To our knowledge this is the first study documenting the process of translating an Internet-based self-help program into another language that includes cost- and cost-effectiveness analysis. It is also the first Internet-based self-help program available in Norway. Based on the results and experience, we conclude that this is feasible and our findings should encourage others to adopt.

### *4.1.3 Efficacy and effectiveness*

Effectiveness studies focus on important factors such as the quality of implementation, which will affect program outcomes when delivered under naturalistic conditions. In this trial as in a “real-world” setting for an unguided intervention, we did not offer any support. As might be expected, the results from Paper II show that the completers’ effect size for depressive symptoms is larger than the effect sizes for ITT participants. This was also true for negative thoughts and depression literacy. The ITT effect sizes for CES-D, ATQ and TDL ( $d = .63, .57$  and  $.59$ , respectively) were all in the medium range and larger than findings from other studies with unguided interventions. Spek, Cuijpers and colleagues (2007) found an average  $d = .26$  for unguided interventions. The findings are not strictly comparable, as Spek et al. used post-test scores divided by pooled SD for their effect size (between effect size at post-test), and we used the difference in intervention and control standardized Cohens’s  $d$  based on change score (post-test – pre-test) divided by the pooled SD, a between group effect size. When we recomputed the effect size based on the same method as Spek et al. (between difference at post-test), the directly comparable result for our study is  $d = .31$ . In the study by Spek and colleagues there were six studies for unguided interventions, four for depression and two for anxiety. The studies differed concerning the aim of the intervention (prevention or treatment), the symptoms that were treated varied (depression, anxiety), and the control groups differed in type (from care-as-usual to an attention placebo). One of the studies in the meta-analysis by Spek, Cuijpers and colleagues (2007) was the first validation study for MoodGYM (Christensen et al, 2004), with effect size  $d = .40$  for the MoodGYM

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group, based on standardized Cohens'  $d$ . The latter study used an attention placebo control group with a reduction in CES-D scores at post-test, which could have lowered the effect size. The participants in the Internet intervention group achieved a greater reduction on the CES-D than those in the control group (4.3 points), with an ITT within ES of  $d = .40$  and  $d = .10$  for the MoodGYM and control groups, respectively. In our study, the change score (post-test – pre-test) was 4.1 points for the Internet intervention group (within ES = .31) and -2.9 points for the control group (within ES = -.26), yielding an a reduction of 7.0 points on the CES-D (between ES = .57). If the control group had stayed unchanged (change score = 0) we would have the same reduction in our study, 4.1 points. Two possible explanations for the increase in depression symptoms in the control group could be that 1) the post-test was just weeks away from the upcoming exams, and 2) students were informed that the enrolment into the trial would occur over several weeks, but at post-test they received only another questionnaire without having received access to the program..

A program that produces significant effects in an efficacy trial may or may not yield similar effects under real-world conditions (Elliott & Mihalic, 2004). The results from Paper II show that the CACE effect estimate for depression was  $d = 2.57$  while the ITT effect was  $d = .63$ . For those who received meaningful intervention dosages, the effect is very high. This is of more than theoretical interest. This effect estimate tells us the potential effect for a user who follows the scheduled intervention, a user who complies with treatment and complies with the trial. This demonstrates the efficacy of the Internet intervention, and the substantial potential the intervention has for reducing symptoms of depression. The “real world” effect offered by the ITT analysis is an effect from those assigned to a condition, containing users that never start the intervention, and incorporates wide variance in compliance. The significant findings, from the CACE analysis for the Internet intervention group, show that the compliers were older than the non-compliers ( $M=32.4$  and  $27.0$ , respectively), and that more compliers felt the need for help at baseline (50% and 38%, respectively). The same pattern was present for the control group. Compliers were older than the non-compliers ( $M=32.3$  and  $25.1$  years, respectively) and more compliers felt the need for help at baseline (65% and 38%, respectively).

The Internet intervention completers in the trial (Paper II) consisted of participants who completed post-test some of whom complied with the treatment and

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some of who were non-compliers. The group complying with treatment consisted of Compliers and Always-Takers (the Treatment Received group in Figure 1).

To identify the compliers in the Internet intervention group we used the empirical model for “Intention to use Internet-based self-help” (Lintvedt et al., 2008; for details see Paper I and Figure 2), the Intention Model. The Intention Model was extended with pre-test mean for TDL (depression literacy), age and a variable for potential complier. We defined the potential compliers as those reporting at least some use of the Internet intervention and those identified as using MoodGYM from the MoodGYM tracking data. After fitting the model, Amos identified 28 participants in each condition as compliers. The strong effect size for the CACE estimate could possibly be a result of using the Intention model, identifying participants with more motivation, more need for self-help, experience with depression and Internet. This group could be the real Compliers, as the Always-Takers could be expected to have lower intentions.

For Paper II it could be useful to explore the distribution of participants according to depressive symptoms, in the same way it was done with data from Paper I (Chapter 4.1.1). When using a cut-off score of 16, the Unmet Need, Sought Help and No Need groups have a high number of participants above cut-off (71%, 76%, and 38%, respectively), 68% on average. By applying the even higher cut-off score of 24 for non-clinical samples, the same groups have a considerably lower number of participants above cut-off (37%, 35%, and 9%, respectively), i.e. 33% on average. Even this higher cut-off score leaves us with a huge number of people above cut-off for depression compared with the prevalence in the population. However, the sample in this study is not from the general population; rather they are self-referrals with elevated symptoms of psychological distress. Consequently, one would expect the sample to comprise a considerably larger number of people with elevated symptoms of depression in this sample. It was not feasible within the practical constraints of the current study to undertake diagnostics assessments of participants in this group. However, it seems plausible that a cut-off score of 24 might be appropriate for this sample. In a meta-analysis, preventive interventions were found to reduce incidents of depressive disorders by 22% (Cuijpers et al., 2008), This indicate that targeting interventions at people with psychological distress and sub-clinical symptoms of depression is one important step in disease prevention.



### 4.1.4 Cost-effectiveness analysis

Taken together, our findings demonstrate the cost-effectiveness of developing Internet-based prevention interventions. Unguided Internet-based Interventions are the most economic but also those with the most attrition. They are available online, respect the anonymity of the user, and attract a lot of “browsers” who do not necessarily have a need for help or an intention to undertake a self-help program. Thus, for trials without identified users the dropout rate will be high, as one could expect for users in a real life setting.

There has been a growing interest in applying measures for health related QoL to evaluate health care services in general. However, in the field of Internet and computer-based self-help for mental disorders, reviews find that studies are missing cost-effectiveness data (Griffiths & Christensen, 2006; Tate et al., 2009). This is a disadvantage for the field as it precludes the comprehensive evaluation of interventions and services. There are several measures available for this purpose, including measures specific to groups of diseases as well as generic measures to be applied across disease areas (Gater et al., 1995). Some produce a single measure as a health index and others produce a profile of scores in different areas of disease.

NICE in England, makes use of cost-effectiveness information to inform healthcare providers. Interventions are assessed in terms of their cost per QALY, as QALY is designed to permit comparisons across programmes of care (NICE, 2008). For unguided interventions this cost per QALY will be negative as soon as the number needed to treat (when cost break even) is achieved. The Rosser Index attempts to value some dimensions of health on a single index, which can be used to calculate QALYs (Gudex & Kind, 1988). By using measures of psychological distress and depressive symptoms, and fitting them to the model it has been possible to obtain a good distribution among the 29 potential health states. Some caution is appropriate. The results cannot be better than the quality of the measure in use. The Rosser Index makes use of a valuation and, although the index seems to correspond well with Norwegian data (Nord, 1996), it might require specific validation for the target group for the intervention. If the target group is the general population with sub-threshold depression, they might have other preferences than those used in the Rosser validation index. However, assuming the valuations are applicable in the current context, the study showed that to obtain one QALY there was a need for 56 individuals to use the

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Internet Intervention in the same way as the group of completers did in the trial. The CER was 3228 per 1000 individuals treated and only 154 if 20,000 were treated, based on the Norwegian estimate for QALY saved.

### *4.1.5 Dropout, compliance and adherence*

In the present study we found a significantly higher dropout rate among full-time than part-time students, but no differences in dropout as a function of demographic status. There was also a significantly higher dropout rate in the Internet intervention group.

Studies have found disappointment as a common reaction after allocation to a control group, which in turn could result in higher dropout rates from control groups (Lindström, Sundberg-Petersson, Adami, & Tønnesen, 2010). However, in the present study we found a significantly higher dropout rate in the intervention group. In fact, this is a common finding in trials of Internet interventions targeted at mental disorders. In a systematic review of all RCTs of Internet-based interventions for depression and anxiety, Christensen and colleagues (2009) reported a consistently higher dropout rate in control conditions. It is possible that the dropout rate among controls was lower because the demand on the control group was low, and the participants in the group were informed that they would receive the intervention after several weeks. It has been found that longer programs are generally associated with higher dropout rates (Christensen, Griffiths, Mackinnon, & Brittliffe, 2006). Moreover, programs with more interactivity and self-help tasks have been reported to yield higher dropout rates (Schneider, Mataix-Cols, Marks, & Bachofen, 2005).

Although dropout was high in this ‘real life’ implementation of a self-guided Internet intervention, such dropout rates are not unusual in effectiveness studies. A meta-analysis of traditional psychotherapy has reported mean dropout rates of 47% (Wierzbicki & Pekarik, 1993). Traditional psychotherapy is not necessarily suitable for all persons with depression. Similarly, it is likely that Internet services are not appropriate for everyone. Some people may feel uncomfortable with self-registration, homework and undergoing the self-report surveys, which were recurring requirements in the current Internet intervention.

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### 4.1.6 User satisfaction

Dropout was high in this trial and could indicate issues related to user satisfaction. It is likely that Internet services are not appropriate for everyone. After having explored the intervention, participants will be better equipped to decide if it is suitable for them, and some will abandon the intervention. Others may feel that the intervention did not meet their needs with respect to their particular problems. Nevertheless, user satisfaction among the completers of the trial was high as most users found the websites useful and indicated that they would probably use the websites again in the future. Most users (90%) stated that they would recommend the websites to others. Taken together, these findings imply that for some people, the intervention has the potential to satisfy a need for a source of knowledge and help.

### 4.1.7 Hypotheses

As discussed in detail above, the primary hypothesis was confirmed, the unguided Internet-based Intervention group showing a greater reduction in symptoms of depression over a 2-month period than the waiting list control group. The secondary hypothesis was also confirmed, as the effect for compliers was substantially greater than the effect from ITT and completers analysis, the cost-effectiveness for the translation project was significant, the Internet Intervention group had greater improvements in negative automatic thoughts and depression literacy than the control group, and the intention among university students to use Internet-based self-help was high.

## 4.2 Threats to validity

### *Conclusion validity.*

Conclusion validity refers to whether or not a relationship between the variables exists. Type I error occurs when we conclude that a relationship between two variables exists, when in fact there is no relationship (Wisdom, 2002). Type II error occurs when we assume that there is no relationship, when one exists (Wisdom, 2002). Missing data is a threat to conclusion validity (Creswell, 2009). Dropout rates and reasons for missingness can be affected by many factors, including the level of disease, the efficacy of treatments, and length of the trial. Participant dropout can cause considerable bias (Lavori, 1992). In a simulation study the average estimate of

standard error (SE) from MMRM analysis was greater in data with dropout than in complete data. The authors found support for the model that MMRM relative to LOCF provided reasonable control of Type I error and altered power (Mallinckrodt et al., 2004). Data from the trial in Paper II is analysed with MMRM, as this method handles missing data adequately. Low power of the analysis can reduce the ability to detect a relationship and consequently can increase the probability for a Type II error (Maxwell & Delaney, 2004). Unreliable measures are also a threat to conclusion validity. In our studies all the outcome scales employed were reliable. Small sample size also represents a threat to construct validity. In our trial (Paper II) the size of the groups is not problematic, but the dropout at post-test was. The latter may lead to a conservative bias and makes it more problematic to make valid inferences from the research data.

### *Internal validity.*

Internal validity relates to causality. We want to find what is responsible for the change in the dependent variable and that changes are not due to other factors. Selection bias could be present in our trial, as we relied on self-selected participants. Accordingly, the findings in Paper II can be generalized to self-selected participants in the population, but not necessarily to the whole population. The inclusion and exclusion criteria employed in our study were not overly strict in our study, as we aimed to undertake a real-life study; thus these criteria should not represent a threat to internal validity. Attrition is a problem when dropout occurring across conditions may be responsible for group differences in outcome. Our trial did have a relatively large dropout rate at post-test, which is a threat to internal validity. It is possible that factors outside the assigned condition affected the change in pre-post scores. Furthermore, testing can also represent a threat to internal validity and can occur if altered performance is a result of a prior assessment. In our study we used K10 as part of the screening assessment and CES-D as the repeated measure. This threat should be minimal. Regression towards mean occurs when extreme scores in the course of time are drawn closer to the mean and is more likely to happen when the standard error (SE) is high and /or the reliability of the measure is low. Measures in our trial had high reliability and the SE was not high. We used a RCT as it serves as a reference for the predictor analyses, so regression was controlled for through the use of a control group.

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### *Construct validity.*

Construct validity refers to whether a scale measures the underlying construct adequately (e.g., if the CES-D depression scale actually measures depression) or how well a series of experiments measures up to its claims (Cronbach & Meehl, 1955; Fitzpatrick et al., 1998). Experimenter bias should not represent a problem in the current study, as there was no personal contact with the participants. Condition diffusion is a threat as we recruited participants from the whole university. This could have led to communication among participants in different conditions during the trial.

### *External validity.*

External validity refers to whether the finding can be generalized across populations or time, if the sample is representative of the population (Aronson, 2007). A setting bias refers to interaction between setting and treatment. The participants were all university students. They differed from the general population as they have above average education and are younger, but they are more disposed to elevated symptoms of depression as the general population (McKay, 2012). A narrower perspective is whether the findings from these trials can be generalized to the same age group in the population. Therefore, these findings need to be replicated among the general population.

### **4.3 Ethical considerations**

One important ethical consideration regarding dissemination of Internet-based interventions is that the interventions must undergo scientific testing to document their feasibility, efficacy, effectiveness and cost-effectiveness (Proudfoot et al., 2011). The studies undertaken for this thesis are addressing this requirement. The studies were approved by the Regional Committee for Medical Research Ethics in North Norway and the Human Research Ethics Committee at the Australian National University.

The principle of “Do no harm” was addressed by having a self-harm risk protocol (Sharkey et al., 2011) in place. During the trial participants could contact the project team if they wanted. They were told to make use of their GP, friends, helplines, etc., if they felt the need for this. In addition, in both MoodGYM and BluePages there was a web page addressing emergency help with updated contact information.

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Before registering as a MoodGYM user one have to agree to the “terms of use”. The terms give information about user rights and responsibilities. Furthermore, privacy protection, secure and encrypted data transmission is also addressed in the terms of use. It is suggested that users use a pseudonym or a made-up username to take care of privacy. The users are informed about how, why and what information that are collected and stored. The MoodGYM website is making use of a protocol to provide bidirectional encryption of communications between server and user, using the Hypertext Transfer Protocol Secure (HTTPS). Finally, the users are able to deactivate the account themselves.

### **4.4 Limitations**

The main limitations of the current study relate to the challenges associated with interpreting and analysing data containing a significant proportion of missing data (almost 38% at post-intervention). Such a large proportion of attrition creates potential biases. Studies and established theory suggest that simulation models or multi imputation models should be the methods of choice with missing data (Elobeid et al., 2009). The MMRM was chosen, as it is able to account for correlations among repeated measurements for participants and can include participants with missing data.

Another limitation of the study in Paper II is that it did not incorporate a 6- or 12-month follow-up, and therefore it was not possible to evaluate if the positive effects of the intervention were sustained over time. We recommend that future research should include a 6- or 12-month waiting-list control comparison group if ethical considerations allow this. Other studies have demonstrated that effects from this kind of intervention are statistically significant at 12 months follow up (e.g., Mackinnon et al, 2008; Spek et al., 2008).

Further research is also necessary to investigate the generalizability of the current findings to young adults other than university students. Students may have a higher computer literacy and may be more willing than their counterparts to employ computers to work with personal problems. It is unclear if the current results could be replicated for people with a lower educational level. Therefore, this study needs to be replicated among the general population of young people.

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The studies in this thesis employed self-report measures of depression symptoms but no clinical diagnostic assessment of depression. This may be a limitation as self-report measures often are found to yield a high rate of false positives and false negatives when compared to formal depression diagnoses (Patel, Rendu, Moran, & Leese, 2005). However, the primary focus of the current study was on level of symptoms rather than clinical diagnostic categories, so we considered that the CES-D was appropriate for the current purposes. The CES-D is often used to evaluate the level of depressive symptoms in community intervention research (including Internet trials).

The cost-effectiveness calculations in Paper III were based on effects from a relatively short time span of 8 weeks. We do not know how the cost-effectiveness of Internet-based interventions is affected when a longer period of time is used, but if an effect is maintained over a longer period this will increase the QALY gain and thus increase the QALY and reduce the number needed to treat. No information on sick leave, other disabilities or other social benefits was collected. The use of such data could have yielded a more complete and realistic cost-effectiveness estimate. However, these benefits would only have increased the estimated savings and presented Internet-based interventions as more cost-effective. The Rosser-Kind Classification of Illness States scale is just one way to estimate health gains, and other methods could have produced different results. However, this method has been employed previously. In particular, a similar estimation for QALY gain was conducted to evaluate cost-effectiveness for a face-to-face group intervention designed to decrease depression (Nord & Dalgard, 2006).

A shortcoming for the Intention model in Paper I might be that factors such as personality and demographic variables are not taken into consideration in predicting the intention to use Internet-based self-help interventions. Some shortcomings also concern the use of TPB in this study. The TPB theory assumes that human beings are rational and make systematic use of the information that is available to them (Ajzen & Fishbein, 1980). Subconscious motives are therefore not considered directly. In online interventions the aspect of subjective norms needs further exploration since norms, social pressure, and beliefs of others might be of less importance to users.

The relatively high number of participants with a felt need for help with psychological problems could be a result of sampling considerations (Paper I and II)

or low specificity of the item. How subjects interpret and understand the question could be affected by earlier experience with depression and ways of coping.

The study design used in Paper II used a combination of two Internet-based self-help interventions as the Internet intervention. This makes it difficult to identify the active factors in the intervention as the two interventions are based on two different concepts, CBT and evidence-based information. Differentiating between the effects of these interventions would require a design with three arms. The intention was however to make available interventions that could optimally represent a real life situation. This could possibly affect effect sizes in the trial. By offering two alternatives to the users the subjects had the possibility to choose the one they found most appropriate for their situation and other preferences. Another alternative would be to offer the interventions in two waves: baseline assessment, BluePages, mid-assessment, MoodGYM, post-assessment.

### **4.5 Implications for future research**

#### *4.5.1 Adherence*

The WHO provides a definition of adherence: “the extent to which a person's behaviour... corresponds with agreed recommendations from a healthcare provider” (WHO, 2003). Adherence seems to result in better treatment outcomes and cost effectiveness (WHO, 2003). In the future, we need research to increase our basic understanding of the issues that function as a barrier to adherence and which factors could assist the development of approaches to overcome non-adherence (McLean, Burton, Bradley, & Littlewood, 2010). Using standard measures for adherence would assist this task. There are some measures available, e.g., Ritterband's Adherence Interview (Ritterband, 2006), which could be modified and used. Furthermore, we could use more complex variables in order to identify differences in adherence, such as coping mechanisms, quality of life, personality, and hope (Geraghty, Wood, & Hyland, 2010). Another example of a complex variable could be “accept”. From the Intention model in Paper I, we find that the user has “accepted” the need for help. Is accept simply admitting to have felt need for help or some more complex construct? Accept could be defined as in mindfulness as: “seeing things as they actually are in the present” (Kabat-Zinn, 1990), reconciling oneself with the facts in the present situation, and being willing to see things as they are and take things as they come. In



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mindfulness, accept is not about taking a passive approach towards the problem or life, or being satisfied with the way things are. Accept could be a complex variable including for example need, beliefs, stigma, readiness and self-concept. In addition, by accepting a problem we will need to act on it by letting it go (like in mindfulness) or taking appropriate actions. Acceptance could be described as the act of accepting (Definitions, 2013). This could be described as creating a contract with oneself, which includes facing the problem and taking appropriate actions, with or without help. A pledge to oneself to take care of the obstacles in life, to get on with reconciling with life, to be mindfully present in ones own life again. There would always be degrees of acceptance, a continuum. The degree of acceptance could for example influence on adherence.

The choice of technology could influence the user experience and thus be of importance to adherence. System design, choice of technology and interaction with the user can affect adherence (Danaher, McKay, & Seeley, 2005; Kelders, Kok, Ossebaard, & van Gemert-Pijnen, 2012).

The use of a brief introduction session based on motivational interview (MI) was found to be beneficial for the outcome in an Internet behaviour change program in primary care (Van Voorhees, Fogel, Reinecke, et al., 2009). This approach should be explored further as it yields a great potential for increased adherence and thus better outcome (Van Voorhees, Fogel, Pomper, et al., 2009).

### *4.5.2 Navigational format, introduction session, and booster session*

The user experience could be affected by the intervention's navigational format, e.g. the structure of the websites information (Danaher et al., 2005; Danaher & Seeley, 2009). The most common information architecture designs are the free-form matrix design (users are free to use all available hyperlinks), the tunnel design (structured, more directive step-by-step, commonly used in e-learning courses), the hierarchical design (semi-structured, directive with some optional hyperlinks), and hybrid design (uses a combination of the other designs) (Danaher et al., 2005).

A major issue with online therapy and Internet-based interventions is as mentioned above non-adherence. One never knows how long the user is going to stay with the intervention, just as the length of stay of inpatients in a hospital is unpredictable. One could propose a fifth information architecture design, based on

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experience with inpatients with psychotic disorders (Gaudiano & Herbert, 2006), where treatment (ACT) was flexibly delivered in stand-alone sessions, each session with a core set of the whole treatment. Subsequent sessions introduce more depth and new elements of the treatment (Bach, Gaudiano, Pankey, Herbert, & Hayes, 2006). This is an interesting approach towards information architecture design as well, delivering the treatment in a parallel sequence in contrast to a more serial sequence employed by the traditional designs.

The use of booster sessions, refreshing the main content of the intervention, is not common in this field of research. Some studies find support for increased adherence to the program when a booster session is applied (Manwaring et al., 2008). Future research should explore the effectiveness of booster sessions (Calear et al., 2009). As concerns MoodGYM, booster sessions could be presented to participants as an additional summary module.

In a study comparing guided vs. unguided delivery of Internet-based self-help treatment of depression, there were no significant differences in outcome measures or dropout between groups (Berger, Hämmerli, et al., 2011). This study used structured diagnostic telephone interview before inclusion, suggesting that screening procedures or personal contact might decrease attrition rates. Introduction sessions based on techniques like MI also have an effect on attrition, and could probably be delivered online as an automated part of the intervention (Van Voorhees, Fogel, Pomper, et al., 2009).

It should be possible to disseminate these services to the public and still take care of those dropping out. Some will prefer to have contact with a therapist, which could be offered through guided Internet-based services with minimal therapist contact. Furthermore, it should also be possible to integrate these Internet-based services within the existing mental health care services. People who start on a process by using these unguided interventions but do not recover with Internet therapy, could in a stepped-care design, receive support between sessions in a face-to-face treatment setting.

### *4.5.3 Future trends in treatment, technology and design*

As discussed earlier, some authors divide the attempts to utilize computers in psychotherapy into four waves (Cavanagh et al., 2003). Are we on our way into a fifth

wave? As the previous four waves are making use of the effective schools of psychotherapy shaped by the computer technology available at the time, it is natural to look into what is present the areas of technology and psychotherapy.

According to Hayes (2004) there have been two waves in behaviour therapy: traditional behaviour therapy and cognitive therapy (Hayes, 2004). A third wave is described as cognitive and behavioural therapies with elements of mindfulness and acceptance (Segal et al., 2002). Effectiveness studies are showing promising results for these therapies in areas such as depression, psychosis and eating disorders (Hayes, Masuda, Bissett, Luoma, & Guerrero, 2004). Some interventions based on this newer approach are Dialectical Behaviour Therapy (DBT) (Linehan, 1993), Functional Analytic Psychotherapy (FAP) (Kohlenberg & Tsai, 1991), Mindfulness-Based Cognitive Therapy (MBCT) (Segal et al., 2002), Mindfulness-Based Stress Reduction (MBSR) (Kabat-Zinn, 1994), and Acceptance and Commitment Therapy (ACT) (Hayes et al., 1999). ACT is on the Substance Abuse and Mental Health Services Administration's (SAMHSA) list of evidence-based mental health treatment programs and mental health promotion programs (SAMHSA, 2013). ACT is building on Relational Frame Theory (RFT) (Hayes, Barnes-Holmes, & Roche, 2001) that is based on research on language and cognition.

Some web-based CBT interventions include mindfulness in their protocol (Eisen, Allen, Bollash, & Pescatello, 2008; Ljotsson et al., 2010; Meyer et al., 2009; Thompson et al., 2010) and some web-based interventions are entirely based on mindfulness (Glück & Maercker, 2011; Krusche, Cyhlarova, King, & Williams, 2012). To date, only a few Internet-based interventions based on ACT have been developed or tested to our knowledge (e.g. Kelders, Pots, Oskam, Bohlmeijer, & van Gemert-Pijnen, 2013; Lappalainen et al., 2013), and a few interventions for smartphones have been evaluated (e.g. quasi-experimental design: Ly, Dahl, Carlbring, & Andersson, 2012). More Web-based ACT interventions are under development (Bricker, 2013; Yahoo! Groups, 2013). As ACT is found to effectively engage patients (Gaudiano & Herbert, 2006), to be effective for mental health problems (Strosahl, Hayes, Wilson, & Gifford, 2004), and suitable for a parallel design (Bach et al., 2006), it would be interesting to evaluate interventions taking up on this approach in the future.

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Most studies on computer- and Internet-based interventions have focused on user characteristics that can explain variations in adherence (Christensen et al., 2009; Kelders, Van Gemert-Pijnen, Werkman, Nijland, & Seydel, 2011; Neil, Batterham, Christensen, Bennett, & Griffiths, 2009; Neve, Collins, & Morgan, 2010). In addition to user characteristics and the content of the intervention, technology is a vital aspect of adherence (Black et al., 2011; Christensen et al., 2009; Danaher & Seeley, 2009; Kelders et al., 2011; van Gemert-Pijnen et al., 2011).

It is important to look at future trends in technology in order to make decisions about developing new interventions. There are a number of interesting, exiting, and challenging trends in the field of technology-based interventions. The following highly qualified guesses are collected from several sources (Gourvenec, 2013; Digital Pacific, 2013; Peters, 2013; PCWorld, 2013; Savitz, 2013; Strickland, 2013) with additional references where needed:

Technology will be all about mobile solutions with emphasis on social utilisation. Information technology is moving from desktops to cloud with online storage. Speech recognition will be implemented on computers, mobile devices, and other equipment. Faster wireless communication solutions will trigger innovation. One will find most personal and even sensitive information through the Internet, even health records. One of the most interesting technologies is the concept of the Internet of Things (IoT). IoT was introduced almost 15 years ago (Ashton, 2009). This could be one of the most disruptive technologies since the web (Grier, 2013). Computers and the Internet are dependent on humans to get information. A way to overcome this obstacle is a self-configuring wireless network where objects are able to transmit their information or status themselves (Ashton, 2009). The harvesting of data to the Internet will be enormous. IoT could reach more than 100 billion Internet-connected objects by 2020 (Grier, 2013). This could be of great importance for e-health and telemedicine, as well as for Internet-based behaviour change interventions. The Internet will be faster and apps will dominate innovations, as the mobile Internet will grow rapidly. The Web will with the next version (Web 3.0, the Semantic Web) become data centric. The Internet will probably be closely monitored, and there will be less online anonymity. There will be security concerns regarding privacy and large amounts of online data, probably resulting in a personal ID number on the Internet. You will get a personal assistant in the Web 3.0 browser. The Semantic Web is

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Berners-Lee's vision of the future Web, based on Linked data technology where all data is tagged as metadata (readable to computers). Tagging existing Web pages can make the whole web machine readable, as a gigantic database. There are a lot of challenges to this vision, and the greatest is data identity. There will be several identifiers to the same object; who is right? Unique objects (e.g. a town or building) have a fixed description or position. It is more challenging to solve how to identify concepts that have a lot of options or answers (e.g. treatment for depression). User tagging of information has to be based on taxonomy, predefined categories or controlled vocabulary terms (Golder & Huberman, 2006). The taxonomy is a hierarchical structure of meaningful labels (Quintarelli, Resmini, & Rosati, 2007).

Some analytics have even predicted what Web 4.0 might be like. They expect that the Web will become a 3D environment with virtual reality elements. Furthermore, the Web will rely on distributed computing and lead to true artificial intelligence, as the Web will be able to “think” by referencing deep ontologies. Some speculate that the web will be able to analyse data and deduce new ideas. Finally, all kinds of equipment (e.g. watches, clothing, cars) will communicate with the Web, and the Web will learn about its users by observing their activities. This must lead to a debate about individual privacy and security. The future evolution in technology and Internet-based services opens up exciting possibilities and will be the basis of the future health care system. The challenge is to be cautious regarding designing, thinking, testing and evaluating future services (Boulos & Wheeler, 2007).

When technology changes rapidly, it is important to have a thorough design for interventions. As mentioned before, system design affects adherence (Kelders et al., 2012), but the system design is just a part of the whole user experience (UE). The International Organization for Standardization (ISO) has defined UE as “...perceptions and responses that result from the use or anticipated use of a product, system or service” (ISO, 2010). It is important to find a balance between human centred design, technology centred design and therapeutic centred design.

There is sparse research paying attention to the overall design and the UE. One could expand the focus in research on technology-based interventions to include more human centred design, by looking into user expectations and decisions. The economic models from Interactive decision theory (Game Theory) could be used as one approach. Game Theory is based on mathematical models and has its origin in the

economy, where the participants' choice of action is an attempt to maximize return/utility (Myerson, 1991). Game Theory could be used to explore and gain a better understanding of what happens in the interaction between the user and technology-based interventions. To understand the mechanism of attrition, we need to understand the user's rationale for making choices. By including game theory in system design one could possibly overcome some of the effects of attrition or to gain a better understanding of why attrition always will be a part trials and real-world usage of these interventions. Such understanding could further improve the overall design of interventions (Ford, Wells, & Bailey, 2004). Game theory is based on settings with at least two participants. This could work well for technology-based interventions with support or when these interventions are used as an adjunct to traditional F2F therapy. For unguided interventions, one could regard the other participant as the intervention or the service provider, but the types of models from traditional game theory seem difficult to incorporate in this setting. A new approach from Patokos (2013) is based on game theory, the Internal Game Theory. This approach offers a way to use game theory with single users. Critics of game theory claim that beliefs are not handled well in this theory (Geanakoplos, Pearce, & Stacchetti, 1989), and some offers their own framework (e.g. Battigalli & Dufwenberg, 2009; Geanakoplos et al., 1989). Other approaches could be used as well, where the goal is to increase our understanding of how different theories could be used to influence the whole process from design to implementations and evaluation of interventions (Peng & Schoech, 2008).

### *4.5.4 Taxonomy*

There is a thorough taxonomy of behaviour change techniques available (Abraham & Michie, 2008), but not for technology-based interventions. The taxonomy of interventions has primarily been developed from the literature on implementation and validation studies (Walter et al., 2003). Even the thorough review by Barak and colleagues (2009) restricts the taxonomy to only include Internet-based interventions. They offer a plausible explanation for why it has been so difficult to agree upon a terminology, as the interventions are so different regarding the content of the intervention and their use of technology. As noted earlier in this thesis, one could try another approach, by defining taxonomy based on these two factors that

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always are present, technology and interventions, combined in a 3-fold structure based on the work by Walter and colleagues (2003). The three categories could be intervention type (attributes describing form and content), mechanism (theoretical framework, behavioural change techniques), and technology (computers, mobile devices, etc.). Intervention characteristics need to be standardized and to be linked to effectiveness (Webb et al., 2010). Such a structure should not be limited by the existing interventions, but be open to future interventions and new technology. There is a need to be innovative and open to future trends. The ideal approach to the standardization process is to put together a group of researchers with background from computer science and engineering, mathematics, physics, law, social and human sciences (Shadbolt et al., 2013).

When the Semantic Web is a reality, the need for a taxonomy covering the whole field of technology-based interventions for mental health is required. If we do not agree upon a terminology the whole field will still be defined as vague and diffuse. This will create uncertainty among users, researchers and decision makers. Future taxonomies need to take into account the folksonomies (the vocabulary of the users) and could be a hybrid model, as proposed by Kiu and Tsui (2011), an approach called TaxoFolk.

### *4.5.5 Tailoring*

Arguably, we need more specific treatments tailored to users needs, values, goals, personality subtype, coping style, demographic factors, severity and previous experience with depression. To be able to tailor treatment to individual user needs we should start the intervention with extensive assessment of the individuals' symptoms (Helgadóttir et al., 2009). Some researchers find tailoring to be more effective only for participants with high levels of depression, with no significant effect for participants with low levels of depression (Johansson et al., 2012).

For sub-clinical symptoms of depression, it could matter what caused these symptoms (Reynolds, 2007), e.g. is it sadness or depression. Extensive assessment for preferences could make tailoring more beneficial as a more personalized experience might lead to better compliance. MDD patients with several depression episodes might be less motivated to do CBT, but could benefit from interventions based on other therapeutic techniques (Bach et al., 2006).

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The Eliza effect refers to the finding that people reacted to the Eliza Program as if the computer were human and became emotionally involved with it (Ekbria, 2008). Weizenbaum (1976) argued that the use of AI in psychotherapy was misguided, as a program cannot simulate human empathy. However, in 1972 the DOCTOR program (Colby et al., 1972) based on ELIZA was promoted as a real therapeutic tool (Crevier, 1993). In a recent paper Helgadóttir and colleagues (2009) picked up Colby's argument. They argued that research shows the importance of a therapeutic relationship in favour of therapist-guided vs. self-guided interventions, supported by reviews and meta-analysis (Elvins & Green, 2008; Martin, Garske, & Davis, 2000). Their approach was to develop web-based self-guided interventions that mimicked the interaction between therapist and client (Helgadóttir et al., 2009). Is the Eliza effect and Turing test actually related to the computer or could it be that the computer just yields a process that is similar to when people interact with each other, or when we feel empowered? A study on expressive writing for mood disorders shows that all writing resulted in lasting effects on physical and psychological health (Baikie, Geerligs, & Wilhelm, 2012). Their recommendations are a time management control-writing task (activity scheduling intervention) for those most severely depressed (Martell, Dimidjian, & Herman-Dunn, 2010), an expressive writing intervention for those with mild to moderate depression (Baikie et al., 2012), and a positive psychology intervention for those mildly depressed or recovered (Seligman, Steen, Park, & Peterson, 2005). Another plausible explanation could be heuristic (Kahneman, 2011) or coherence of associative activation that induces a confirmatory bias (Morewedge & Kahneman, 2010). That is, the attitude we have towards computers and previous experiences, determines how we perceive the intervention.

Regardless of what explanation we prefer, AI could improve the way we tailor the self-guided intervention to each user's personality subtype, needs, coping style, and demographic factors. This could strengthen the subjective experience, feeling of being noticed and thus more attached with the intervention, and lead to symptom relief or changes in behaviour. The possibilities will be unimaginable when the virtual technology in the future blends even more with our physical world. Already the Web 3.0 (Semantic web) offers tremendous opportunities regarding tailoring the intervention to the users preferences.



### 4.5.6 *New statistical analysis*

Firstly, in future research one has to encourage the use of newer approaches to handle missingness of data. The use of mixed models with repeated measure is to prefer over the more biased (e.g. LOCF) or limited (e.g. Completer analysis) methods. To be able to compare new results with existing research, one might have to reanalyse existing research trials and meta analysis (Christensen et al., 2009).

Secondly, the use of CACE analysis to estimate the intervention behavioural effectiveness when the treatment is in fact taken (Little et al., 2009) might be usefully employed to understand the pure effect of the intervention (Little & Rubin, 2000). This information is important for decision makers in their evaluation of cost-benefit when comparing different interventions, and the information could be valuable for evaluating interventions in the implementation phase (Schochet & Chiang, 2009).

Thirdly, a consistent taxonomy for computer-based interventions might form new ways to group existing research, also resulting in the need for re-analysis.

Lastly, use of new meta-analysis methods such as network meta-analysis, could open up the possibility of new comparison of treatment options not directly compared in trials (Thorlund & Mills, 2012). This relatively new technique allows for a multitude of comparisons and is being increasingly accepted in the research community (Ioannidis, 2009). The studies need to be sufficiently homogenous (Mills et al., 2012) with respect to populations, design and outcomes. NICE will soon release their new guidelines for treatment of social phobia, where they make use of network meta-analysis (NICE, 2012b). This approach could provide a stronger evidence base (Thorlund & Mills, 2012), as soon as a thorough taxonomy for technology-based interventions and control conditions are defined.

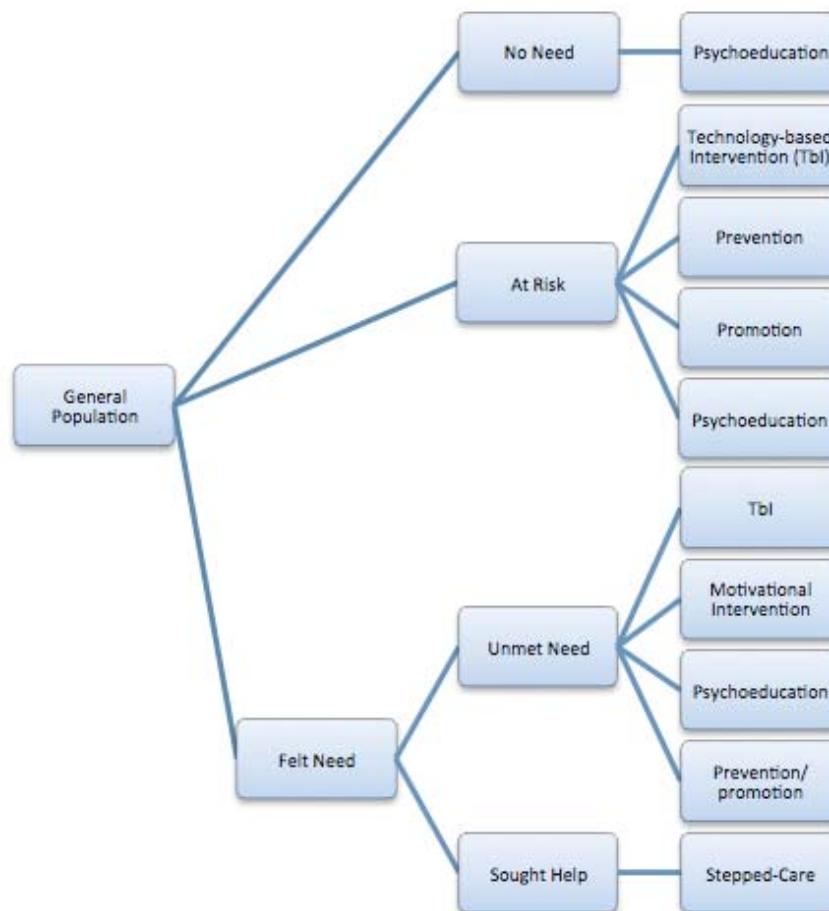
### **4.6 Proposal for Internet-based Interventions in a stepped-care model**

Stepped care systems for internet-based self-help have been suggested (Richards, 2004), but it is still unclear how much resources are needed for each step. From a public health perspective, unguided Internet-based self-help interventions can be suitable in a stepped-care model as they potentially could reach a lot of people in need (Andersson & Cuijpers, 2009; Muñoz, 2010).

Figure 3 serves as an illustration of how the general population could make use of Technology-based Interventions (TbI) for help. The use of a stepped-care system requires that the service users are aware of their needs and seek help (i.e. the

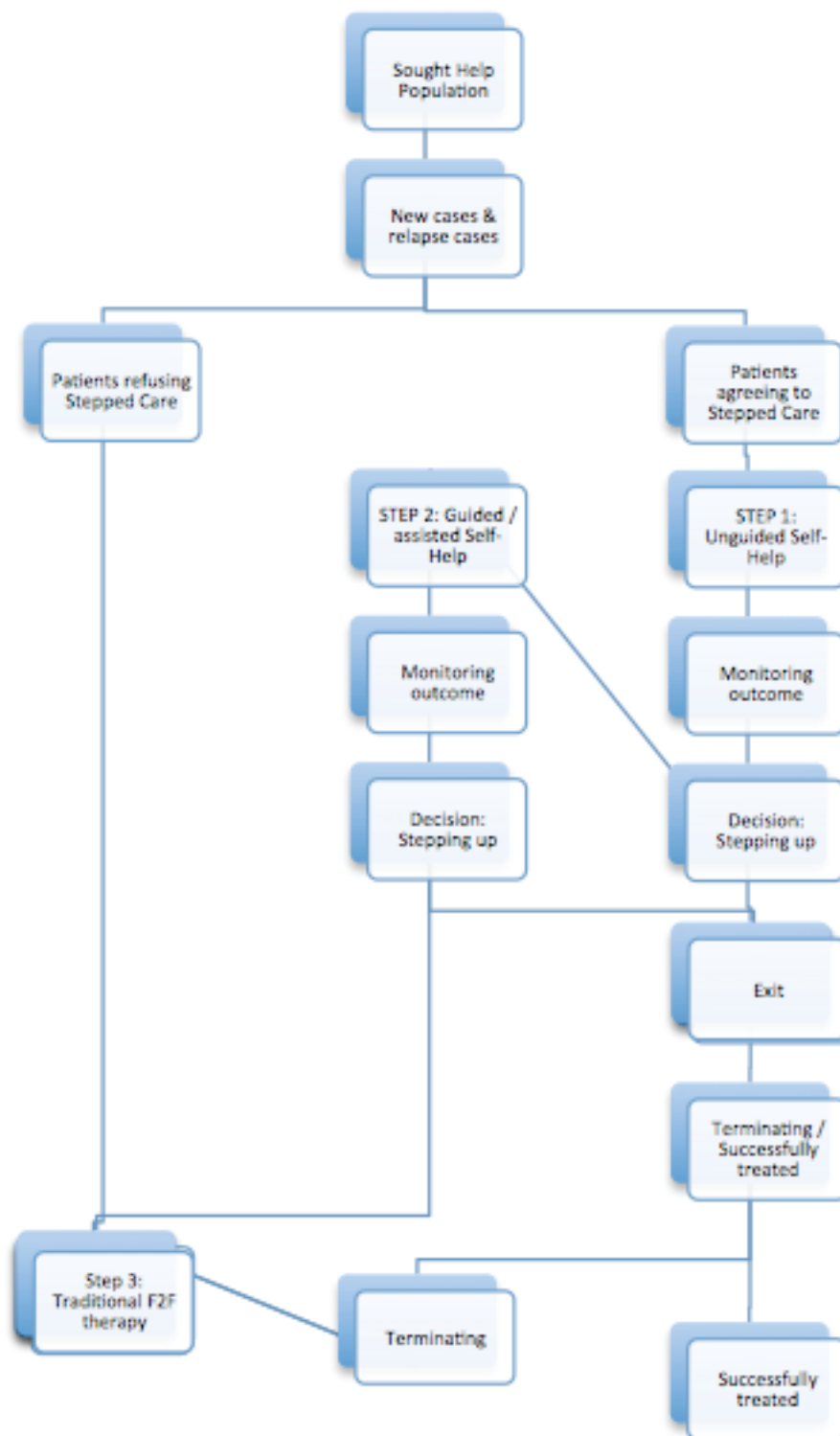
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Sought-Help group). The Unmet-Need group represents those acknowledging their need for help, but who have not sought any help for their problems (e.g. do not want to seek help, have not made a decision, etc.). Those in the No-Need group could use psycho-education to educate themselves, and support others in need. For the At-Risk group one could make use of universal, selective or indicated prevention interventions, psycho-education delivered as web-based interventions, interventions focusing on health promotion and TBI targeting the potential problem.



*Figure 3.* General model for technology-based intervention (TBI) options based on need for help in the general population.

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*Figure 4.* A simple three-step stepped care model in health care, based on technology-based intervention for depression.

A stepped care system based on a principal model of Bower and Gilbody (2005) is presented in Figure 4. A key element in stepped care is to deliver treatments

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with differing intensity (Bower & Gilbody, 2005), in this model starting with unguided Tbl. Research has focused on self-guided treatments as a propitious element in stepped care models (Andersson & Cuijpers, 2009; Scogin et al., 2003). Users should be screened for suitability before introduced for such a treatment option (Scogin et al., 2003). Some claim that stepped care and self-guided interventions is best suited for less severe disorders (Lovell & Richards, 2000). Those not suitable for self-guided interventions should be offered more intensive treatment options (Newman, 2000).

The available interventions could define the number of steps in a stepped care model (Bower & Gilbody, 2005; Scogin et al., 2003), with standard routine care as an upper limit. A stepped care system for depression in Norway could be designed with three steps:

Step 1: Starting with pure self-help interventions, no therapist contact.

Step 2: Guided self-help, limited to 1-2 hours per patient

Step 3: Standard care, for Norway and UK this could be 6-16 hours per patient (Lovell & Richards, 2000; Norwegian Directorate for Health and Social Affairs, 2009).

The aim of stepped care is to maximize the effect from available therapeutic resources (Bower & Gilbody, 2005). In rural areas, mental health services are being less available than in the metropolitan areas (Caldwell, Jorm, & Dear, 2004). In the Northern Norway health region where more than 32% of the citizens live in rural areas, there are 0.6 psychologist per 1000 inhabitants compared to 1.1 per 1000 in the metropolitan area (Oslo and Akershus) (Statistics Norway, 2010). This adds a heavy burden to the providers of mental health services in the northern region which is characterised by long travelling distances to regional hospitals, longer waiting lists, and fewer specialized services and health care professionals in the rural areas than in the cities (Helse Nord, 2005). When patients finally contact the GP for help they will normally have to wait 3-6 months for treatment in the specialised health service.

Providing a stepped care system, gives patients the opportunity to work with a internet-based therapy program, both when on the waiting list, between the appointments with the GP, after discharge and last not least together with the therapist during treatment, and as a result the effect of treatment could be strengthened (Sethi,

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Campbell, & Ellis, 2010). Consequently, the treatment can be initiated more quickly and become more efficient which will reduce personal suffering and societal costs.

Learmonth and colleagues (2008) aimed to develop an alternate CBT delivery model, which could reduce waiting lists and meet the demands for increased service capacity in specialist CBT centers. The uptake rate of computer-based therapy as a treatment choice was high (67%), as was the completion rate (71%). These authors also reported that waiting times for anxiety and depression treatment was cut by as much as 25% by this approach. They found that, after completing all eight sessions with the self-help computer-based CBT program, 64% of service users were successfully discharged and 18% were referred for face-to-face CBT. Of the 18% referred for face-to-face treatment, the additional number of sessions required before the users could be successfully discharged, was on average 3.7 (total of 11.7 sessions). The standard for this clinic was 15 sessions for ordinary face-to-face therapy. Another study from UK of computer-aided psychotherapy (Proudfoot et al., 2004) found a 67% take-up from GPs referrals for computer-aided psychotherapy, while in another study 60% of 606 referrals to a primary mental health centre chose to enter a self-help service (Fletcher, Lovell, Bower, Campbell, & Dickens, 2005).

Undoubtedly, Internet-based interventions represent a potential option for bridging service gaps with regard to the availability of specialized services to people experiencing geographic and mobility constraints, such as people living in rural and under-served communities, and people with disabilities (Conrad, 1998; Griffiths & Christensen, 2007; Griffiths, Farrer, & Christensen, 2010).

### **4.7 Conclusions**

This thesis has reported an explanatory model for intention to use unguided Internet-based self-help interventions for depressive symptoms. The thesis has demonstrated the effect of the interventions in a real life setting (effectiveness) as well as the more potential effect of the intervention (efficacy). The cost-effectiveness of unguided delivery to the community has been established. Moreover, user satisfaction among completers proved to be very high.

The acceptability of self-help in the population can influence attrition and dropout from trials. The users of all these Internet-based self-help interventions have views about the acceptability of self-help in general. There is still a need for more

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information about user preferences, user values, intentions to use and views from diverse population groups. A consideration of the dissemination of new services like unguided Internet-based self-help, raises questions about the relationship between level of symptoms or diagnosis, disability, risk and outcome. The difficulty of matching individual patients to effective treatment (‘‘aptitude treatment interaction’’; Sobell & Sobell, 2000), presents a major problem. If we cannot discover who is ‘‘suitable’’ for the treatment in question, should everyone be offered self-help prior to being assessed for more intensive therapy, as some advocates of stepped care might argue? Some might raise objections that for some service users this merely delivers the experience of failure, reinforcing low self-esteem, whilst others argue that any experience of helping is better than an extensive period on a waiting list. Such issues lie at the heart of debates about risk versus volume and the economic allocation of resources in mental health care systems.

Since depression has a high prevalence and as few as 20% of people with depression seek help and get treatment (Cole & Dendukuri, 2003), we need new ways to treat sub-threshold depression and to prevent major depressive episodes. Our present knowledge about efficacy, effectiveness, cost savings, acceptability and feasibility urges us to integrate these Internet-based services into existing mental health services as well as to offer them as open access interventions.

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**6. APPENDIX A1-A3 (PAPER I-III)**

**6.1 APPENDIX A1: PAPER I**

Lintvedt, O. K., Sørensen, K., Østvik, A. R., Verplanken, B., & Wang, C. E. (2008).  
The need for web-based cognitive behavior therapy among university students.  
*Journal of Technology in Human Services*, 26, 239-258.



## **5.2 APPENDIX A2: PAPER II**

Lintvedt, O. K., Griffiths, K. M., Sørensen, K., Østvik, A. R., Wang, C. E. A.,  
Eisemann, M., & Waterloo, K. (2011).  
Evaluating the effectiveness and efficacy of an Internet-based self-help  
intervention for the prevention of depression: A randomised controlled trial.  
*Clinical Psychology & Psychotherapy*, 20(1), 10-27.



**5.3 APPENDIX A3: PAPER III**

Lintvedt, O. K., Griffiths, K. M., Eisemann, M., & Waterloo, K. (2013).

Evaluating the translation process of an Internet-based self-help intervention for prevention of depression: A cost-effectiveness analysis. *Journal of Medical Internet Research*, 15(1), e18.



**7. APPENDIX B (MEASURES)**

Overview of the main outcome measures used in the Papers I, II and III

*Measures used in assessments.*

Measures :	Paper I	Paper II	Paper III	Online
ATQ		X	X	
CES-D	X	X	X	
TDL		X	X	
K10		X	X	
HINT	X			
TPB	X			
Goldberg				X
Warpy Thoughts				X
Pleasant Events Schedule				X
Life Event Stress				X
Parental style and stress				X

Note: Online measures are not used in the papers.

**Description of measures.**

*Automatic Thoughts Questionnaire (ATQ).*

This measure measures the frequency of negative automatic thoughts associated with depression. The ATQ (Hollon & Kendall, 1980) consists of 30 items and has five response categories. Accordingly, scores range from 30 to 150. The Norwegian version of the ATQ had previously shown an internal consistency of  $\alpha = .83$  and has proven to discriminate between clinically depressed and non-depressed psychiatric patients and healthy controls (Chioqueta & Stiles, 2004). In this study the internal consistency of the Norwegian version of the scale was  $\alpha = .95$ .

*Centre for Epidemiological Studies–Depression Scale (CES-D).*

Depressive symptoms were assessed by the Centre for Epidemiological Studies–Depression Scale (CES-D; Radloff, 1977). This 20-item self-report scale



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records symptoms according to 4-point Likert-type response scales (0–3), allowing a range from 0 to 60, with scores 16 or higher reflecting symptoms of depression. A full description of the inventory, including psychometric properties, can be found in Radloff (1977). The sum of all of the items were computed and used in all of the analyses ( $\alpha = .87$ ).

### Treatment Depression Literacy (TDL).

This measure comprises a combination four depression literacy measures previously described by Christensen and colleagues (2004) and which evaluated the participants' knowledge about the effectiveness of treatments for depression and their knowledge about cognitive behaviour therapy. The measure covers the following areas: medical literacy (scores range 0-2), psychological literacy (scores range 0-3), lifestyle literacy (scores range 0-3) and cognitive behaviour therapy (CBT) literacy (scores range 0-16). In this study the internal consistency of the Norwegian version of the scale was  $\alpha = .87$ .

### Kessler Psychological Distress Scale

Kessler Psychological Distress Scale (K10; Kessler et al., 2002) is a scale of psychological distress developed for use in epidemiological surveys. Scores on the K10 scale range from 0 to 50, with higher scores indicating greater distress. People who score under 20 are likely to be well, 20-24 are likely to have a mild mental disorder, 25-29 are likely to have moderate mental disorder and score 30 and over are likely to have a severe mental disorder. A Norwegian version of the K10 was used as a screening tool for identifying participants eligible for the study. The English language version was translated into Norwegian by the authors with subsequent back translation into English by an expert translator. The internal consistency of the Norwegian version of the scale was  $\alpha = .79$ . As participants at risk of depression were the target group, a cut-off score of 20 or above was set for eligibility for the Internet intervention study. The recommended intervention for people scoring between 16 and 29 on the K10, is self-help (Saunders & Daly, 2001).

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### Habit Index of Negative Thinking (HINT).

Habitual negative self-thinking was assessed by the Habit Index of Negative Thinking (HINT; Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007). This 12-item self-report scale asks for the degree of negative thinking on a 7-point Likert-type response scales (1–7), allowing a range from 12 to 84, with higher scores indicating a stronger negative thinking habit. A full description of the inventory, including psychometric properties can be found in Verplanken and colleagues (2007). The sum of all of the items were computed and used in all the analyses ( $\alpha = .95$ ).

### TPB questionnaire.

The intention to use an Internet-based counseling service based on CBT (i.e., MoodGYM) was assessed by using the theory of planned behavior (TPB; Ajzen, 1991, 2002). The TPB questions developed for this study comprise different scales measuring perceived behavioral control (4 items), subjective norms (5 items), attitudes toward using MoodGYM (7 items), and intentions to use MoodGYM (5 items), all to be scored along a 7-point Likert-type response scale, items ranging from 1 (totally agree) to 7 (totally disagree). Attitudes toward using MoodGYM were scored along a 7-point semantic differential scale. The scale contains 7 semantic differential pairs of adjectives, each pair scored from 1 (negative adjective) to 7 (positive adjective). The scale includes pairs of adjectives such as whether MoodGYM is negative or positive, harmful or beneficial, bad or good, etc. The sum of all of the items were computed and used in all of the analyses (Cronbach's alpha: subjective norm  $\alpha = .80$ ; perceived behavioral control  $\alpha = .76$ ; intention to use MoodGYM  $\alpha = .95$ ; attitudes toward MoodGYM  $\alpha = .86$ ).

### Online assessments (in MoodGYM / Bluepages).

#### Goldberg Depression and Anxiety Scales<sup>i</sup>.

Each of the Goldberg scales comprises 9 items. These scales are ideal for use on the Internet because they are brief, well accepted, of satisfactory reliability and validity, and have been previously used in epidemiological survey

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research using a handheld computer interface<sup>ii</sup>. The scales are administered prior to each module. Other online assessments included;

### Warpy Thoughts Questionnaire<sup>iii</sup>,

a 42-item scale that measures dysfunctional thinking, The Warpy Thoughts Quiz was developed at the Centre for Mental Health Research at the ANU.

### Life Event Stress<sup>iv</sup>,

measures the stress of life events. Consists of items covering health, pregnancy (women only), bereavement, family and social issues, interpersonal relationships with friends and family, education, work, mobility and financial and legal matters. The person indicates whether any of the items have applied over the last 12 months. Each item is associated with a distress rating (1, 2 or 3). The person then receives a score for the number of events checked and the score with distress rating included.

### Pleasant Events Schedule<sup>v</sup> (PES),

is measuring relaxation.

### Parental style and stress<sup>vi</sup> (MOPS),

measures of early experiences of parenting. MOPS is designed to measure three aspects of parenting: indifference, over-control and abuse.

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<sup>i</sup> Goldberg, D., Bridges, K., Duncan-Jones, P., & Grayson, D. (1988). Detecting anxiety and depression in general medical settings. *British Medical Journal*, 297(6653), 897-899.

<sup>ii</sup> Caldwell, T. M., Rodgers, B., Jorm, A. F., Christensen, H., Jacomb, P. A., Korten, A.E., et al. (2002). Patterns of Association Between Alcohol Consumption and Symptoms of Depression and Anxiety in Young Adults. *Addiction*, 97(5), 583-94.

<sup>iii</sup> Christensen, H., Griffiths, K. M., & Groves, H. (2004). *MoodGYM Clinician Manual*. Canberra: Centre for Mental Health Research.

<sup>iv</sup> Tennant, C., & Andrews, G. (1976). A scale to measure the stress of life events. *Australian and New Zealand Journal of Psychiatry*, 10(1), 27-32

<sup>v</sup> MacPhillamy, D., & Lewinsohn, P. M. (1982). The Pleasant Events Schedule: studies on reliability, validity and scale intercorrelation. *Journal of Consulting and Clinical Psychology*, 3, 363-380.

<sup>vi</sup> Parker, G., Roussos, J., Hadzi-pavlovic, D., Mitchell, P., Wilhelm, K., & Austin, M. P. (1997). The development of a refined measure of dysfunctional parenting and assessment of its relevance in patients with affective disorders. *Psychol Medicine*, 27(5), 1193-1203.

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### Measures:

#### ATQ:

Listed below are a variety of thoughts that pop into people's heads. Please read each thought and indicate how frequently, if at all, the thought occurred to you over the last week. Please read each item carefully and fill in the blank with the appropriate number; using the following scale:

- 1 = Not at all
- 2 = Sometimes
- 3 = Moderately often
- 4 = Often
- 5 = All the time

- \_\_\_\_\_ 1. I feel like I'm up against the world.
- \_\_\_\_\_ 2. I'm no good.
- \_\_\_\_\_ 3. Why can't I ever succeed?
- \_\_\_\_\_ 4. No one understands me
- \_\_\_\_\_ 5. I've let people down.
- \_\_\_\_\_ 6. I don't think I can go on.
- \_\_\_\_\_ 7. I wish I were a better person.
- \_\_\_\_\_ 8. I'm so weak.
- \_\_\_\_\_ 9. My life's not going the way I want it to.
- \_\_\_\_\_ 10. I'm so disappointed in myself.
- \_\_\_\_\_ 11. Nothing feels good anymore.
- \_\_\_\_\_ 12. I can't stand this anymore.
- \_\_\_\_\_ 13. I can't get started.
- \_\_\_\_\_ 14. What's wrong with me?
- \_\_\_\_\_ 15. I wish I were somewhere else.
- \_\_\_\_\_ 16. I can't get things together.
- \_\_\_\_\_ 17. I hate myself.
- \_\_\_\_\_ 18. I'm worthless.
- \_\_\_\_\_ 19. I wish I could just disappear.
- \_\_\_\_\_ 20. What's the matter with me?
- \_\_\_\_\_ 21. I'm a loser.
- \_\_\_\_\_ 22. My life is a mess.
- \_\_\_\_\_ 23. I'm a failure.
- \_\_\_\_\_ 24. I'll never make it.
- \_\_\_\_\_ 25. I feel so helpless.
- \_\_\_\_\_ 26. Something has to change.
- \_\_\_\_\_ 27. There must be something wrong with me.
- \_\_\_\_\_ 28. My future is bleak.
- \_\_\_\_\_ 29. It's just not worth it.
- \_\_\_\_\_ 30. I can't finish anything

**Center for Epidemiologic Studies Depression Scale (CES-D)**

Below is a list of the ways you might have felt or behaved. Mark how often you have felt this way during the past week.

	During the Past Week			
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues, even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people disliked me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Treatment Depression Literacy

*This first section refers to different people (some professional, some not) who might help someone who has depression. We would like you to rate whether you think these people are likely to be helpful for someone with depression.*

		Helpful	Neither helpful nor harmful	Harmful	Don't know
<b>1</b>	GPs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>2</b>	Counsellors and clinical psychologists	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>3</b>	Psychiatrists	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>4</b>	Family and friends	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

*This next list is about medical treatments. We would like you to rate whether you consider each of these treatments is likely to be helpful or not for someone who has depression.*

		Helpful	Neither helpful nor harmful	Harmful	Don't know
<b>5</b>	Antidepressants	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>6</b>	Electroconvulsive therapy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>7</b>	Tranquillisers	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>8</b>	Oestrogen	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

## Unguided Internet-based self-help for symptoms of depression

*This next list refers to psychological treatments people might use to help with depression. Please rate whether or not you think each treatment is likely to be helpful for someone with depression.*

		Helpful	Neither helpful nor harmful	Harmful	Don't know
<b>9</b>	Cognitive-Behaviour Therapy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>10</b>	Interpersonal Psychotherapy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>11</b>	Psychodynamic Psychotherapy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>12</b>	Hypnotherapy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>13</b>	Counselling	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
<b>14</b>	Reading self-help books for depression	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

## Unguided Internet-based self-help for symptoms of depression

*Questions 15 to 30 ask about ways of dealing with depression and your understanding of factors that affect depression.*

Cognitive behaviour therapy involves understanding how childhood experiences contribute to depression.

Yes  1

No  2

Don't know  3

People who feel depressed have a negative view of themselves as people.

Yes  1

No  2

Don't know  3

Happy people have a positive view of the future.

Yes  1

No  2

Don't know  3

Rather than the event causing us to feel miserable, it is our thoughts about that event that make us vulnerable to depression.

Yes  1

No  2

Don't know  3

In 'all or none' thinking a mistake or error is interpreted as a pattern of mistakes, and errors.

Yes  1

No  2

Don't know  3



## Unguided Internet-based self-help for symptoms of depression

'Jumping to conclusions' involves thinking negatively about something without supporting evidence.

Yes  1

No  2

Don't know  3

Personalisation involves attributing blame to somebody else when it is not his/her responsibility.

Yes  1

No  2

Don't know  3

The statement 'I'm a stupid idiot' is an example of labelling.

Yes  1

No  2

Don't know  3

People are vulnerable in different ways. The need to be perfect and the need for approval are two areas of vulnerability.

Yes  1

No  2

Don't know  3

'Taking the role of a whale' is a method of contesting warpy thoughts.

Yes  1

No  2

Don't know  3

It is sometimes useful to step back from a situation and evaluate it with a new objectivity.

Yes  1

No  2

Don't know  3

## Unguided Internet-based self-help for symptoms of depression

I should automatically believe my thoughts because they will more often than not be accurate.

Yes  1

No  2

Don't know  3

The central concept of overcoming negative emotions is to challenge and contest warpy thinking.

Yes  1

No  2

Don't know  3

Progressive muscular relaxation and meditation are techniques that have nothing in common with each other.

Yes  1

No  2

Don't know  3

Drinking and taking drugs are potential dangers during the breakup of a relationship.

Yes  1

No  2

Don't know  3

The survey method in cognitive behaviour therapy involves surfing the net.

Yes  1

No  2

Don't know  3

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The Kessler Psychological Distress Scale (K10)

Please tick the answer that is correct for you:	All of the time (Score 5)	Most of the time (Score 4)	Some of the time (Score 3)	A little of the time (Score 2)	None of the time (Score 1)
In the past 4 weeks, about how often did you feel tired out for no good reason?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel nervous?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel so nervous that nothing could calm you down?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel hopeless?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel restless or fidgety?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel so restless you could not sit still?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel depressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel that everything was an effort?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel so sad that nothing could cheer you up?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In the past 4 weeks, about how often did you feel worthless?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The Habit Index of Negative Thinking (HINT)

Occasionally we think about ourselves. Such thoughts may be positive, but may also be negative. In this study we are interested in negative thoughts you may have about yourself. Please indicate how much you agree or disagree with the following statements.

Thinking negatively about myself is something . . . .	strongly disagree				strongly agree		
	1	2	3	4	5	6	7
1. I do frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I do automatically.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I do unintentionally.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. that feels sort of natural to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I do without further thinking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. that would require mental effort to leave.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I do every day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I start doing before I realize I'm doing it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I would find hard not to do.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I don't do on purpose.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. that's typically "me."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I have been doing for a long time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### TPB questionnaire

Instructions:

Please read through the text before you answer the questions.

Many people experience periods of increased stress, feelings of loneliness and lack of confidence and students are not an exception. Moving from home, getting established in new environment, exams etc yield a lot of stress onto the student. A survey conducted among students in Tromsø in 2006 showed that 20% of the students felt a need for help for their problems, but failed to seek help.

Many are not aware of how to seek help and are not familiar with existing resources. Description of existing help sources, such as: GPs, psychologist, student's social service, student priest...

Some people may still find it difficult to seek help for their problems, and their wish for anonymity can exceed their need for help.

Prevention of mental disorders like depression and anxiety at an early stage is essential for both mental and physical well-being. We are planning to launch an Internet-based self-help intervention for students in Tromsø to prevent and increase resistance to psychological problems like depression and stress.

By means of the MoodGYM program people will obtain insight into their problems and increase their resistance. The program can be used anonymously.

Based on the description above of an Internet-based program (MoodGYM), we ask you to rate the following:

#### [Attitude]

1. Indicate your attitude to the use of MoodGYM:

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Positive	1	2	3	4	5	6	7	Negative
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Harmful	1	2	3	4	5	6	7	Beneficial
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Unpleasant	1	2	3	4	5	6	7	Pleasant
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Good	1	2	3	4	5	6	7	Bad
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Worthless	1	2	3	4	5	6	7	Valuable
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Enjoyable	1	2	3	4	5	6	7	Not enjoyable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Safe	1	2	3	4	5	6	7	Risky
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

*[Subjective norm]*

Most people who are important to me would find it OK if I use MoodGYM

	1	2	3	4	5	6	7	
Totally agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Totally disagree

3. I'm expected to use MoodGYM

Totally agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Totally disagree
---------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	------------------

4. People whose opinion matters to me would disapprove my use of MoodGYM

Totally agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Totally disagree
---------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	------------------

5. My friends will accept that I use MoodGYM

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Totally agree         Totally disagree

6. My parents will not like that I use MoodGYM

Totally agree         Totally disagree

[Perceived Behaviour Control]

If MoodGYM would be available today, what would best describes your personal opinions:

For me, it will be difficult to use MoodGYM

1 2 3 4 5 6 7  
Totally agree         Totally disagree

If I wish, I can use MoodGYM

Totally agree         Totally disagree

It is totally up to me to use MoodGYM

Totally agree         Totally disagree

It is mostly up to myself to use MoodGYM

Totally agree         Totally disagree

[Intention]

I intend to make use of MoodGYM

1 2 3 4 5 6 7  
Totally agree         Totally disagree

I shall try to make use of MoodGYM

Totally agree         Totally disagree

I'm planning to make use of MoodGYM

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Totally agree         Totally disagree

I expect to make use of MoodGYM

Totally agree         Totally disagree

Probably I will make use of MoodGYM

Totally agree         Totally disagree

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## 8. APPENDIX C (PROGRAMS)

### 8.1 The Internet-based intervention programs

MoodGYM is an interactive website that offers cognitive behavioural therapy. BluePages is a psycho-education website that offers information about depression and treatments in general.

Depression interventions using the Internet are both primary and a secondary intervention. Blues Pages provides depression literacy, which is valuable for both people already struggling with depression and for the general public. Depression awareness is valuable for everyone because it can help a mentally healthy person recognize signs of depression and prevent it from developing; help friends and family of a depressed person cope; and facilitate understanding. The other intervention, MoodGYM, designed to prevent and decrease symptoms of depression, seeks to help people struggling with depression or depressive symptoms. It is a secondary intervention because it tries to rehabilitate patients who have symptoms of depression and prevent their symptoms from progressing further. The MoodGYM and BluePages websites aim to alleviate depression symptoms and increase understanding of depression using the Internet. Both programs was developed by the Centre for Mental Health Research (CMHR) at the Australian National University and launched in 2001. The Norwegian version was translated by the Department of psychology at the University of Tromsø in Norway, and launched in 2006.

### 8.2 MoodGYM

MoodGYM (<http://www.moodgym.no>) is a free, interactive Internet-based program. MoodGYM delivers cognitive behaviour therapy (CBT), which is an evidence-based psychotherapy that is often used in clinical practice. The cognitive therapy component is designed to change dysfunctional beliefs and thoughts, thereby lowering emotional distress. The behaviour component, which includes relaxation

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training, problem solving, and activity scheduling, is designed to identify factors in the environment that could change behaviours. The MoodGYM program consists of five cognitive behavior training modules, a personal workbook (containing 29 exercises and assessments), an interactive game and a feedback evaluation form. These are completed in a set order, as each module builds upon material covered in earlier modules. MoodGYM includes homework exercises and an online personalised and tailored Workbook, which creates and tracks user profiles and progress.

MoodGYM is one of a few free CBT programs available on the Internet. Through its interactivity MoodGYM is designed to exploit the capabilities of the web medium. MoodGYM generates a database of records for each user that is currently used by the CMHR for research purposes. MoodGYM is intended to provide direct help in preventing and treating depression and to encourage the seeking of professional help. MoodGYM users who believe they may have a mental health problem are recommended to seek the advice and help of a health professional.

MoodGYM aims to teach how to feel less stressed, depressed and anxious, and to be better able to cope with life. MoodGYM wants to learn users helpful ways of thinking about problems, how to improve self-esteem, and how best to relate to others (and to be more assertive). Users will also learn how to increase the pleasure in their life, how to relax and how to cope with a relationship breakup.

Before starting the first module one is invited to meet the characters, where MoodGYM's six characters will be introduced. At the beginning of each MoodGYM module one is asked to complete the Goldberg Depression and Anxiety quizzes. These quizzes give an indication of how people are feeling as they progress through MoodGYM. In the Workbook, there is a graph that displays the results on the Depression and Anxiety quizzes.

### **Module 1: Feelings**

The user meet a set of six characters and identify that other individuals might have similar thoughts and feelings to their own. The users complete the Goldberg Depression and Anxiety Scales and receive feedback about their current levels of

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symptoms. The users complete the Warpy Thoughts Quiz and receive feedback on areas of vulnerability. The results are displayed as percentages. The highest score indicates the person's greatest area of vulnerability. The seven areas of vulnerability are:

1. The need for approval from others;
2. The need to be loved;
3. The need for success;
4. The need to be perfect;
5. The sense of being responsible for the feelings of others;
6. The view that happiness is contingent on external things; and
7. The sense of feeling deserving (i.e. 'things should always go my way').

The module introduces the concept that negative or biased thinking can directly influence feelings of anxiety, inferiority and depression. The concept of 'WUTIWUF' is introduced: what you think is what you feel. Find out about negative thinking patterns, biased perceptions of situations, and negative views about the future. Discover biased views of the future or of oneself. Reflect on how one tends to respond to day-to-day challenges.

The user complete three exercises in the module:

- 1) Identifying negative thoughts from the conversation of a number of the characters (Identifying Negative Thoughts),
- 2) Identifying examples of their own warped thoughts (Auto Talk Quiz), and
- 3) Identifying thoughts that recently made them upset or angry (Bad Hair Day).

In addition the users are asked to complete the exercise Three Encounters of an Emotional Kind for homework.

### **Module 2: Thoughts**

The user repeats the Depression and Anxiety Scales, and begins to identify common patterns of thinking that can result in biased thinking through a number of exercises (Identify the Warped Thoughts, Identify the Types of Warped Thinking).

The next phase is to contest errors through examples and exercises (Unwarping the Warp Using Straight Talking). Further, to review their particular areas of

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vulnerability. The user review their positive and negative characteristics and is asked to spend 10 minutes a day over the next week doing activities that they like to do.

Finally, they complete an exercise for homework (Being Nice to Myself for a Change). The theme for this module is to find out the areas where one is most vulnerable: Is it the need for approval, the need to be loved, the need to succeed, the need to be perfect or something else? Start learning about self-esteem and how to improve it.

### **Module 3: Unwarping**

The users repeat the Depression and Anxiety Scales and complete a number of exercises (The Reporter's Notebook, I Do Have Some Positive Features, Surveying the Scene). All of these are designed to help the user develop more realistic interpretations of events. Then the users are introduced to the idea of mental biofeedback, which involves monitoring the frequency of 'warpy' thoughts.

In this module the users go through a variety of exercises based on their highest scores from the first Warpy Thoughts Quiz. In brief, individuals with high scores on the need for approval read specific information and then complete a specific exercise (I'll Not Cry Even if I Want to), those with high scores on the need to be loved complete a specific exercise (The Phantom and the Phantome), high scorers on the need to succeed complete the exercise Near Death Experience, high scorers on the need to be perfect complete the exercise Weekly Plan to Overcome Perfectionism (this includes some helpful time-management strategies), and those scoring highly on the sense of feeling deserving, the sense of being able to influence all things, and the sense of external control/happiness are provided with specific information on these topics but not with specifically associated exercises.

Then the users undertake a practice exercise, Seeing the Alternatives, which consolidates learning across all the specific areas of vulnerability. Next, the users undertake the Pleasant Events Schedule. This program provides the student with an indication of the average frequency with which they undertake various activities and the average pleasantness of the ratings. These ratings can be compared with those from the population as a whole. It also provides an indication of frequently undertaken activities that are not enjoyable, and infrequently undertaken activities that are enjoyable. These form the basis for activity scheduling. This exercise takes a long

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time to complete, but can be done in segments by re-entering the training program. Finally, the users undertake Activity Scheduling, using answers achieved from the Pleasant Events Schedule.

### **Module 4: De-stressing**

The users undertake the Depression and Anxiety Scales and identify situations that might lead to warpy thinking. The users start learning about stress and how it works, and a distinction is made between life whacks (life events that are common), and *chronic nagging issues* (stressors that are chronic). The users are also asked to analyse the checked events, to determine which events might be changeable and which are not. Strategies for controlling 'un-changeable' events are also introduced.

The users then undertake the Mum and Dad Quiz. This provides users with feedback about the parenting they experienced and information about a possible association between parental over-control and vulnerability to depression and anxiety. This information is provided in the users progress reports.

A guide to improving relationships with parents is then introduced. Strategies are recommended and a number of 'warpy thoughts' specifically associated with parental relationships are discussed. The rationale and methods of relaxation are introduced. Three types of relaxation tapes are available to download from the site. One can find out more about relaxation in the Relaxfest, the relaxation game-show.

### **Module 5: Relationships**

The Relationships module is the last and shortest MoodGYM module. In this module one have to complete the Depression and Anxiety Scales again. Further, read material about relationships and how individuals can learn to cope with relationship break-ups, read about potential dangers associated with the break up of a relationship, learn a simple problem solving strategy, complete the Final Depression and Anxiety Scales, complete the final Warpy Thoughts Quiz, complete the Feedback Questionnaire, and print out the MoodGYM Certificate of Completion.

Relationships can be a source of great distress when they go wrong. This module aims to help users cope with and grow after a relationship breakup. The module also describes simple, but highly effective problem-solving strategies.

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### **After the last module**

Once one has completed the MoodGYM modules, there is one final set of quizzes to complete – the final Depression and Anxiety quizzes, and the final Warpy Thoughts quiz. When these quizzes are done users are presented with the Wrapping It Up page. This page provides a run-down of the topics covered in MoodGYM.

### **Workbook**

In the user's workbook there is a record of all completed exercises and quizzes. It shows exercises from partially completed modules. When answers to a quiz or exercise are saved, the answers are stored in the users Workbook. Also stored in the Workbook is a graph showing results in the Depression and Anxiety quizzes that are completed.

### **Overview over modules in MoodGYM.**

#### *Module 1: Feelings*

Exercise 1: Depression and Anxiety Quiz

Exercise 2: Identifying negative thoughts

Exercise 3: Warped thoughts quiz

Exercise 4: Bad hair day

Exercise 5: Three encounters of an emotional kind

#### *Module 2: Thoughts*

Exercise 6: Depression and Anxiety Quiz

Exercise 7: Identify the warped thoughts

Exercise 8: Identify the types of warped thinking

Exercise 9: Unwarping the warp and my warpy thoughts test

Exercise 10: My scores on the warpy thoughts test

Exercise 11: What do I think of myself?

Exercise 12: Being nice to myself for a change

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### *Module 3: Unwarping*

Exercise 13: Depression and Anxiety Quiz

Exercise 14: The reporter's notebook

Exercise 15: I do have some positive features

Exercise 16: Surveying the scene

Exercise 17: I'll not cry even if I want to

Exercise 18: The phantom and the phantome

Exercise 19: Near death experience

Exercise 20: Weekly plan to overcome perfectionism

Exercise 21: Seeing the alternatives

Exercise 22: Activity scheduling

### *Module 4: De-Stressing*

Exercise 23: Depression and Anxiety Quiz

Exercise 24: Life Whacks

Exercise 25: Analyzing Life Whacks

Exercise 26: Analyzing thoughts about your parents

Exercise 27: What leads to bad interactions?

### *Module 5: Relationships*

Exercise 28: Depression and Anxiety Quiz

Exercise 29: My final Warpy thoughts test

**Description of measures.**

*Goldberg Depression and Anxiety Scales*<sup>1</sup>. Each of the Goldberg scales comprises 9 items. These scales are ideal for use on the Internet because they are brief, well accepted, of satisfactory reliability and validity, and have been previously used in epidemiological survey research using a handheld computer interface<sup>2</sup>. The scales are administered prior to each module.

*Warpy Thoughts Questionnaire*<sup>3</sup>, a 42-item scale that measures dysfunctional thinking, The Warpy Thoughts Quiz was developed at the Centre for Mental Health Research at the ANU.

*Life Event Stress*<sup>4</sup>, measures the stress of life events. Consists of items covering health, pregnancy (women only), bereavement, family and social issues, interpersonal relationships with friends and family, education, work, mobility and financial and legal matters. The person indicates whether any of the items have applied over the last 12 months. Each item is associated with a distress rating (1, 2 or 3). The person then receives a score for the number of events checked and the score with distress rating included.

*Pleasant Events Schedule*<sup>5</sup> (PES) is measuring relaxation.

*Parental style and stress*<sup>6</sup> (MOPS), measures of early experiences of parenting. MOPS is designed to measure three aspects of parenting: indifference, over-control and abuse.



### **8.3 BluePages**

*The BluePages* website (<http://www.bluepages.no>) provides information about depression, including symptoms, general and specific sources of help, evidence-based information about medical, psychological and alternative/lifestyle treatments for depression, and information about depression prevention. BluePages provide depression literacy, offering evidence-based information at 8th grade reading level. Online quizzes allow the users to assess levels of anxiety and depression (Goldberg) relative to community levels. The Australian version of the site also includes BlueBoard, a forum through which you can talk to other people who have experienced or are interested in learning about depression. The site also includes advanced search capabilities.

BluePages maintains a high standard of information on interventions for depression through ongoing "systematic reviews". A systematic review involves a lengthy process of searching for all the scientific research on a specific intervention, and compiling and integrating the highest quality evidence. This is considered to be the most objective approach to evaluating different interventions.

The four main areas in BluePages are Symptoms (how does depression feel?), Treatments (What works and what doesn't), Help and resources (Where can I get help?), and Prevention (how might depression be prevented?).

#### **Symptoms of depression.**

This section offers information about depression and the type of problems that depressed people experience. Further, one can read about how depression is diagnosed and finally, one can take the depression and anxiety tests.

#### **Treatment for depression.**

This section has reviewed the scientific evidence for a range of conventional and alternative and self help 'treatments' for depression. Some treatments are effective, some are promising but require more study, and others are not supported by scientific evidence. A rating system is used to show how useful treatments are, based on scientific evidence. As some people prefer medical treatments, some prefer

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psychological therapy and others are most interested in alternative treatments and lifestyle changes, this section is divided in three parts.

### *Medical treatments.*

Medical treatments for depression include prescribed drugs and other treatments usually given only by a doctor; Antidepressants, Electroconvulsive Therapy, Oestrogen, Transcranial magnetic stimulation and Tranquillisers.

### *Psychological treatments.*

Psychological treatments are described as a process forming a supportive relationship and changing the way one think or behave. Psychological treatments for depression include Bibliotherapy, Cognitive behaviour therapy (CBT), Hypnotherapy, Interpersonal psychotherapy (IPT), Psychodynamic psychotherapy, Reminiscence therapy and Supportive counselling.

### *Lifestyle and alternative treatments.*

Lifestyle and alternative treatments involve changing the way one live or using natural therapies. The list contains 36 different treatments such as Acupuncture, Meditation, Alcohol avoidance, Music, Exercise, Fish oils, St John's worth.

### *Help and resources.*

Help and resources answer the question about where we can get help for someone we care about or ourselves. It gives information about people and organisations that can help if one is depressed. It focuses on why one deserves help and what sort of professional and other help could be useful. It provides information on how to get help and find information in the national and local or community-based health care system as well as listing voluntary organisations that offers online or telephone based help services. There is information for those who are feeling suicidal as well. Finally there is information about other resources (books, clinical practice guidelines, videos & web sites) that could be helpful.

### *Prevention.*

The prevention section gives a rationale for online prevention and gives information and facts about online delivery as a alternative and possible solution. It gives a short description of MoodGYM as well.

**References to online measures used in MoodGYM.**

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