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# THERAPEUTIC HORTICULTURE FOR CLINICAL DEPRESSION IN A GREEN CARE CONTEXT: PROSPECTIVE STUDIES ON MENTAL HEALTH BENEFITS, ACTIVE COMPONENTS AND EXISTENTIAL ISSUES

TERAPEUTISK HAGEBRUK VED KLINISK DEPRESJON I EN GRØNN OMSORG KONTEKST:  
PROSPEKTIVE STUDIER PÅ MENTAL HELSE UTBYTTE, AKTIVE KOMPONENTER OG  
EKSISTENSIELLE FORHOLD

MARIANNE THORSEN GONZALEZ

Therapeutic horticulture for clinical depression in a Green Care context:  
Prospective studies on mental health benefits, active components and existential issues

Terapeutisk hagebruk ved klinisk depresjon i en Grønn Omsorg kontekst:  
Prospektive studier på mental helse utbytte, aktive komponenter  
og eksistensielle forhold

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We may have to learn again the mystery of the garden: How its external characteristics model the heart itself, and how the soul is the garden enclosed, our own perceptual paradise where we can be refreshed and restored.

(Thomas Moore cited in Grut 2003 p. 97)



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## Summary

Historically, asylums were surrounded by gardens, parks and open landscapes, and patients often participated in horticultural activities. Horticultural therapy and therapeutic horticulture are today widely known therapeutic strategies within mental health, despite the fact that formal research in this field is scarce.

Depressed individuals suffer from impaired mood, attentional impairment, rumination, reduced interest, inactivity and social withdrawal. Depression is further highly co-morbid with anxiety and inversely associated with existential issues such as a sense of meaning in life.

The main aim of the present research was to assess changes in depression severity, anxiety, positive affects, perceived stress, perceived attentional capacity, rumination and existential issues during a twelve week therapeutic horticulture program in a Green Care farm context. The research also aimed to identify when during a therapeutic horticulture program the most significant changes took place, and to investigate if the elements of attention restoration theory, being away, fascination and group cohesiveness acted as possible active components. The research further aimed to investigate the persistence of changes at 3-month follow-up.

Two single-group design studies with multiple measurement points and convenience samples were used (Study 1:2008 and Study 2:2009). The participants, all meeting the DSM IV criteria for major depressive disorder, completed a group-based therapeutic horticulture program in twelve weeks, attending twice a week for three hours each time.

The thesis includes four papers: an empirical investigation of changes in depression severity and perceived attentional capacity in relation to the restorative qualities being away and fascination (Study 1, Paper I); an empirical investigation of changes in depression severity, perceived attentional capacity and rumination as mediated by the restorative qualities being away and fascination (Study 2, Paper II); an empirical investigation of levels of group cohesiveness in relation to changes in depression severity, anxiety, positive affects and perceived stress in the pooled sample (Study 1 and Study 2), with an analysis of qualitative data related to social aspects of the therapeutic horticulture intervention (Paper III); and finally an empirical investigation of changes in life regard (Study 1) and sense of coherence (Study 2) in relation to changes in depression severity, together with an analysis of qualitative data related to these existential issue in therapeutic horticulture for clinical depression (Paper IV).

In both studies, depression severity declined significantly during the intervention, and the most significant change took place during the first four weeks. The decline compared to

baseline was still significant at 3-month follow-up in both studies. Perceived attentional capacity increased in both studies; the most significant change took place after four weeks in Study 1 and after eight weeks in Study 2. However, the increase dissipated by the 3-month follow-up in both studies. Rumination decreased significantly during the intervention in Study 2. The participants reported high and stable values on the restorative qualities being away and fascination during the intervention. Those participants who were most fascinated by the intervention showed a significantly greater decline in depression severity (Paper I). Decline in depression severity and increase in perceived attentional capacity were mediated by change in the restorative qualities being away and fascination from home to the garden context. Brooding acted as a moderator of decline in depression severity (Paper II).

The improvements in anxiety, positive affects and perceived stress during the intervention were all statistically significant. The participants reported high levels of group cohesiveness, and the levels of group cohesiveness correlated positively, but not significantly, with the improvements in depression severity, anxiety, affects and perceived stress. The participants evaluated positively the social aspects of the therapeutic horticulture intervention and more than a third of the participants reported increased social activity after having participated in the intervention (Paper III).

There were no significant changes in the two studies in the existential issues life regard and sense of coherence. However, more than two thirds of the participants evaluated that participation in the therapeutic horticulture intervention had contributed to change in their view of life. The qualitative data supported these evaluations (Paper IV).

This research is limited by a lack of control group, small sample sizes in each study and a complex intervention performed at four different locations. The research is strengthened by double assessments at baseline, multiple measurement points and two data collection periods, enabling replication that increases confidence in the findings. The research is theoretically consistent looking across perspectives on depression, the selection of measures and the active components of the intervention. It is also considered a strength that the statistical analysis used allowed for determining when the most substantial changes took place, and for examining possible mediators and moderators. Additional strengths were that the design allowed for investigating changes at 3-month follow-up. This research appears to be the first to investigate the benefits of therapeutic horticulture in clinical depression.

## Sammendrag

De psykiatriske asylene har i et historisk perspektiv vært omgitt av hager, parker og åpne landskap. Terapeutisk hagebruk er i dag vel kjent som terapeutisk strategi innen psykisk helsevern, til tross for at det er lite forskning på dette feltet.

Depresjon kjennetegnes av nedstemthet, kognitive begrensinger, grubling, redusert interesse for aktiviteter, inaktivitet og sosial tilbaketrekning. Depresjon opptrer ofte sammen med angst og er inverst assosiert med eksistensielle forhold som mening i livet.

Den primære hensikten med dette forskningsprosjektet var å evaluere endringer i alvorlighetsgrad av depresjon, angst, positive emosjoner, opplevd stress, opplevd oppmerksomhetskapasitet, grubling og eksistensielle forhold etter deltakelse i et tolv ukers terapeutisk hagebruksprogram på Grønn Omsorg gårder. Forskningen hadde også til hensikt å identifisere når den største endringen fant sted, og å undersøke om endring i omgivelser, fascinasjon og gruppetilhørighet var mulige aktive komponenter i intervensjonen. Videre hadde studien til hensikt å undersøke i hvilken grad endringene holdt seg ved 3 måneder oppfølging etter avsluttet intervensjon.

To studier med single-group design, repeterte målepunkter og bekvemmelighetsutvalg ble benyttet (Studie 1:2008 og Studie 2:2009). Deltakerne, alle med diagnosen major depressive disorder i henhold til DSMIV, fullførte et gruppebasert terapeutisk hagebruksprogram over tolv uker, to ganger i uken tre timer hver gang.

Avhandlingen inkluderer fire artikler; en empirisk undersøkelse av endringer i alvorlighetsgrad i depresjon og opplevd oppmerksomhetskapasitet relatert til de restorative kvalitetene endring i omgivelser og fascinasjon (Studie 1, Paper I); en empirisk undersøkelse av endringer i alvorlighetsgrad av depresjon, opplevd oppmerksomhetskapasitet og grubling mediert av de restorative kvalitetene endring i omgivelser og fascinasjon (Studie 2, Paper II); en empirisk undersøkelse av nivå av gruppesamhold i relasjon til endringer i alvorlighetsgrad i depresjon, angst, positive emosjoner og opplevd stress i det samlede utvalget (Studie 1 og Studie 2) og en analyse av kvalitative data relatert til den sosiale dimensjonen av terapeutisk hagebruk (Paper III); en empirisk undersøkelse av endringer i syn på livet (Studie 1) og opplevelse av sammenheng (Studie 2) i relasjon til endringer i alvorlighetsgrad av depresjon samt en analyse av kvalitative data relatert til den eksistensielle dimensjonen i terapeutisk hagebruk for klinisk depresjon (Paper IV).

I begge studiene var det en signifikant reduksjon i alvorlighet av depresjon i løpet av intervensjonen, med den mest signifikante endring etter fire uker. Endringen var fremdeles signifikant sammenlignet med baseline ved 3 måneders oppfølging. Opplevd

oppmerksomhetskapasitet økte i begge studiene med den mest signifikante endring etter fire uker i studie 1 og etter åtte uker i studie 2. Imidlertid hadde denne økningen falt bort ved 3 måneders oppfølging i begge studiene. Grubling avtok signifikant i løpet av intervensjonen i Studie 2. Deltakerne rapporterte høye og stabile verdier på de restorative kvalitetene som endring i omgivelser og fascinasjon under intervensjonen. De deltakerne som var mest fascinert i intervensjonen hadde en signifikant større reduksjon i alvorlighetsgrad av depresjon (Paper I). Reduksjon i alvorlighetsgrad av depresjon og økning i opplevd oppmerksomhetskapasitet var mediert av de restorative kvalitetene som endring i omgivelser og fascinasjon. Grubling opererte som en moderator på reduksjon i alvorlighetsgrad av depresjon (Paper II).

Bedringer i angst, positive emosjoner og opplevd stress i løpet av intervensjonen var alle statistisk signifikante. Deltakerne rapporterte høye nivåer av guppiesamhold, og nivå av gruppesamhold korrelerte positivt, men ikke signifikant, med bedringer i alvorlighetsgrad av depresjon, angst, positive emosjoner og opplevd stress. Deltakerne evaluerte positivt den sosiale dimensjonen ved terapeutisk hagebruk og mer enn en tredjedel av deltakerne rapporterte økt sosial aktivitet etter deltakelse i intervensjonen (Paper III).

Det var ingen signifikante endringer i de to studiene i de to instrumentene som var valgt til å måle eksistensielle forhold (syn på livet og opplevelse av sammenheng). Imidlertid rapporterte mer en to tredjedeler av deltakerne at deltakelse i terapeutisk hagebruk hadde bidradd til å endre deres syn på livet. Dette ble videre støttet av de kvalitative data (Paper IV).

Studiens begrensninger er knyttet til mangel på kontroll gruppe, lite utvalg i hver studie og en kompleks intervensjon gjennomført på fire forskjellige steder. Studiens styrke er dobbel baseline, multiple målepunkter og to perioder med innsamling av data, noe som impliserte en replikasjon med styrket tilliten til funnene. Studien anses å være teoretisk konsistent i sine perspektiver på depresjon, valg av måleinstrumenter og intervensjonens aktive komponenter. De statistiske analysene som ble benyttet for å bestemme når den mest signifikante bedringen fant sted, og for å identifisere mulige mediatorer og moderatorer, anses også å styrke studien. Likeledes vurderes det som en styrke at designet muliggjorde målinger ved 3 måneder oppfølging. Denne studien antas å være den første som undersøker nytten av terapeutisk hagebruk ved klinisk depresjon.

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- III Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. & Kirkevold, M. (in press). A prospective study of group cohesiveness in therapeutic horticulture for clinical depression. *International Journal of Mental Health Nursing*.
- IV Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. & Kirkevold, M. (Revised version in press). A prospective study on existential issues in therapeutic horticulture for clinical depression. *Issues in Mental Health Nursing*.

## Abbreviations

AHTA	American Horticultural Therapy Association
AFI	Attentional Function Index
ART	Attention Restoration Theory
BA	Being Away
BDI	Beck Depression Inventory
CBT	Cognitive Behavioural Therapy
CIDI	Composite Diagnostic Interview
DSM- IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Editions
FA	Fascination
FR	Framework Scale
FU	Fulfilment Scale
GP	General Practitioner
HT	Horticultural Therapy
ICD	International Classification of Diseases
LRI-R	Life Regard Index – Revised Version
M.I.N.I	Mini International Neuropsychiatric Interview
NAV	Norwegian Labour and Welfare Administration
NSD	Norwegian Social Science Data Services
PANAS-PA	Positive and Negative Affect Scale – Positive Affect
PRS	Perceived Restorativeness Scale
PSS	Perceived Stress Scale
REK	Regional Committees for Medical and Health Research Ethics in Norway
RCT	Randomized Controlled Trial
RM-ANOVA	Repeated Measures Analysis of Variance
RRS	Ruminative Response Scale
SOC	Sense of Coherence Scale
SPSS	Statistical Package for the Social Sciences
STAI-SS	State-Trait Anxiety Inventory-State Subscale
TH	Therapeutic Horticulture
TFI-CS	Therapeutic Factors Inventory – Cohesiveness Scale
UK	United Kingdom
USA	United States of America
WHO	World Health Organization



## 1 Introduction

### *1.1 Modern psychiatry is more than psychotherapy and medication*

The organisation and treatment of mental health disorders have undergone major changes during the last thirty years. The large asylums have been closed down. In-patient treatment has been reduced to a minimum and many of the old therapeutic strategies from the therapeutic communities and milieu therapy have faded out. Modern psychiatry has become more and more an indoor psychiatry based on different psychotherapies and medication. The demands related to evidence-based practice have also led to a strong focus on bio-medical treatment and psychotherapies backed by strong research evidence.

One might question whether some of the good parts of the asylum traditions have been lost. There is however today a beginning trend to open up for new strategies and to investigate new approaches to mental health issues (Ernst *et al.* 1998; Jorm *et al.* 2002). The understanding of the significance of increased levels of activities more generally, and physical activity more specifically (Babyak *et al.* 2000; Martinsen & Stephens 1994; Mead *et al.* 2009), has been established. Moreover, curiosity regarding the significance of leisure activities like music and dance, food and vitamins, use of nature, landscape and pets has also stimulated their use. It is tempting to view this as the start of a renewed curiosity regarding therapeutic strategies that to some extent were also in use on the asylums.

Care for patients with chronic mental disorders such as depression is a complex task in need of ‘complex interventions’ that consist of a number of different active ingredients (Fletcher *et al.* 2007). As depression is a multifaceted form of suffering, it is important both to develop and examine complementary and supplementary interventions in order to prevent depression, alleviate symptoms in those who are depressed, and facilitate recovery. Ebmeier (2006) concludes in a comprehensive review article in *Lancet* that it is important to open for a wide range of treatment choices in depression because of its comprehensive effects: ‘*All effective treatments for this condition, which by its very nature is associated with the most profound suffering, have to be welcomed*’ (p.163).

### *1.2 Therapeutic horticulture – old strategy in modern psychiatry*

Therapeutic horticulture is both a new and an old strategy in nursing practice and research, across cultural and national borders (Hansen-Ketchum *et al.* 2009; Maller *et al.* 2006; Meehan 2003; Page 2008). People have long used nature, parks and gardens for rest and recreation. This can be traced in written texts from Old Persia and the Bible. The monasteries and the

convents that from early time took care of people suffering from mental illness were surrounded by gardens, parks and peaceful landscapes. The gardens and the natural surroundings were used intentionally for therapeutic reasons from the birth of psychiatry at the end of the 18th century (Foucault 1965; Relf & Lohr 2003). Therapeutic use of gardens and nature also had a core position in the therapeutic programs at the more modern psychiatric institutions in the beginning of 1900 in the USA. This was inspired by Dr. Charles Menninger, who started the Menninger Clinic in 1935 (Friedman 1990). Different forms of therapeutic horticulture were used in treatment, rehabilitation and vocational therapy in Europe and the USA both during and after the 1st and 2nd World War. Today, the use of gardens for therapeutic activities is widespread.

With the development of interest has come educational programs and professionalization. The first instructor in horticultural therapy was presented at the Women's Occupational Therapy Department at Bloomingdale, White Plains, New York in 1917 (Söderback *et al.* 2004). The National Council for Therapy and Rehabilitation through Horticulture (today the American Horticultural Therapy Association – AHTA) was established in 1973. Likewise, Kansas State University started to offer a Bachelor's degree in horticultural therapy in 1973.

### *1.3 Definitions of horticultural therapy and therapeutic horticulture*

Diane Relf, a nestor in the therapeutic horticulture field, turns to Webster's *New World Dictionary* (Second College Edition) for the very semantic roots of *hortus* (a garden) and *cultura* to define horticultural therapy. 'Culture' is here described both as '*cultivation of the soil and the development, improvement and refinement of the mind, emotions and interests*' (Relf 1998). She defines horticultural therapy as: '*the art and science of growing fruits, vegetables, trees, and shrubs, resulting in the development of the minds and emotions of individuals, the enrichment and health of communities, and the integration of the garden in the breadth of modern civilization*' (p. 21).

AHTA distinguishes horticultural therapy from therapeutic horticulture, which is in the focus of the present research. Horticultural therapy (HT) is linked to explicit client goals and is implemented by trained therapists. It has been defined as '*the use of plants by trained professionals as a medium through which certain clinically goals may be met*' (GrowthPoint 1999, p.4). Therapeutic horticulture (TH) is a more open program, defined as: '*a process that uses plant-related activities through which participants strive to improve their well-being*

*through active or passive involvement*' (GrowthPoint 1999, p.4). Both TH and HT may be useful in a variety of clinical settings and for a broad range of clinical populations and may serve as a nursing intervention or strategy (Infantino 2004; Page 2008). However, TH can more easily be implemented and performed by a greater variety of health care providers in a variety of settings, including out-patient clinical settings and Green Care farms.

#### *1.4 The Green Care farm as a resource in mental health care*

For centuries, farms have had a central position within mental health care, as the asylums historically were situated in relation to or close to farms. Nowadays, farms may be used both in treatment and rehabilitation for several user groups, among them individuals suffering from mental health problems. Green Care and Farming for Health are different terms representing similar meanings representing a movement that is spreading throughout Europe, Canada, New Zealand and the USA (Hassink 2006; Relf 2006).

For recreational and work-related purposes, the animals, plants, garden, forest and landscape may all be used in a Green Care context. The farms situated in or close to large cities can be considered a valuable resource within mental health care. Offering Green Care activities also open new possibilities for work and income for the farmers. The farms offer qualities like distance from everyday stress and struggle, space, silence, a range of activities and a protective and caring environment.

As loneliness is a core issue within mental health (Heinrich & Gullone 2006; Lauder *et al.* 2004), the term social farming is also often used. Farms are often small communities, and being together with the farmer, his or her family and co-workers as well as other people striving for a shorter or longer period with mental health problems may help in getting out of loneliness and social withdrawal followed by increased social activity and social skill. According to Jan Hassink (2006), the overall general self reported experiences with Green Care farms are positive across national borders. Moreover these positive self-reports request further research evidence on which user groups might benefit from what kind of activities or interventions.

#### *1.5 Purpose of the thesis*

The overall research aim in the present thesis was to investigate the mental health benefits of a therapeutic horticulture intervention for clinical depression in a Green Care context. To date,

it appears that no studies have investigated benefits from a therapeutic horticulture intervention in clinical depression. The present research responds to the request both for new intervention research in clinical depression (Ebmeier *et al.* 2006) and for investigation of the active components in these interventions (Fletcher *et al.* 2007). It also responds to the recommendations by Hartig *et al.* (1999) that further research should investigate the underlying therapeutic components coming into play in therapeutic horticulture and restorative gardens.

The main objectives of the four papers that present this research were as follows:

- Based on cognitive theoretical perspectives on depression and therapeutic horticulture, to investigate the variations in depression severity and perceived attentional capacity (Papers I and II) and rumination (Paper II) during and after a therapeutic horticulture intervention.
- Based on cognitive theoretical perspectives on depression and therapeutic horticulture, to investigate if restorative qualities in the environment mediate or moderate depression severity, perceived attentional capacity (Papers I and II) and rumination (Paper II) during a therapeutic horticulture intervention.
- Based on psychosocial perspectives on depression and therapeutic horticulture, to investigate the associations between the levels of group cohesiveness and changes in mental health variables during and after a therapeutic horticulture intervention (Paper III).
- Based on existential perspectives on depression and therapeutic horticulture, to investigate the associations between change in existential issues and change in depression severity during and after a therapeutic horticulture intervention (IV).

### *1.6 Presentation of the thesis*

The thesis is organised into nine sections, including this first section with its brief introduction to the topic and presentation of main objectives. In Section 2, depression as a phenomenon is elucidated in terms of scope, diagnostic issues and relevant theoretical perspectives. In Section 3, therapeutic horticulture is put into focus historically and theoretically to explain how it can be beneficial in clinical depression. In Section 4, the research aims and research questions are presented. The methods of the research are presented in Section 5. The results across Papers I- IV are presented in Section 6. In Section 7, the

findings, methodological and ethical issues are discussed. In Section 8, the conclusions focus on the clinical and theoretical relevance of the research as well as directions for future research. Section 9 presents the references used in this thesis.

In the four articles, use of the pronoun 'we' indicates that the whole project group has been involved in the research process. However, in this thesis the pronoun 'I' will be used to indicate that the thesis is a work written by the PhD student.

## **2 Depression as a serious health issue**

### *2.1 Scope of the problem*

The term *depression* was in use already in 1792 (Shorter 1999). The treatment of depression at that time involved rest cures, spas and mineral waters. It was common to take the depressed patients to different spas like Baden Baden or San Remo because the patients were informed that a change in scenery was needed for recovery from depression. Freud used the term melancholia and related it to loss of valuable relationships (Freud 1922). Some decades later, Meyer used a mixed social and biological framework emphasizing that depression was caused by reactions in the context of an individual's life (Lewis 1934). Depression was recognized as a mental disorder already in the first two American Psychiatric Associations DSM classifications (Fink *et al.* 2007). To date there also has been a discussion of various kinds of depression, and distinctions have been drawn between melancholia and depression (Shorter 2007). The first antidepressants came in 1958 (Shorter 1999).

Depression in modern times is a comprehensive health issue both individually and globally. On a worldwide basis, 5.8 % of all men and 9.5% of all women suffer from depression at any time (Fletcher *et al.* 2007). Mental disorders in general account for five of the top ten causes of disabilities in industrialized countries and 14% of the global burden of disease is related to neuropsychiatric disorders, mostly due to depression (Prince *et al.* 2007). Depression is ranked first in prevalence of the mental disorders (Lopez & Murray 1998; Murray & Lopez 1996; Ustun 1999).

Depression tends to affect women and men in different ways, and there appear to be different causes of depression for women and men (Kendler *et al.* 1999; Kendler *et al.* 2001). According to Kessler *et al.* (2003) twice as many women as men meet the criteria for major depressive disorder at some time in their lives. It is thought that this is related to both biological factors (hormonal and genetic) and psychosocial variables (Nolen - Hoeksema & Hilt 2009).

Clinically depressed persons suffer from impaired mood and distortion of cognition (American Psychiatric Association 2000; Porter *et al.* 2003), including attentional impairment (Delaloye *et al.* 2008; Gollan *et al.* 2008; Keilp *et al.* 2008; Porter *et al.* 2003; Wells & Matthews 1994). Depression also influences interpersonal relationships, occupational adjustment, functional ability, personal cognition and behaviour (Klerman & Weissman 1992). Depression further tends to recur and become chronic (Charney & Manji 2004; Evans & Charney 2003; WHO 2001) with recurrence characterized by increased episodic severity, increased duration in episodes, and shorter periods of wellness between periods (Kupfer 1991; Thase 1992). The majority of depressed clients are treated in primary care only (Fletcher *et al.* 2007), and management of depressive disorders tends to be suboptimal (Gilbody *et al.* 2003). Depression is followed by increased risk for work disability (Lopez & Murray 1998; Ustun 1999; Waddell *et al.* 2003) and is by this costly both on an individual and on a societal basis. Major depression is expected to be the second cause of work disability by the year 2020 (Murray & Lopez 1996).

Depression is highly co-morbid with anxiety (Boland & Keller 2009) and associated with stress (Bergdahl & Bergdahl 2002; Melchior *et al.* 2007; Pedrelli *et al.* 2008). There is also a long-term risk for developing cardiovascular diseases, psychosocial and physical impairment and suicide with depression (Hammen & Brewin 1997).

## *2.2 Diagnostic criteria and diagnostic process*

There are two classification systems for mental disorders, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), published by the American Psychiatric Association (2000), and the International Classification of Diseases, 10<sup>th</sup> Revision (ICD-10), published by the World Health Organization (WHO 2007). For depression, the diagnostic criteria are mostly the same across the two systems. In this research the DSM-IV classification system is used.

A diagnosis of depression is based both on anamnestic information and clinical observations. The diagnosis of a major depressive episode according to DSM-IV requires the presence of five or more of the following symptoms during the last two weeks or longer: 1) depressed mood most of the day, 2) diminished interest or pleasure in activities, 3) weight loss, weight gain, decrease or increase in appetite, 4) insomnia or hypersomnia, 5) psychomotor agitation or retardation, 6) fatigue or loss of energy, 7) feelings of worthlessness

or guilt, 8) diminished ability to think or concentrate, or 9) recurrent thoughts of death or suicide (American Psychiatric Association 2000).

### *2.3 Standard recommended treatment*

Cognitive-behavioural or interpersonal psychotherapies and antidepressant medications are beneficial as separate treatments (Butler *et al.* 2007). However, a substantial number of patients do not respond to conventional treatments. Antidepressants show little to moderate effect (Kirsch *et al.* 2008). Patients that are treated with cognitive-behavioural therapy (CBT) are however less likely to have a relapse of depression than those treated with antidepressants (Paykel *et al.* 1999).

### *2.4 Complementary therapies and interventions*

For the last several decades the medical model has had a dominant position both in explaining and treating mental disorders. Given the fact that depression is multi-faceted, with a large variety of causes, predictors and courses, numerous calls have been made for investigation of supplementary and complementary interventions to aid depressed patients (Hunter 2008). Ebmeier (2006) concludes that given the commonness, lethality and incapacitation of depression, it is important to open for a wide range of treatment choices.

Research on complementary and supplementary interventions in depression is scarce (Ernst *et al.* 1998; Jorm *et al.* 2002). However, several studies report positive effects due to increase in pleasant activities (Cuijpers *et al.* 2007; Hammen & Glass 1975; Jorm *et al.* 2002; Lewinsohn & Graf 1973; Zeiss *et al.* 1979). Music therapy is also associated with improvements in mood (Ernst *et al.* 1998; Maratos *et al.* 2008), and different relaxation therapies like yoga, meditation and progressive relaxation appear promising (Jorm *et al.* 2008). Other evidence suggests that physical exercise alleviates depression (Babyak *et al.* 2000; Martinsen & Stephens 1994; Mead *et al.* 2009). Pleasant activities might open for laughter, which also has a positive impact on mood (Sakuragi *et al.* 2002). Moreover improved mood is a significant product of leisure activities in general (Hull 1990).

Less effort has been invested in examining the degree to which exposure to natural environments or activities performed in natural environments might alleviate depression. As depression is a multi-dimensional disorder, the variety of theoretical perspectives on depression open for consideration of the ways in which a nature-based intervention like TH might work to alleviate depression.

## *2.5 Perspectives on depression*

In the following, I will elaborate on several theoretical perspectives on depression that are relevant for a nature-based intervention like TH.

### 2.5.1 Behavioural perspectives

Depression is associated with inactivity, and behavioural inhibition (behavioural avoidance) (Kasch *et al.* 2002; Stone & Quartermain 2005), and a lack of socially reinforcing activities related to ‘active leisure’ (Barge-Schaapveld *et al.* 1995). According to the behavioural tradition in psychology, depression can be viewed as a response to loss or lack of positive reinforcement (Lewinsohn 1974). The loss or removal of reinforcement is in the behavioural tradition called extinction (Kanter *et al.* 2007). Insufficient reinforcement and extinction leads to dysphoria and more passivity which again ultimately leads to depression. However the inactivity and behavioural avoidance in depression might also be understood in terms of avoidance as a coping strategy to life stressors, a problem-solving style or as a personality dimension (Ottenbreit & Dobson 2004).

The observation that depression is characterised by behavioural avoidance and inactivity leads to the assumption that a TH intervention might be beneficial by increasing both general and social activities. The implicit lack of socially reinforcing activities that follows inactivity and behavioural avoidance in depression is one reason why the TH intervention was organized as a group intervention in the present studies.

### 2.5.2 Cognitive perspectives

Depression is characterized by cognitive patterns of negative thoughts (Beck 1967), and there is broad evidence that attention is impaired in depression (Brand & Jolles 1987; Delaloye *et al.* 2008; Gollan *et al.* 2008; Keilp *et al.* 2001; Keilp *et al.* 2008; Massman *et al.* 1992; Porter *et al.* 2003). Change in cognitive functions like attention and concentration is one of the earliest prodromal signs in the development of major depression, and is also a core symptom in the prodromal stage (Hagerty *et al.* 1997). Massmann *et al.* (1992) concludes that depressed patients, because of subcortical dysfunctions, have reduced mental processing and attentional deficits.

Attention has been a core issue from the very beginning of experimental psychology and was historically addressed by William James. Attention implies the concentration of consciousness and a withdrawal from some things in order to deal effectively with others

(James 1890, pp.403-404). James stated that attention could be either passive and non-voluntary or active and voluntary. According to James, voluntary attention is characterised by an active choice of focus for attention. When the stimuli in the background attract the attention away from the scope of voluntary attention, the attentional switch to these competing background stimuli is called involuntary or passive attention.

James introduced two stimulus features that led to a shift from voluntary to involuntary or passive attention. The features he introduced were intensity and suddenness (Näätänen 1992). The switch in attention is fundamental to the phenomenon of *distraction*. Distraction occurs when the attention is attracted from the task focused on with voluntary attention to a new focus.

In modern academic psychology, attention is often theoretically treated within the framework of cognitive psychology. Attention is however not looked upon as a unitary phenomenon, sooner a variety of phenomena (Styles 2006). According to Lezak (2004), attentional functions differ from general cognitive functions. Attention underlies cognitive functions and in a sense maintains the activity of cognitive functions and works more as a command function (Lezak *et al.* 2004) and can because of this be classified as a mental activity variable.

Attention is essential in perceiving, memory, thinking and behaving, and the capacity for attention indeed is an important resource in activities of daily life, in studying as well as in working. However, people are continuously exposed to a large amount of stimulation and information. This has to be filtered, selected, interpreted and processed. For these tasks, the ability to sustain attention is needed, especially when attentional tasks are demanding and long lasting. Moreover, attention has a limited capacity (Lavie 2001; Lavie *et al.* 2004) in the sense that only a certain amount of processing can take place at a time. Likewise the attentional capacity varies both between individuals and within each person at different times and under different conditions. The demand for sustained attention can again lead to 'lapses of attention' or attentional fatigue followed by a decrease in attentional efficiency (Leclercq 2002). The processing capacity of attention is likewise limited due to the available attentional resources. The more difficult the task, the more attention is demanded. The total perceptual load can be looked at in a causal perspective as putting limits on the attentional capacity for target processing and task performance (Styles 2006). Likewise the attention can be focused on one particular activity or it can be divided on many activities at the same time (Kahneman

1973). To sum up, attention is viewed as a vital and core cognitive resource, however limited under normal conditions.

Aron Beck has developed a cognitive approach to the understanding and treating of emotional and psychiatric disorders. The approach is that emotional disorders result from and are maintained by activation of certain memory structures or schemas. The schemas consist of stored representations of past experiences which again represent generalisations that guide and organise experiences. These schemas or cognitive tracks can lead to streams of involuntary and parallel negative 'automatic thoughts' (Beck, 1967). In depression these thoughts are dominant and 'use up' cognitive resources and capacity (Wells & Matthews 1994), followed by attentional and emotional tiredness and fatigue.

In depression and fatigue, attentional functioning and capacity can be temporarily limited or reduced (Zimmermann & Leclercq 2002) with impairments of inhibitory mechanisms (Lemelin *et al.* 1997; MacQueen *et al.* 2000). To sustain directed attention, a capacity to control or inhibit interference from distractions is needed (Joormann *et al.* 2007; Lavie 2001; Lavie *et al.* 2004). As depression is associated with weakened and impaired inhibitory mechanisms, depressed persons have problems with protecting working memory from being entered and disturbed by irrelevant negative information (Davis & Nolen-Hoeksema 2000; Joormann & Gotlib 2008). Depression is thus often characterized as a cognitive deficit state (Mialet *et al.* 1996).

It is proposed that there are two different cognitive response styles to depressed mood; a ruminative response style and a distraction response style. A ruminative response style can be described as a behavioural and attentional pattern in which the person intently focuses on depressive symptoms, their causes and possible consequences without taking action to change the situation (Nolen-Hoeksema *et al.* 1993). This ruminative response style occupies cognitive resources (Ellis & Ashbrook 1988) and working memory (Joormann 2009), leading to weakening of executive functions (Ward *et al.* 2003). Because rumination tends to keep cognitions, memories, and interpretations negatively focused, depression may also be sustained and amplified (Nolen-Hoeksema 1987; Raes & Hermans 2008).

While a ruminative style of response to depressed mood is hypothesized to prolong and intensify depression, a distractive response style is hypothesized to alleviate, shorten and diminish episodes of depression (Morrow & Nolen-Hoeksema 1990; Nolen-Hoeksema 1991). Distracting responses are thoughts and behaviours that switch attention from the depressed mood to pleasant or neutral activities. Distraction may weaken depressive symptoms or

episodes (Morrow & Nolen-Hoeksema 1990; Nolen-Hoeksema & Morrow 1993; Nolen-Hoeksema *et al.* 2008) and open for positive reinforcement through engagement and absorption in activities (Nolen-Hoeksema *et al.* 2008).

Rumination can further be characterized by two distinct components – brooding and reflection (Treyner *et al.* 2003). Brooding refers to self-critical moody pondering while reflection refers to more neutral pondering (Treyner *et al.* 2003). Brooding is found to mediate depression (Lo *et al.* 2008) and is thus the maladaptive component of rumination (Crane *et al.* 2007). As such, it is an appropriate target for intervention.

The present research addresses positive distraction or the capture of effortless involuntary attention as an active component in therapeutic horticulture, and it takes interest in the associations that positive distraction has with attention and rumination (brooding).

### 2.5.3 Psychosocial perspectives

Depression is characterized by low levels of positive affect (Joiner & Timmons 2009), shyness (Alfano *et al.* 1994; Elovainio *et al.* 2004), interpersonal dependency (Mazure *et al.* 2000; Sanathara *et al.* 2003) and an anxious attachment style (Reinecke & Rogers 2001; Roberts *et al.* 1996). Interpersonal stress and excessive reassurance seeking are reciprocally involved with depression (Joiner & Timmons 2009). Depression is further characterized by social withdrawal, and low self-reported social skills ratings (Huprich *et al.* 2004; Joiner & Timmons 2009). In fact, poor social skills have been reported to predict recurrence of depression (Bos *et al.* 2007). Given the interpersonal and psychosocial dimensions in depression, the TH intervention in the present research was organised as an intervention in small groups.

### 2.5.5 Stress perspectives

Stress is a vital cause in the etiology of depression (Kendler *et al.* 1999; Melchior *et al.* 2007). It is a heterogeneous and complex construct with emotional, cognitive and behavioural components where stress is the complex response to different stressors which can be both biological and psychological in nature (van Praag *et al.* 2004).

Depression is often preceded by life events that for one reason or the other are experienced as traumatic, difficult or worrisome, followed by apprehension and powerlessness. From a psychopathological point of view these experiences of being overpowered might be followed by a state of psychic tension and general arousal, with

behaviour characterized by anxiety, irritability, lack of interest and manifestations of aggression. The traumatic life events and the generated psychological distress together with increased levels of anxiety and aggression might be accompanied by elevated levels of stress hormones (van Praag *et al.* 2004). This does not mean that stress will necessarily cause depression. Whether it does so or not depends in part on the individual's vulnerability (Caspi *et al.* 2003; Charney & Manji 2004).

Nonetheless, several authors report associations between stress and depression (Bergdahl & Bergdahl 2002; Kessler 1997; Melchior *et al.* 2007; Pedrelli *et al.* 2008). Some evidence also indicates that stress causes depression (Kendler *et al.* 1999), while other evidence indicates that depression itself may generate stress, at least in women (Hammen 1991). Given the multiple associations between stress and depression, perceived stress was of interest in the present studies.

#### 2.5.6 Existential perspectives

Despite the huge amount of research on the causes of depression, people tend to have their own explanations for why their depression has occurred. According to Addis *et al.* (1995), people often give existential issues as reasons for why they are depressed. The established evidence on beneficial treatments of depression within a cognitive-behavioural or biochemical theoretical framework together with a standardized diagnostic procedure however often ignore the existential dimension in understanding, in assessment and in treatment of depression (Close 2000; Cullberg 1996a; Cullberg 1996b; Maxman & Ward 1995). Freud stated that '*the moment a man questions meaning in life, he is sick*' (Freud cited in Yalom 1980, p.449). Likewise, feelings of emptiness and reduced interest in activities are also associated with depression according to the DSM-IV diagnostic system (American Psychiatric Association 2000).

Viktor Frankl assumed that striving for meaning is a basic human need, a purpose and a life force (Frankl 1963; Frankl 1978). Frankl looked upon meaninglessness as a worldwide problem, characterised by lack of interest, lack of initiative, boredom and apathy (Frankl 2000). Frankl named the phenomenon existential frustration or existential vacuum and he related them to modern life's gap between nature and humans. He also associated lack of meaning and purpose in life with depression (Frankl 1978). Likewise, Crumbaugh and Maholick (1964) who developed the Purpose in Life test based on Frankl's concepts, clearly associated depression with existential frustration or lack of purpose in life. From an existential

perspective in line with Frankl's concepts and theory, major depression may be regarded as a crisis of meaning in life (Close 2000).

Aron Antonovsky (1979) is known for his salutogenic orientation to psychological health with sense of coherence as the key concept. Sense of coherence is an individual's global view on how comprehensible, manageable and meaningful life is experienced to be, with meaningfulness as the core dimension (Antonovsky 1987). Sense of coherence (SOC) is assumed to be created as a result of all the different stimuli that constitute the human experience (Antonovsky 1979), with a suggestion that SOC might function as a 'sixth sense' in survival and in health generating activities (Lindstrom & Eriksson 2006). Inverse associations between SOC and depression have been reported (Carstens & Spangenberg 1997; Sinikallio *et al.* 2006). Likewise, suicidal ideation is associated with low scores on the Meaning Subscale of the SOC scale (Petrie & Brook 1992). Ultimately, major depression can be looked upon as a break down in the sense of coherence (Carstens & Spangenberg 1997).

In assuming that depression is a multidimensional disorder, the existential dimension is often an ignored issue in both clinical assessment and treatment of depression (Frankl *et al.* 1970; Yalom 1980). As depression also includes an existential dimension, existential issues were addressed in this research.

### **3 Therapeutic horticulture as a complex intervention in depression**

#### *3.1 Historical perspectives*

Humans have always depended upon botanical knowledge (Janick 1992). They have among other things been occupied with the possibilities that certain plants have healing qualities, and some of the earliest horticulturists were physicians who sought to grow plants for the benefit of their medicinal value (Tereskovich 1973).

Throughout history the mentally ill were taken care of by the family and the small societies they belonged to (Bøe 1994). But in the Middle Ages the responsibility shifted to the society in general and to the church. The monasteries in particular took care of the mentally ill and the poor. The monasteries owned farms, and working in the monastery implied therefore also working on the farm. This connection can be seen across Europe. Likewise, the monasteries ran hospitals, and the monastery gardens that belonged to the monastery hospitals were used as places for spiritual and restorative purposes (Cooper Marcus & Barnes 1999; Gerlach-Spriggs *et al.* 1998; Warner 1995). Especially for the women, the monasteries gave

some kind of freedom and independence, and they could occupy themselves with gardening, music and poetry.

The first monastery especially for the mentally ill was established in the year 300 in Bysans (Harding 1975). One of the oldest psychiatric hospitals in Europe was Bethlem (Bedlam) in London. It was originally the monastery of St Mary of Bethlehem of London, founded in 1200 and later in 1547 transferred to The City of London (Schneck 1960; Shorter 1997). Bethlem was noted for its 'fine gardens' where the patients could '*enjoy fresh air and recreate themselves amongst trees, flowers and plants*' (von La Roche 1888).

At the end of the 18<sup>th</sup> century, humanistic ideas in the 'Age of Enlightenment' arrived at several European hospitals. Philippe Pinel, who at that time worked at Bicêtre and La Sâlpêtrière in Paris, became very interested in these ideas, which have often been referred to as 'the moral treatment'. The moral treatment implied the creation of a favourable environment in hopes that a spontaneous recovery from mental illness would take place (Menninger 1963). These humanistic ideas, with Spain as their cradle (Schneck 1960), started a whole new era and way of thinking in psychiatry all around the Western world. Thanks to this, the mentally ill gradually received better care within the existing hospitals and new hospitals were constructed. Psychiatry at this time became a discipline of its own, although it was still more a question of care for the mentally ill rather than proper treatment (Danielson 1983). In the treatment and care of the mentally ill, recreational activities and occupational therapy were under the doctors' supervision (Schneck 1960).

Pinel himself argued that it was crucial for mentally ill persons that they should be isolated from their milieu and stressful context. For this reason the asylums became isolated outside of the cities and towns, situated in calm and silent landscapes, surrounded by walls, with beautiful parks and gardens inside the walls (Alexander & Selesnick 1966; Sachs 1999). The gardens were planned and ornamented so that the patients could undertake recreational and vocational activities (Rutherford 2003). It was observed and reported in Spain as early as 1806 that different agricultural activities had a positive influence on patients suffering from mental illness (Olszowy 1978).

In York in England, William Tuke was inspired by the same humanistic ideas. Tuke was a dedicated member of the Quaker Society of Friends, and he founded the York Retreat asylum in 1792, which was the model for the Friends Asylum established later in the USA (Baxter 1994). Tuke meant that mental illness belonged to a life that had distanced itself from

nature (Foucault 2003), and the patients at York were involved in all kinds of garden activities, both active and passive.

Several authors also refer to Benjamin Rush concerning the use of farming and gardening on the asylums for the mentally ill. A pioneer American physician and a signer of the Declaration of Independence (Brodsky 2004), Rush was inspired by the idea that *'digging in the soil had a curative effect on the mentally ill'* (Sullivan 1979; Tereskovich 1973). Dr. Rush, who was a professor at the Institute of Medicine and Clinical Practice in Philadelphia, Pennsylvania, reported curative effects of the horticultural activities (Kim 2003). He (1812) meant that *employment* of any kind was important, and that inactivity and passivity led to hypochondria. He stated that *'absence of occupation is not rest'* and *'a mind quite vacant is a mind distressed'* (Rush 1812, p.119). His ideas were further developed at the first private psychiatric institution in the USA, Friends Hospital of Philadelphia, founded by the Quakers in 1813. The patients at Friends Hospital participated in scenic walks, outdoor planting and work in green houses.

When planning and building the Buffalo State Asylum in the 1870s in the USA, both the architect Henry Hobson Richardson and the landscape architect Frederick Law Olmsted were concerned with the light, repose and serenity of both the buildings and the surrounding environment (Palamuso 1985). The outdoor facilities were designed for recreation and explicitly for therapy. Olmsted had earlier been a farmer, and had experienced the values of agricultural life and work. Gardening was considered by Olmsted to be a therapeutic process (Palamuso, 1985). Olmsted also helped to bring parks and gardens into cities and residential areas, and he is well known for his work in planning Central Park in New York City (Irvine & Warber 2002).

Karl Menninger (1942), the founder of the Menninger Clinic in Topeka in Kansas, was also very occupied with horticultural therapy. He meant that the field of activities was practically limitless, and that it was an activity and hobby for all seasons. He described the process of cultivating plants from a *'lifeless-looking'* seed as creating a living thing of beauty out of seemingly nothing. *'Each plant must be coddled, shielded and protected like an infant until it has adjusted itself to its surroundings and responded by making steady increase in size and vigour'* (Menninger 1942, p.67). As a hard working leader and a physician, he described what horticulture meant to him personally in restoring from work overload, and he appreciated how the natural processes in the garden between blooming and withering may open up for existential reflection of life and death, health and disease.

The value of the therapeutic horticulture activities in mental health asylums was not only an issue for Europe and the USA. Gardening was also a core activity in asylums operated in cultures ruled by or colonised by Europeans, as on Robben Island, South Africa (Deacon 2000). The garden and gardening were used to restore the patients' rationality. The gardens were also used for recreation in the treatment of the mentally ill. Especially the distinctive Victorian garden design was used to restore rationality and social order from the more chaotic nature of the mentally ill. Gardening as a leisure activity was seen as a matter of both cultivating the soil and cultivating the mind (Waters 1988).

The same ideas were used in the Norwegian asylums. When Herman Wedel Major founded Gaustad asylum near Oslo, he meant that it was important that the asylum was placed in a lonely and peaceful environment, though not too far from the town. Major also underlined the importance of change in environment and the necessity of work and occupational facilities (Austad & Ødegård 1956). Several hundred trees and shrubs were planted in the park and garden at the Gaustad asylum, and it was the patients themselves who did the work, although the idea was that gardening work should be calming and not demanding.

The first more official garden therapy programs were in use as early as 1900 in hospitals, institutions, mental institutions, and reformatories in the USA (Kim 2003; Rice & Remy 1994). The establishment of organised horticultural programmes was followed by formalisation of competence within the field, and in 1917 the first recorded instructor in gardening began work at the Woman's Occupational Therapy Department at Bloomingdale, White Plains, New York.

Following World War I, gardening therapy became more common and was used in different rehabilitation programs for disabled soldiers. Gardening was mentioned in almost every book in occupational therapy until the outbreak of World War II (Sullivan 1979). 'Gardening' was in the UK prescribed both as an occupation and as therapy from early in the 20th century. The same is true from the 20s in Germany and from the 40s in Sweden (Söderback *et al.* 2004). From 1940, the term 'horticultural therapy' was used for gardening interventions in the rehabilitation of injured soldiers from World War II (Sullivan 1979).

After World War II, the milieu therapy was introduced to the asylums and psychiatric hospitals. Horticultural therapy became integrated as a part of the milieu therapy in some treatment contexts, especially as inspired by Dr. Harry Stack Sullivan (1892-1949) and Dr. Karl Menninger (1892-1990) (Sachs 1999). Psychiatric care and treatment subsequently developed more and more as indoor activities, and the documentation of the health effects or

preferences for activities in outdoor environments are scarce or missing for the more recent period (Sachs 1999).

To sum up, horticultural therapy has been actively used as therapy for a variety of diagnoses and problems since at least the 1700s (Relf 2003), and one may say that it is among the first prescribed therapeutic activities used in psychiatry. Looking to recent times, the National Council for Therapy and Rehabilitation Through Horticulture was established in 1973 in the USA (Kim 2003). This later became the American Horticultural Therapy Association (AHTA s.a.). Likewise, horticultural therapy practice and organisations have been established in the UK (Matrix e-Business 2010), Germany (GGuT 2010), Netherlands (Natuur voor Gezondheid s.a.), Canada (CHTA s.a.), Australia (Australian Horticultural Therapy Association s.a.), New Zealand, Korea, Japan and other countries across Europe and worldwide. There are also multiple possibilities for education in horticultural therapy, both on the bachelor's and master's degree level, especially in the USA.

Despite the long clinical and educational tradition of therapeutic horticulture within mental health, there are however rather few accessible published studies (Sempik *et al.* 2003).

### *3.2 Research on therapeutic horticulture related to mental health*

Social and behavioural research on the psychological and social impacts of plants and the natural environment on people began to appear in the 1960s and 70s (Talbot *et al.* 1976). In this section an overview of related research in the present field will be presented. This review is not exhaustive, in that it includes only articles published in peer-review journals listed in the most widely used databases. It does not cover chapters in books or theses describing graduate research. It nonetheless illustrates the diversity in the populations that have been targeted for therapeutic interventions involving horticultural activities or otherwise receiving benefits from gardening activities within mental health care. It also shows that a variety of methodological approaches have been taken to address the question of whether and through what process the horticultural activities were beneficial.

A broad range of key words was used to identify articles for the overview (e.g., horticultural therapy, therapeutic horticulture, gardening activities, healing garden, restorative garden). The search with these keywords was limited to titles and abstracts and included the major databases of peer-review journals in those fields that in one way or another could be involved in the development and delivery of horticultural interventions (i.e., PubMed, ISI Web of Science, CINAHL, Nursing Index and PsychINFO). Articles that directly or indirectly

reported on benefits from therapeutic horticulture within mental health care were extracted. Summaries of these studies are presented in Table 1.

**Table 1** Overview of related research

	Sample	N	Theory	Intervention	Findings
<b>RCT-design</b>					
Cimprich and Ronis (2003)	Breast cancer	157	ART-theory	120 min. garden visit - passive experience	Improvements in attentional capacity
Son <i>et al.</i> (2004)	Schizophrenia	50	None	HT-intervention over 5months, twice a week, one hour each time	Improvements in self-esteem, social interaction, depression and anxiety
Lee <i>et al.</i> (2004)	High-school students	74	None	HT-intervention	Reduction in anxiety
Wichrowski (2005)	Cardiac patients	107	None	Garden visit with activities	Reduction in total mood disturbance
<b>Quasi-experimental</b>					
Stepney and Davies (2004)	Heterogenous mental health population	10	None	HT-intervention	Improvements in anxiety and depression
Richards and Kafami (1999)	Incarcerated offenders Substance abuse	33	Biophilia hypothesis	HT-program	Reduced vulnerability to addiction. No change in depression and anxiety.
<b>Survey</b>					
Kidd and Brascamp (2004)	Mid-aged women. Gardening as leisure	361	ART-theory Biophilia hypothesis	Non-intervention study	Psychological, emotional, social and spiritual benefits
Waliczek and Zajicek (2005)	Adults with gardening as leisure	402	ART-theory Biophilia hypothesis	Non-intervention study	Higher levels on zest of life Than non-gardeners
Kohlleppel <i>et al.</i> (2002)	Garden visitors	246	Stress theory	Walk in botanic garden	Reduction of stress and depression
<b>Qualitative design</b>					
Perrins-Margalis <i>et al.</i> (2000)	Chronic mental illness	10	None	Group-based HT-program	Influence on life satisfaction, well-being and self-concept
Unruh <i>et al.</i> (2000)	Life threatening illness	3	ART-theory Existential theory	Garden as leisure activity	Spirituality interwoven in the gardening experience

In addition to the diversity of populations of interest and of methods used to study the benefits of therapeutic horticulture, this review illustrates four important points. First, standard search methods used with large databases reveal that there is rather little widely accessible, peer-reviewed research on therapeutic horticulture in mental health. Theoretical perspectives tend to be attention restoration theory (ART) (Kaplan & Kaplan 1989) or theory related to the biophilia hypothesis (Wilson 1984). Moreover, ideas from stress theory and existential theory have also been used. However, the presented research tend to lack a more explicit theoretical rationale both for using a gardening or nature intervention in relation to the population that is investigated and for the choice of outcome measures. Third, only one of the cited studies (Cimprich & Ronis 2001) tested theoretical hypotheses and none of the cited studies investigated the active components in the interventions using quantitative methods that are suited to testing hypotheses about mediating processes (e.g., as described by Baron & Kenny 1986). Fourth, the samples are often heterogeneous. This makes it difficult to address the beneficial changes that occurred during the intervention to the clinical problems specifically related to the participants' diagnoses. Planning for the present research took these various limitations into consideration.

### *3.3 Theoretical underpinnings of therapeutic horticulture as beneficial in clinical depression*

Therapeutic horticulture is looked upon as a complex intervention with a multidimensional theoretical underpinning. In the following I will present an overview of theories that explain how therapeutic horticulture can be beneficial in clinical depression.

#### 3.3.1 Behavioural activation

Behavioural activation is a general strategy in the treatment of depression rooted in the behavioural tradition in psychology. Behavioural activation was established by Lewinsohn (1974) and aims to increase the levels of reinforcing activities in order to alleviate depression. There are numerous specific strategies for assisting depressed persons to increase mastery and pleasure and to disengage from problems and rumination (Martell *et al.* 2001). However, evidence suggests that pleasant events in particular have an effect on activity level and mood (Dobson & Joffe 1986; Harmon *et al.* 1980).

Behavioural activation is a psychotherapeutic process that combines activation through positively reinforcing activities with psychotherapy sessions addressing the depressed

individual's behavioural avoidance patterns (Hopko *et al.* 2003). Positive reinforcement may include any form of social reinforcement (Kanter *et al.* 2009). Activation alone may be as effective as the therapeutic strategy that also includes psychotherapy for behavioural avoidance (Jacobson & Gortner 2000). The key ingredient in behavioural activation is to move the patient from a lifestyle of behaviour avoidance into an activity-based lifestyle (Dimidjian *et al.* 2006; Hopko *et al.* 2003).

In the present studies, therapeutic horticulture is regarded as a general behavioural activation strategy, and it is assumed that the activities included in TH will often be experienced as pleasant. It is hypothesized that the general activation that TH offers will contribute to an experience of social reinforcement and to pleasure and mastery.

### 3.3.2 Restoration of attention

Depression is as earlier described associated with temporarily limited or reduced capacity to direct attention (Zimmermann & Leclercq 2002), attentional deficits (Mialet *et al.* 1996), impairment of inhibitory mechanism (Lemelin *et al.* 1997) and general cognitive deficits (Mialet *et al.* 1996),

The cognitive inhibitory mechanism on which directed attention depends can become depleted or fatigued under normal conditions of use. This might again lead to difficulties in problem solving and reduced effectiveness in daily activities (Kaplan 1995; Ouellette *et al.* 2005). The problem of ordinary attentional fatigue has been addressed by attention restoration theory (ART) (Kaplan & Kaplan 1989; Kaplan 1995). This theory can give some help in understanding how therapeutic horticulture might be beneficial in depression. The concept of restoration in general can be defined as *'the process of renewing, recovering, or re-establishing physical, psychological, and social resources or capabilities diminished in ongoing efforts to meet adaptive demands'* (Hartig 2004, p. 273). ART postulates different qualities with environments that are especially related to restoration of the capacity to direct attention. At the same time, one can find in ART an explanation for why TH interventions might provide relief in depression by improving attentional capacity and contributing to disengagement from rumination.

ART posits four restorative components in the experience of the environment (Kaplan & Kaplan 1989; Kaplan 1995). According to ART, restoration from attentional fatigue can occur when a person gains physical or psychological distance from tasks, the pursuit of goals, and other routine mental contents to which he or she directs attention (*being away*). However,

being away is not sufficient for attentional restoration; attentional switching should occur in which an effortless, interest-driven form of attention (*fascination*) becomes engaged in the encounter with the environment. This allows the person to rest the inhibitory mechanism required for effortful, directed attention. The experience of fascination can be sustained if the person experiences the environment as rich in stimuli yet coherently structured and with substantial scope for exploration (*extent*). Finally, the theory also acknowledges the importance of the match between the person's inclinations at the time, the demands imposed by the environment, and the environmental supports for intended activities (*compatibility*). Thus, fascination is indicated as the core restorative component, and it is supported by other aspects of the encounter with the environment.

For the above reason being away and fascination will be investigated as active components or possible mediators both of depression severity, perceived attentional capacity and rumination in the present research.

### 3.3.3 Distraction and disengagement from rumination

As depression is associated with weakened and impaired inhibitory mechanism, depressed persons have problems with protecting working memory from being entered and disturbed with irrelevant negative information (Davis & Nolen-Hoeksema 2000; Joormann & Gotlib 2008). It has also been hypothesized that attentional inflexibility might occur in ruminators because of switching or inhibitory deficits (Davis & Nolen-Hoeksema 2000; Whitmer & Banich 2007). Such deficits further complicate the executive processes.

Distraction and disengagement can be looked upon as disadvantageous. However, they can be used for therapeutic purposes, for example in interventions that aim to restore an overloaded or fatigued attention capacity, or to disengage or distract from rumination. While a ruminative style of response to depressed mood is hypothesized to prolong and intensify depression, a distractive response style is hypothesized to alleviate, shorten and diminish episodes of depression (Morrow & Nolen-Hoeksema 1990; Nolen-Hoeksema 1991).

Distracting responses are thoughts and behaviours that may switch attention from the depressed mood to pleasant or neutral activities. Distraction and disengagement of attention imply that attention can be trained, manipulated, and switched on purpose. Stimulating pictures or messages that have a high impact on emotions and are experienced as interesting or fascinating may attract and disengage the attention (Zimmermann and Leclercq, 2002). Likewise environmental features or situations may block or reduce worrisome thoughts

(Ulrich 1999). The engagement of effortless attention by particular environmental features and the process of exploration implies a switch away from effortful directed attention, or, more explicitly, positive distraction (Nolen-Hoeksema *et al.* 2008; Watkins *et al.* 2000).

It is hypothesised in the present research that TH can act as a therapeutic strategy to purposefully distract, disengage and switch attention from rumination into horticultural activities and environmental features of the horticultural context in order to reduce rumination and restore attentional capacity. It is further hypothesized that this contributes to the recovery of the inhibitory mechanism on which directed attention depends, and to alleviation of depression severity.

#### 3.3.4 Affective and stress issues

Human interactions with the natural environment are commonly attended by both affective and aesthetic responses (Ulrich 1983). In the encounter between person and the environment through visual perception, some have claimed that affect comes before cognition, though this assumes a view of cognition as conscious processing (Kaplan 1987). When this perception reaches consciousness, the first stage of affective reaction evolves into other emotions, attended by changes in physiological activation (e.g., decline or increase) (Ulrich 1983; Zajonc 1980). The evolving emotions might in turn influence perception and cognition, entailing a complex interplay of feelings and thoughts that might eventually involve the creation of long-lasting memories. Ulrich (1983) postulates that as the person's first response to plants is affective, this affective response also opens for the creation (or reinforcement) of meanings and memories.

If the affective response is positive, it may mobilize further exploration of the environment, landscape or scenery that evoked the response. The positive encounter with the environment might also elicit feelings of pleasantness and consequently contribute to block stressful thoughts and negative emotions (Ulrich 1979). For people who are experiencing stress, anxiety or are otherwise aroused, these aesthetic and affective effects of the visual encounter with an unthreatening natural scene may promote restoration (Ulrich 1983). This implies that the more aroused or stressed the person is, the more beneficial the encounter with the environment may be.

Much research shows that leisure activities in wilderness and in green residential settings contribute to stress reduction (Ulrich & Parsons 1992). These beneficial effects on stress reduction might be due to learning (Ulrich 1999); people might learn through week-

ends or vacations spent with the parents that nature, parks and gardens are places to restore after stressful working periods.

Another theoretical explanation for why exposure to nature might have a stress-reducing effect is related to arousal theory. It postulates that because natural environments involve lower complexity, intensity and movement than an urban or working environment, it can contribute to decline in stress (Wohlwill 1983).

The evolutionary theories hold that modern humans have a genetic inherited readiness to respond positively to certain natural environments that at the same time were favourable to well-being and survival (Ulrich *et al.* 1991; Ulrich 1993). The theory holds that stress reduction due to a natural settings that for any reason was related to survival or well being involves a shift to a more positive emotional state as well as reduced blood pressure and reduced level of stress hormones and improved immune functions (Ulrich 1993). From this hypothesis also follows that human beings have a biological drive to seek out to and spend time in natural settings in order to alleviate stress, and that this stress response occur rather quickly (Ulrich 1999). In non-patient populations stress reducing effects obtained in parks, gardens and nature are reported (Hartig *et al.* 1991; Ulrich & Addoms 1981; Ulrich *et al.* 1991) though these make no claim to test directly any evolutionary hypotheses.

Given that depression is associated with stress, there are reasons to believe that being exposed to natural scenes that evoke aesthetic and affective responses might be emotionally beneficial and promote stress reduction, which in turn could alleviate depression severity. As both stress and affects are core issues in depression, it was hypothesized that a TH intervention would contribute to stress recovery and to a general increase in positive emotions.

### 3.3.5 Group cohesiveness

The primary therapeutic factor related to psychotherapy in groups is group cohesiveness (Yalom 1995). Cohesiveness can be broadly defined as '*the attractiveness of a group for its members*' (J. D. Frank cited in Yalom 1995 p. 49). Group cohesiveness is assumed to involve a sense of belonging, experience of acceptance, mutual trust and group cooperation (Lese & MacNair-Semands 2000). As group cohesiveness represents the investments in and commitment to the group by its members, it is a quality that any group formation may develop, no matter its task or focus. In cohesive groups, the members feel engaged and mutually rewarded, with a feeling of being uplifted and affirmed after the group meeting

(Hornsey *et al.* 2009). From this it follows that the development of cohesiveness might yield therapeutic benefits and facilitate social skill improvement (Bernthal & Insko 1993; Ettin 1999).

Group participation has the potential to address a core variable in the course of depression, namely interpersonal functioning and support (Brown & Moran 1994). It is also reported that group psychotherapy is effective in alleviating symptoms of depression (McDermut *et al.* 2001). In the present studies, the contribution of cohesiveness in a group-based TH intervention for clinical depression was investigated as an active component of a group-based TH intervention.

### 3.3.6 Existential issues

Existential issues have personal, social and physical dimensions. According to van Durzen (1988), the physical dimension, or the natural world, is the most fundamental of these. Likewise, the phenomenology of existence is concerned with ‘being in the world’ (Heidegger 1990; King & Valle 1978). Meaning, or more specifically ‘terrestrial meaning’, can be created or discovered within the observable universe and involves experiencing oneself as part of a wider and greater existence (O'Connor & Chamberlain 2000). For some people, tuning in to and acting within the natural world gives an existential sense of being, and is most often accomplished through leisure activities (van Deurzen 1988). Human existence might be attributed meaning as a dimension of belonging to nature and the biological world (O'Connor & Chamberlain 2000). Experienced continuity between one’s self and nature and the biological world may be a particularly salient dimension of meaning in the context of TH.

Gardening is often described as a creative and spiritual leisure activity in which existential meaning can be achieved through active (Clark *et al.* 1998; Heliker *et al.* 2000; Trombly 1995; Unruh 2000) and passive experiences (Kaplan 1973; Kaplan & Kaplan 1989; Kaplan & Kaplan 1990; Kaplan 1995; Menninger 1942). A garden can have personal meaning as a place of privacy, a place to anchor and understand nature, and a place where one can help care for the planet (Bhatti 2006). Involvement with the natural environment may also activate a process of reflection that may help the person to extract meaning from the past and make plans for the future (Kaplan 1983).

Meaning-making through gardening can also be described as a personal narrative involving the discovery of coherence in nature and one’s own life story (Heliker *et al.* 2000; Kielhofner & Barrett 1998; Ottosson & Grahn 2008). Meaning may also be attached to

aesthetic experiences through affective responses. According to Ulrich (1983), the human's first response to plants is affective, and this affective response, when it occurs, opens for the creation of meanings and memories. Nature and the garden, as environmental constructs, also serve as metaphors for diverse aspects of life: the great and the small, the beautiful and the ugly, growth and decay (Grut 2003). Recognizing these metaphoric qualities of gardens might bring a person into closer contact with his or her own life cycle.

Given the above, it was hypothesized that a TH intervention might influence existential issues such as meaning in life and sense of coherence and thereby contribute to alleviation of depression in the present studies.

#### **4 Research aims**

In addition to this introduction, the thesis consists of four empirical papers. All of the papers were based on one or both of two studies. Study 1 was performed in 2008 and Study 2 was performed in 2009. The research settings and the therapeutic horticulture intervention were the same in Study 1 and Study 2. Paper I follows a cognitive approach and reports data from Study 1 related to depression severity, perceived attentional capacity, and restorative qualities of the TH intervention. Paper II is an extension and follow-up of Paper I, but it uses data from Study 2. It includes rumination as an additional cognitive issue and investigates if restorative qualities mediate the changes in the outcome measures. Paper III has a psychosocial approach and reports pooled data from Study 1 and Study 2 with a focus on the covariation between group cohesiveness and change in anxiety, stress and positive affects, as well as depression severity. Paper IV takes an existential approach and reports data from both Study 1 and Study 2, though separately, in a two-study format, with the focus on different existential issues in relation to change in depression severity. The research questions of the respective papers are given below.

##### *4.1 Paper I*

The research questions in Paper I concern the degree to which participants with clinical depression benefit from a TH intervention in terms of decline in depression severity and increase in perceived attentional capacity, and whether positive change corresponded with restorative qualities perceived in the TH context.

1. Does severity in depression decline and perceived attentional capacity increase in clinical depression during a TH intervention?

2. Do the decline in depression severity and the increase in perceived attentional capacity persist in clinical depression at 3-month follow-up after a TH intervention?
3. Do the decline in depression severity and increase in perceived attentional capacity covary with the experience of being away and fascination?

#### *4.2 Paper II*

The research questions in Paper II concern the degree to which participants with clinical depression benefit from a TH intervention in terms of decline in depression severity, increase in perceived attentional capacity and decline in rumination. It was also of interest whether restorative qualities of the TH context were active components that could mediate the changes in outcomes.

1. Does severity in depression decline, perceived attentional capacity increase and rumination decline in clinical depression during a TH intervention?
2. Do being away and fascination mediate decline in depression severity, increase in perceived attentional capacity and decline in rumination in clinical depression during a TH intervention?
3. Do increase in perceived attentional capacity and decline in rumination mediate decline in depression severity?
4. Do the declines in depression severity and rumination and the increase in perceived attentional capacity persist at 3-month follow-up after a TH intervention?

#### *4.3 Paper III*

The research questions in Paper III concern the degree to which group cohesiveness covaries with changes in anxiety, positive affects and perceived stress during a TH intervention, and how the participants evaluate the therapeutic horticulture experience.

1. Does anxiety decline, positive affect increase and perceived stress decline during a TH intervention and how do these changes covary with levels in group cohesiveness?
2. Do the changes in anxiety, positive affects and perceived stress persist at 3-month follow-up after a TH intervention?

3. Do the changes in depression severity, anxiety, positive affects and perceived stress vary across the two years in which the TH intervention was run?
4. How do the participants evaluate the social dimension of therapeutic horticulture?

#### *4.4 Paper IV*

The research questions in Paper IV concern the degree to which changes in life regard and sense of coherence covary with change in depression severity, as well as how the participants evaluate the existential issues of the therapeutic horticulture experience.

1. Do existential issues improve due to a twelve week TH intervention?
2. How do changes in existential issues covary with change in depression severity?
3. How do the participants evaluate the TH intervention in terms of existential issues?

## **5 The empirical work**

### *5.1 Research design*

A single-group within-subject design with multiple measurement points was employed for the present research. The measurement points were recruitment (T1 in Study 1, T0 in Study 2), baseline (T1 and T2 in both studies), intervention start (T2), after 4 weeks (T3), after 8 weeks (T4), after 12 weeks of the intervention (T5), and at a 3-month follow-up (T6). Study 1 thus had two pre-intervention measurement points (T1, recruitment/baseline; T2, intervention start), whereas Study 2 had three pre-intervention measurement points (T0, recruitment; T1, baseline; T2, intervention start).

### *5.2 Participants*

Adults with DSM-IV major depressive disorder, dysthymia, or depressive phase of bipolar II disorder, and a Beck Depression Inventory (BDI) score  $\geq 15$  were recruited. In the following the expression clinical depression is used. People with borderline personality disorder, eating disorders, post traumatic stress disorder, schizophrenia, addictive problems out of control for the last 6 months, present hospitalization in a psychiatric unit, or having gardening as a leisure activity were excluded. The participants all spoke Norwegian fluently, given the recruiting procedure and the language demands of the self-report measures.

In Study 1 twenty-two people fulfilled the criteria and entered the study. Three of them dropped out of the project in the first week of the intervention, due respectively to

recurrence of serious cancer, a vocational rehabilitation opportunity, and unhappiness in the group. Nineteen patients completed the intervention; however, one did not complete the questionnaires. The remaining 18 participants (3 men, 15 women) ranged in age from 27 to 65 years ( $M = 49.7$ ). Sixteen had recurrent major depression (range 3 – 30 episodes) and two had bipolar II. Ongoing treatment, during and after the intervention, consisted of regularly psychotherapy at varying frequency as the only treatment for four participants, and a combination of psychotherapy and medication for 11 others. Three of the participants were not currently receiving any treatment. These participants were advised to consult their general practitioner (GP). At the 3-month follow-up, 16 participants completed and sent in the questionnaires.

In Study 2, 30 people fulfilled the criteria and entered the study. One withdrew after the first session because of massive psychological distress, and one dropped out after four weeks without giving any reason. Twenty-eight people (7 men, 21 women) completed the intervention. They ranged in age from 25 to 64 years ( $M = 44.1$ ). Five had bipolar II disorder with the most recent episode being depressive, 22 had major depressive disorder – recurrent, and one had major depressive disorder – single episode. Information from the GP on ongoing treatment was provided for 22 of the 28 participants. Nine received psychotherapy only at varying frequency, one received antidepressant medication only, and 10 had a combination of the two. Two did not receive any treatment and were encouraged to contact their GP. At the 3-month follow-up, 25 participants completed and sent in their questionnaires.

### *5.3 Recruiting*

Participants were mainly recruited through advertisements in newspapers; however, in Study 2 they were also recruited through the Norwegian Labour and Welfare Administration (NAV). The inclusion procedure followed the same pattern in both studies. Potential participants addressed themselves directly to the researcher by telephone, and received via post information on the project, an informed consent sheet and the Beck Depression Inventory (BDI) (Beck & Steer 1987). Upon receiving their informed consent and completed BDI (screening, baseline 1), the researcher contacted the potential participant by telephone and completed an additional diagnosis by using the Norwegian version of the Mini International Neuropsychiatric Interview (M.I.N.I.) (Sheehan *et al.* 1998). The reliability of such a telephone interview has been demonstrated in different studies (Cacciola *et al.* 1999; Crippa *et al.* 2008; Rohde *et al.* 1997). The researcher had received formal training in the use of this

instrument and received support on consultative basis from an experienced clinician and researcher.

The rest of the pre-intervention and recruiting procedure differed in Study 1 and Study 2. In Study 1, the participants were included at T1 and sent descriptions of the TH program and the questionnaires by post together with information on practical issues just before the start of the intervention (T2, baseline 2). In Study 2, the participants were included at T0, were sent all questionnaires for a baseline 1 measure (T1), and then after some weeks were sent the same questionnaires for baseline 2 (T2), together with the information on the TH project and practical issues. This implies that in Study 2 there was a double baseline for all questionnaires, while in Study 1 there was a double baseline only for BDI (Table 2).

#### *5.4 Research settings*

The present research is part of a larger project concerned with the viability of therapeutic activities in farm settings for people with mental health problems, commonly referred to as 'Green Care'. For that reason, farms were selected as research settings for the therapeutic horticulture intervention. Ten urban farms in the counties of Oslo and Akershus were evaluated for their appropriateness for the intervention, and four of these farms were selected. The issues that were considered for judging the farm as appropriate for the intervention were as follows: Absence of traffic noise, open scenery and landscape, the availability of different 'garden rooms', accessibility with public transportation (bus or metro), facilities for cultivating plants like a green house or 'plant beds', and the farmers' knowledge of gardening and experience in opening the farm for 'green care activities'. All of the four chosen farms have strong historical and cultural identity, and are situated in open, hilly cultural landscapes. The farms were easy to access either by bicycle, private car or bus from where the participants lived. The participants could choose on which farm they wanted to attend. The farms further offered indoor facilities for changing and drying clothes and boots. The farmers facilitated the TH group activities. They were given basic instructions and received continuing support from the researcher before and during the intervention.

#### *5.5 Intervention*

A 12-week TH program was developed for the intervention. The program included ordinary and easy gardening activities, both active and passive. Participation implied attendance twice a week in 3-hour TH-sessions. The active parts of the TH program included sowing,

germinating, potting, planting, composing beds, cultivating vegetables, and rooting various cuttings of flowers and herbs. The passive parts included walking around, sitting on benches, picking flower bouquets, and watching birds, insects, butterflies, the weather and the landscape.

The intervention was designed as a group intervention with 3 - 7 participants in each group. The composition of groups was subordinate to the scheduling preferences of the farmers and participants. The TH program also provided possibilities for being alone.

At the start of the intervention the participants received an overview of which plants and seeds would be used in the program, as well as a sheet with 'good advice' concerning clothing, shoes, sun, wind, and so forth. The participants brought their packed lunches, while tea and coffee were served at the farm. They were advised to keep communication among themselves to the horticultural activities while attending the program.

The intervention took place between April and August in 2008 (Study 1) and 2009 (Study 2), and was led and coordinated by the farmers. The participants continued their ongoing treatment during the intervention. Mean attendance across the two samples was 18.4 of 24 sessions (76.7 %).

### *5.6 Outcome measures*

In the following, the outcome measures used in the present research will be presented. The general mental health outcome measures will be presented first, followed by the cognitive outcome measures and the existential outcome measures. At the end, the measures related to the hypothesised active components in the intervention will be presented.

#### 5.6.1 Beck Depression Inventory

The Beck Depression Inventory (BDI) was used to measure depression severity (Beck & Steer 1987). Each of 21 items consists of four statements about depressive symptoms, and scores ranging from 0 (*normal*) to 3 (*most severe*) with 63 as a maximum sum score. The internal consistency and stability of the BDI is well established, it discriminates well between patients with varying degrees of depression, and it accurately reflects changes in depression intensity over time (Beck *et al.* 1988; Richter *et al.* 1998). A decline in BDI score  $\geq 6$  has been described as clinically significant (Bright *et al.* 1999). In the present research  $\alpha$  fell between 0.79-0.90 across measurement points and studies.

### 5.6.2 Spielberger State – Trait Anxiety Inventory

The State - Trait Anxiety Inventory - State Subscale (STAI-SS) was used to measure anxiety (Spielberger *et al.* 1983). The instrument is extensively used to explore current anxiety, that is, how participants feel *at the particular moment in time*. Participants rate how much they feel in line with 20 descriptions of possible present states (1 = *not at all*; 4 = *to a great degree*) with a possible maximum score of 80. The test has good construct validity and test-retest reliability (Spielberger *et al.* 1983). In the research study  $\alpha$  fell between 0.88-0.93 across measurement points and studies.

### 5.6.3 Positive and Negative Affect Scale

Positive affect was measured with seven items from the Positive and Negative Affect Scale (PANAS-PA) (Watson *et al.* 1988). Participants rated the extent to which they currently experienced the following affects: *Interested, strong, enthusiastic, inspired, proud, alert, strong and active* (1 = *very little*; 5 = *extremely*). The score for the PANAS-PA was the mean of the seven responses, and thus could vary from 1 to 5, with lower values indicating lower positive affect. The PANAS has good internal consistency, it is valid and sensitive to mood fluctuations (Watson *et al.* 1988). In the present research  $\alpha$  fell between 0.89-0.92 across measurement points and studies for the PANAS-PA with seven items.

### 5.6.4 Perceived Stress Scale

The Perceived Stress Scale (PSS) was used to measure general stress. The original PSS contains 14 items and measures the degree to which general situations in one's life are appraised as stressful (Cohen *et al.* 1983). The four-item version used in the present studies exhibits good predictive validity (Cohen & Williamson 1988). It includes two positively and two negatively-stated items, aimed at assessing general stress during the preceding four weeks (0 = *never*; 4 = *very often*) with a maximum possible score of 16. In the present research  $\alpha$  fell between 0.53-0.66 across the measurement points and studies.

### 5.6.5 Attention Function Index

The Attentional Function Index (AFI) (Cimprich 1993) was used to measure perceived effectiveness in cognitive activities requiring directed attention, such as planning, deciding, following a train of thought, and concentrating on details (Cimprich 1992). AFI is inspired by ART and consists of 16 linear analogue scales (0-10) labelled at either end with 'not at all'

and 'extremely well'. The maximum possible score of 160 indicates a strong perceived capacity to direct attention. AFI is sensitive to change over time (Cimprich 1993) and validity and reliability have been established in cancer populations (Cimprich 1992; Cimprich 1993). In the present research  $\alpha$  fell between 0.89 - 0.92 across measurement points and studies.

#### 5.6.6 Ruminative Response Scale - Brooding Subscale

The Brooding Scale used in this research is a subscale from a revised version (Treyner *et al.* 2003) of the original 22-item version of the Ruminative Response Scale (RRS) (Nolen-Hoeksema & Morrow 1991). The Brooding Subscale consists of five items assessing the degree to which individuals passively focus on the reasons for their distress (e.g., *think 'What do I do to deserve this?'*) (1 = *almost never*; 2 = *sometimes*; 3 = *often*; 4 = *almost always*), with a possible maximum score of 20. Treyner *et al.* (2003) reported  $\alpha = 0.72$  and test-retest correlation of 0.62 for the Brooding Subscale. In the present research  $\alpha$  fell between 0.82 - 0.87 across measurement points and studies.

#### 5.6.7 Life Regard Index – Revised

The Life Regard Index – Revised version (LRI – R) (Debats 1998) developed from the original LRI instrument of Battista and Almond (1973) was used to measure the degree to which individuals have a meaningful life on a value-independent level (Debats 1999). The LRI – R consists of 28 items that addresses various existential issues (e.g. *'Living is deeply fulfilling'*, *'I just don't know what I really want to do with my life'*). Responses are given with 3-point scales (1 = *do not agree*; 3 = *agree*), giving a maximum possible score of 84. The measure consists of two different subscales; a Framework Scale (FR) and a Fulfilment Scale (FU), each with 14 items. The items address the experience of having fulfilled life goals (FU) or having a framework for or being in the process of fulfilling life goals (FR). Both subscales have been significantly related to psychotherapy treatment outcome with stronger correlations between depression and FU than depression and FR (Debats 1996). Reliability and construct validity are satisfactory (Debats 1998). In the present research the LRI-R, treated as a single 28-item scale,  $\alpha$  fell between 0.79-0.92 across the measurement points in Study 1.

#### 5.6.8 Sense of Coherence Scale

The 13-item version of the Sense of Coherence Scale was used to measure existential issues. The SOC13 (hereinafter SOC) was developed from the original 29-item version developed by

Antonovsky (1987) and is reported to adequately represent the construct captured with the full version of the SOC scale (Antonovsky 1993; Callahan & Pincus 1995). The items address the degree to which participants experience various aspects of life as meaningful, comprehensible and manageable (e.g., *'In the past, have you been surprised by the behaviour of people whom you thought you knew well?'*; *'Do you feel that you are being treated unfairly?'*) Responses are given on a 1-7 scale with verbal anchors at each end (e.g., for the above statements, respectively, *never happened – always happens*; *very often - very seldom*). The maximum total score of 91 indicates strong SOC. The SOC is well validated (Antonovsky 1993; Flannery *et al.* 1994). Internal consistency and test-retest reliability are reported to be acceptable in previous research (e.g.,  $\alpha = .85$ ) (Eriksson *et al.* 2007). In the present research  $\alpha$  fell between 0.49 - 0.73 across measurement points in Study 2.

#### 5.6.9 Perceived Restorativeness Scale

Perceptions of restorative qualities of the environment and TH activities were measured with subscales of the Perceived Restorativeness Scale (PRS) (Hartig *et al.* 1997b). The scale was designed to measure the constructs in attention restoration theory (ART) (Kaplan & Kaplan 1989). The 10 items used were selected from the subscales for being away (BA) (e.g., *'Being here gives me a break from my everyday routine'*) and fascination (FA) (e.g., *'There is much to explore and discover here'*) from the version published by Hartig, Kaiser and Bowler (1997a). Responses are given on 11-point scales (0 = *not at all*; 10 = *completely*). Scores for being away and fascination have reliably distinguished between places with different affective valences acquired through personal experiences (i.e., favourite, neutral, unpleasant) (Korpela & Hartig 1996; Korpela *et al.* 2001). In the present research,  $\alpha$  fell between 0.86 - 0.96 across measurement points and studies.

#### 5.6.10 Therapeutic Factor Inventory - Cohesiveness Scale

The Therapeutic Factors Inventory Cohesiveness Scale (TFI-CS) measures the socio-emotional aspects of group cohesion (Lese & MacNair-Semands 2000), and it addresses the presence of group therapeutic factors described by Yalom (1995). Of the subscale's nine items, seven items that reflect on a group member's general sense of belonging and experience of acceptance, trust and group cooperation were selected for use in the present research (Strauss *et al.* 2008). Responses are given on a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*). A test-retest reliability of .93 over one week, and  $\alpha = .90$  is reported for this

measure with all nine items (Lese & MacNair-Semands 2000). In the present research  $\alpha$  fell between 0.90-0.93 across measurement points and studies.

### *5.7 Exploration of the therapeutic horticulture experience*

After the intervention was completed, the participants were asked to respond to questions related to group issues and existential issues. The social aspect of TH was addressed with a single question about whether the participants experienced the social dimension of TH as important (1 = *totally agree*; 5 = *totally disagree*). Further, the participants were asked to report *yes* or *no* whether the level of their social activity had increased during or after the intervention.

Further exploration of the importance of the existential experience with therapeutic horticulture was addressed in four questions asking if the participants experienced the existential dimension of TH as important (i.e., '*Participation in TH has contributed to change in life regard*'); '*Participation in TH has given me aesthetic experiences*'; '*I have experienced working with plants and gardening as meaningful*'; '*Participation in therapeutic horticulture has given me a sense of taking care of nature*'). These were answered with 5-point scales ranging from *totally agree* (1) to *totally disagree* (5).

The participants were also asked to answer, in writing, one open question: *How did you experience taking part in the TH project?*

### *5.8 Procedure*

Before, during and after the intervention the questionnaires were sent to the participants by post at each measurement point and returned by post to the researcher within a couple of days. On occasion, participants were reminded by telephone.

### *5.9 Data analysis*

#### 5.9.1 Statistical analysis

In addition to the calculation of means, standard deviations and other descriptive statistics, statistical procedures were used to assess the associations of interest in Papers I-IV. These included paired-samples t-tests, bivariate correlations, repeated- measures analysis of variance, and linear regression. All of the statistical analysis were conducted with SPSS for Windows (SPSS 16.0 in Paper I; SPSS 17.0 in Paper II-IV). In the hypothesis testing, the

criterion for type 1 errors was set at  $\alpha = .05$ . This significance level implies that disconfirmation of the null hypotheses required 95 % security.

#### 5.9.1.1 Bivariate associations

The paired samples t-test is a statistical test that can be used to compare data from the same group of individuals at two different measurement points. Paired-samples t-tests were used both to investigate if there were significant changes in baseline scores prior to the intervention, or between pre-intervention scores and post-intervention (follow-up) scores.

Bivariate correlations were used to assess the strength and direction of the linear relationships among variables and among changes in variables (Kirkwood & Sterne 2003). In the research we calculated Person's  $r$  and Spearman's  $\rho$ .

#### 5.9.1.2 Repeated measures analysis of variance (RM-ANOVA)

The RM-ANOVA can be used when there are repeated measures for the same subjects on the same variable or variables over two or more measurement points. The RM-ANOVA is an extension of the paired sample t-test. It uses the measurements of the same characteristics under different conditions, such as time points in the course of a therapeutic program. As the same subjects are being measured at each time point, the individual differences are controlled in an economical way in an RM-ANOVA, something that increases power and degrees of freedom. The RM-ANOVA is a useful analysis for small samples, as in both Study 1 and Study 2 (Tabachnick & Fidell 2007).

In this research RM-ANOVA was used to assess whether there were significant changes for the same participants over different measurement points (T1, T2, T3 ..) with the same measures of outcomes and active components. This was done separately for measures collected before the intervention, during the intervention, and after the intervention. Within the RM-ANOVA with measures collected during the intervention, Helmert contrasts were used to identify when the most significant change took place. These contrasts compare the mean of a dependent variable at a given measurement point to the mean of the dependent variable over the subsequent measurement points.

In the RM-ANOVA reported for group cohesiveness and several of the mental health outcomes in Paper III, the year of the study was added as a between-subjects factor to determine whether the pattern of change observed during the intervention was approximately the same in 2009 as in 2008.

### 5.9.1.3 Mediation and moderation

This research aimed to investigate possible active components or mediators in the TH intervention. Mediators are variables that intervene between the treatment and the outcome variable before the end of an intervention (Baron & Kenny 1986). According to Judd and colleagues (2001), mediators are factors or mechanisms that produce the effect of an intervention. They should be distinguished from moderators, which are factors that account for the magnitude of the effect of an intervention looking across different individuals.

Because this research used a within-subject design, the analytic approach recommended by Judd *et al.* (2001) for within-subjects experiments with small samples for investigating possible mediators was applied. The regression analysis they prescribe has a dependent variable that is the amount of change ( $\Delta$ ) across measures obtained before and after the intervention has been introduced. This analysis includes two main predictors. One of the predictors is also a change score; change across measures of the presumptive mediator obtained before and after the intervention has been introduced is used to predict change across measures of the outcome. The coefficient for this predictor provides the test of mediation. This coefficient should be estimated with adjustment for variation attributable to the general level over measurement points of the presumptive mediator. The second predictor, a sum score ( $\Sigma$ ) represents the sum of the score before and after the intervention has been introduced. This sum score is in effect a moderator; it indicates whether the degree of change in the outcome depends on the general level of the mediator looking across individuals.

### 5.9.1.4 Analysis of aggregated data

A method available for small samples was applied to check for Type I errors related to nesting of patients within small groups receiving the intervention (Baldwin *et al.* 2005). If the members of a group over time share the same common environment or therapist or the group fosters interaction by its members, this can create dependencies that influence how the participants answer on the outcome measures (Baldwin *et al.* 2005). Members of the same group may answer similarly. This means that the determination of the statistical significance of results from the paired-samples t-tests and RM-ANOVA might be liberal. Accordingly, some analyses were followed up using the group mean scores instead of individual scores. Given the small number of cases in each study (i.e., 5 groups of patients), this approach could

only be used to follow up on the RM-ANOVA initially done with individuals as cases. These are thus very conservative tests.

#### 5.9.2 Exploration of data on the therapeutic horticulture experience

In the exploration of text data from the open question, a review of the written notes was conducted looking for significant statements, recurrent themes and phrases related to the social and existential dimensions of the experience of the TH intervention. The identified themes, phrases and statements were grouped into clusters. On the items related to the social and existential issues, percentiles were calculated for levels of agreement.

#### *5.10 Ethical considerations*

The research was approved by the Regional Committees for Medical and Health Research Ethics in Norway (REK) and the Norwegian Social Science Data Services (NSD). The participants received printed information about the project with the invitation to participate, and they provided written informed consent.

## **6 Results**

The presentation of the results is organised in three main sections representing three major concerns of the analyses: stability in baseline measures before the intervention, changes and variation in outcome measures during the intervention and the persistence of change in outcome measures after the intervention (at 3-month follow-up). To support the presentation of the results, an overview of the means and standard deviations for all measures across all measurement points in both studies is given in Table 2. The table thus also gives an overview of which outcome measures the participants filled out at a certain measurement point in each study.

**Table 2:** Means and standard deviations over the measurement points (T1-T6) for the Beck Depression Inventory (BDI), Spielberger State-Trait Anxiety Inventory – State Subscale (STAI-SS), Positive and Negative Affect Scale – Positive Affect (PANAS-PA), Perceived Stress Scale (PSS), Attention Function Index (AFI), Ruminative Response Scale – Brooding Subscale (Brooding), Being Away (BA), Fascination (FA), Therapeutic Factor Inventory – Cohesiveness Scale (TFI-CS), Life Regard Index – Revised (LRI-R), Sense of Coherence Scale (SOC). The order of the measures in the table corresponds to the order of the presentation of the outcome measures in the text. The range of possible scores for each scale is given in parentheses beneath the abbreviation.

Measure (Range)	Study	T1 Baseline 1	T2 Baseline 2	T3 4 Weeks	T4 8 Weeks	T5 12 Weeks	T6 3-Month Follow-Up
		Start				End	
BDI	Study 1	28.4 (6.3)	27.3 (6.8)	20.5 (6.2)	19.3 (6.9)	17.6 (7.4)	20.8 (9.0)
(Sum: 0 - 63)	Study 2	25.2 (7.8)	24.1 (8.4)	21.6 (7.0)	19.6 (7.7)	19.6 (8.0)	20.4 (10.3)
STAI-SS	Study 1	-	56.8 (8.8)	-	-	49.3 (9.4)	53.1 (10.4)
(Sum: 20 – 80)	Study 2	53.3 (11.4)	55.4 (11.4)	-	-	52.7 (9.2)	52.7 (11.4)
PANAS-PA	Study 1	-	2.37 (.75)	-	-	2.75 (.79)	2.42 (.87)
(Mean: 1 - 5)	Study 2	2.09 (.72)	2.18 (.86)	-	-	2.36 (.77)	2.34 (.88)
PSS	Study 1	-	14.2 (2.4)	-	-	13.0 (2.4)	12.9 (2.7)
(Sum: 0 – 16)	Study 2	14.2 (2.4)	14.0 (2.2)	-	-	13.0 (2.3)	13.6 (2.3)
AFI	Study 1	-	68.8 (18.4)	77.9 (20.6)	76.3 (18.7)	79.0 (14.8)	74.5 (25.4)
(Sum: 0 – 160)	Study 2	64.4 (21.6)	63.4 (23.0)	66.3 (18.11)	71.5 (20.2)	73.6 (18.6)	67.0 (17.7)
Brooding	Study 1	-	-	-	-	-	-
(Sum: 5 – 20)	Study 2	13.4 (3.6)	13.4 (3.2)	12.9 (3.4)	12.5 (3.4)	11.8 (3.3)	12.3 (3.8)
LRI-R	Study 1	-	48.8 (6.8)	-	-	50.2 (7.5)	49.8 (10.5)

(Sum: 28 – 84)									
SOC	Study 2	44.3 (6.1)	43.6 (6.6)	-	-	-	44.6 (7.5)	45.5 (7.0)	
(Sum: 13 – 91)									
BA	Study 1	-	-	8.0 (1.0)	8.0 (1.1)	8.2 (1.2)		-	
(Mean: 0 – 10)	Study 2	4.6 (2.1)	4.5 (2.1)	7.5 (1.4)	7.6 (1.5)	7.3 (1.6)		4.6 (1.7)	
FA	Study 1	-	-	7.9 (1.1)	8.1 (1.5)	8.1 (1.4)		-	
(Mean: 0 – 10)	Study 2	3.2 (2.0)	3.4 (2.3)	7.0 (1.3)	7.1 (1.8)	7.1 (1.9)		3.3 (1.9)	
TFI-CS	Study 1	-	-	5.78 (.92)	5.57 (1.03)	5.82 (.91)		-	
(Mean: 1 – 7)	Study 2	-	-	5.72 (.95)	5.83 (.98)	5.93 (.99)		-	

Note: Study 1 (2008): T2-T5  $n = 18$ , T6  $n = 16$ . Study 2 (2009): T2-T5  $n = 28$ , T6  $n = 25$

### *6.1 Before the intervention: Stability in outcome measures*

In both studies there was stability in all baseline measures (Papers I-IV). This implies that while waiting for the intervention to start, receiving treatment as usual, there were no significant changes in scores across the baseline measurement points. In both studies, levels on BDI baseline scores indicate that the participants were moderately depressed. Further the scores show moderate values on STAI-SS and PANAS-PA, while scores on PSS indicate that they had high levels of perceived stress prior to the intervention. Baseline AFI scores indicate that perceived attentional capacity was fairly far below the possible total, and the Brooding scores were moderate to high. Both the levels of LRI-R and the SOC scores indicate that the existential dimension was only to a moderate level fulfilled in their lives. In Study 2, the participants also reported fairly low levels of both being away (BA) and fascination (FA) at baseline when they were at home (Table 2).

Neither the main effect of Year nor the Time x Year interaction was significant with regard to depression severity ( $P = .152$  and  $P = .948$ , respectively). The BDI was the only outcome measure for which these effects could be tested. The results imply that there were only minor differences related to year between Study 1 and Study 2 (Table 2).

### *6.2 During the intervention: Variation in outcome measures*

Of interest here were changes and variation in outcome measures during the intervention. As depression severity (BDI) is the core variable in the research and BDI scores are reported in all papers, the results on BDI will be presented in the first section. As restorative qualities and group cohesiveness are assumed to represent active components in the intervention, the findings regarding these variables are presented thereafter. In the subsequent sections, the cognitive outcomes (AFI and Brooding) are presented in relation to restorative qualities (Paper I and Paper II). Thereafter follows a presentation of findings related to change in mental health outcomes (STAI-SS, PANAS, PSS as well as BDI) in relation to group cohesiveness (Paper III). Finally, findings concerning change in existential issues (LRI-R and SOC) in relation to change in BDI are presented (Paper IV)

#### 6.2.1 Change in depression severity

The outcomes on BDI were somewhat different in Study 1 and Study 2. In Study 1, BDI scores on average declined 9.7 points from T2 to T5 (Paper I). A change in BDI score greater than or equal to six points ( $\Delta\text{BDI} \geq 6$ ) was found for 72% of the cases. In Study 2, BDI

declined 4.5 points (Paper II). A clinically significant decline ( $\Delta\text{BDI} \geq 6$ ) was found for 50 % of the cases. Although the change appeared to be somewhat greater in Study 1 than in Study 2, it was statistically significant in both studies. The non-significant test of the effect of year in the RM-ANOVA indicates that the average levels of depression severity were statistically equivalent over the two years, and the non-significant test of the Year x Time interaction indicates that the pattern of change in depression severity during the intervention was also similar across the two years (Paper III). In both studies planned contrasts indicated that the most significant change in BDI occurred during the first 4 weeks of the intervention.

### 6.2.2 Levels of restorative qualities and group cohesiveness

Both in Study 1 and Study 2, the participants reported rather high levels of both being away (BA) and fascination (FA) throughout the intervention (Table 2) (Paper I and Paper II). In Study 2 the levels of BA and FA were also measured at the home, and the levels at home were substantially lower than the levels on the farm (Table 2) (Paper II). The levels in BA and FA remained stable during the intervention in both studies.

The levels of group cohesiveness (TFI-CS) were found to be fairly high after four weeks of intervention. Cohesiveness continued to increase throughout the intervention (Table 2). The levels of and pattern of change in cohesiveness were similar across Study 1 and Study 2 (Table 2) (Paper III).

### 6.2.3. Cognitive outcomes in relation to restorative qualities and depression severity

In Study 1 perceived attentional capacity (AFI) improved over the course of the intervention; the mean AFI score increased 10.2 points. This increase was marginally significant. The planned contrasts indicated that the greatest improvement in AFI scores occurred during the first 4 weeks of the intervention (Paper I).

In Study 2, perceived attentional capacity (AFI) improved significantly over the course of the intervention; the mean AFI scores again increased 10.2 points. The planned contrasts indicated that the greatest improvement in AFI scores occurred during the first eight weeks of the intervention (Paper II).

In Study 2, rumination also declined significantly during the intervention; the mean Brooding scores declined 1.6 points over the course of the intervention. The planned contrasts indicated that the Brooding scores continued to decline during the entire 12-week intervention (Paper II).

In Study 1, it was found that those participants that experienced more psychological distance from their everyday routines (BA) over the course of the intervention, showed a slight, though not significantly greater degree of decline in depression severity ( $\Delta$ BDI), and a slight, but not significantly greater increase in perceived attentional capacity ( $\Delta$ AFI). Those participants who found the intervention to engage their attention (FA) at a higher level, showed a significantly greater decline in BDI score over the course of intervention ( $\Delta$ BDI), but not a greater increase in perceived attentional capacity ( $\Delta$ AFI) (Paper I).

In Study 2, mediation by BA and FA of change in the outcome measures was investigated. BA and FA were strongly correlated, so they could not be included as mediators in the same analysis. In separate regression analyses, it was found that change in depression severity ( $\Delta$ BDI) was mediated by change in both BA and FA; that is to say, the greater the increase in BA and FA from home to farm, the greater the decline in BDI from T2 to T5 (Paper II).

It was also found that change in perceived attentional capacity ( $\Delta$ AFI) was similarly mediated by change in both BA and FA. In addition it was found that the decline in Brooding ( $\Delta$ Brooding) was not mediated by change in either BA or FA; however, the overall level of FA across measurement points significantly moderated change in Brooding, such that change in Brooding was greater among those with a higher general level of fascination (Paper II). These last results did not align with our expectations; it was anticipated that the greater the increase in BA and FA from home to farm, the greater would be the decrease in Brooding from T2 to T5.

A further regression analysis showed that change in Brooding did not mediate change in either BDI or AFI, but the average level in Brooding acted as a moderator of change in BDI. Those who had a higher level of Brooding across all measurement points (T2 to T5) also showed greater the decline in BDI (Paper II).

The final regression analysis showed that change in AFI significantly mediated change in BDI, implying that the greater the increase in perceived attentional capacity, the greater the decline in depression severity (Paper II).

#### 6.2.4 Other mental health outcomes in relation to group cohesiveness

Anxiety (STAI-SS), positive affects (PANAS-PA) and perceived stress (PSS) all changed in the direction of better mental health during the intervention in each of the two samples/years (Table 2). These improvements from T2 to T5 were statistically significant for STAI-SS,

PANAS-PA, and PSS in the pooled data (N = 46). The overall levels of the outcomes, and the patterns of change in the outcomes, did not vary substantially across the samples/years, as reflected respectively in the non-significant main effect of Year and the non-significant Time x Year interaction in each analysis (Paper III).

The overall level of group cohesiveness during the intervention (TFI-CS) correlated positively with improvement in all of the mental health outcome measures, including BDI; however, none of the correlations was statistically significant. This may have had to do with the restriction of range in the TFI-CS variable; the scores were with only one exception above the mid-point of the scale (Paper III).

#### 6.2.5 Existential outcomes in relation to depression severity

The scores on the measures of existential issues increased marginally and non-significantly during the intervention. This was the case both in Study 1 with the Life Regard Index - Revised (LRI-R) and in Study 2 with the Sense of Coherence Scale (SOC). In Study 1, the correlations between the degree of change in LRI-R and change in BDI were positive but not significant. In Study 2, there was a significant positive correlation between change in SOC and change in BDI. Note that change in existential issues is not represented here as a mediator of depression. Instead, the use of the simple correlations reflects appreciation of the possibility that depression and lack of meaning or coherence in life may be reciprocally related (Paper IV).

#### *6.3 After the intervention: Persistence of change in outcome measures*

There was still a significant decline in BDI from intervention start to 3-month follow-up both in Study 1 and Study 2. The mean AFI score, however, had decreased after the intervention terminated in both studies (Table 2) (Paper I and Paper II), and in Study 2 it was found that Brooding also had relapsed (Table 2) (Paper II). However the AFI scores in both studies and the Brooding scores in Study 2, still showed some persistent improvement from intervention start (Table 2).

Likewise, there were persistent though non-significant improvements in perceived stress (PSS), anxiety (STAI-SS) and positive affect (PANAS-PA) in the pooled data (Study 1 and Study 2) from intervention start till 3-month follow-up. The main effects of Year and the Time x Year interactions were not significant for these outcomes, indicating that their overall

levels and the persistence of improvement in them to the 3-month follow-up were similar across the two samples/years (Paper III).

Concerning existential issues, there was negligible changes between intervention start and 3-month follow-up in both LRI-R and SOC-13.

#### *6.4 Analysis of aggregated data*

The conclusions were checked by treating the groups as cases, with group mean scores replacing individual scores. The significant changes in outcome measures found in the analyses with individuals as cases were for the most part confirmed in the analyses with groups as cases (Papers I-III). The exceptions were AFI in Study 1 and Study 2, Brooding in Study 2, and PANAS-PA in the pooled data. The results of these extremely conservative tests mainly strengthen confidence in the findings of significant improvement in mental health during the course of the intervention.

#### *6.5 Exploration of data on the therapeutic horticulture experience*

The majority of the participants (93%) answered from agree to totally agree that the social component of the TH intervention was important. After 12 weeks of intervention (T5), 38.0 % of the participants reported that their social activity level had increased. Of those who provided data at T6, 31% still had increased social activity at the 3-month follow-up, implying that the increase was stable over the intervening period. The qualitative data related to the open question clustered to the *significance of group membership*, which underlines the importance of TH as a group activity. The participants appreciated the group atmosphere and the group composition. The participants remarked that mutual trust, respect, the possibilities to be oneself in the group, the importance of being together with people in the same situation and improvement in social security were important. However, some participants felt that participation in the group had been challenging, especially being the lone man in a group. The participants would have wanted to continue in the project, expressed sadness that the project went to an end, and hoped for the project to be permanent in the future (Paper III).

On the close-ended items related to the existential dimension of the TH intervention, the participants overall answered from agree to totally agree to the following items;

*“Participation in therapeutic horticulture has contributed to change in my view of life”*;  
*“Participation in therapeutic horticulture has given me aesthetic experiences”*; *“I have experienced working with plants and gardening as meaningful”*; *“Participation in*

*therapeutic horticulture has given me a sense of taking care of nature*". The qualitative data related to the open question clustered to the *existential dimension of the TH experience*, the participants described their participation in TH activities as meaningful, interesting and instructive. Their accounts especially focused on themes related to the excitement and absorption in following the growth process from seeds to plants, flowers, vegetables and herbs. Some participants discovered gardening as a new leisure activity for their future life (Paper IV).

## **7 General discussion**

This section includes considerations and reflections upon the main results in relation to the research aims and research questions. Further in this section the main results will be mirrored along with relevant research in the field. As elaborated earlier (Chaper 3.2) the available research in the field is scarce, and the present research is to our knowledge the first investigating the benefits of a TH intervention in clinical depression. For this reason, the discussion of main findings with relevant research constitutes a small part of the discussion. The limitations and strengths of the research will in this section be discussed as parts of methodological issues with Shadish, Cook and Campbell (2002) used as a frame of reference. Finally, ethical issues that were challenged in the study will be discussed.

### *7.1 Main results in relation to research aims and research questions*

#### 7.1.1 Stability in baseline scores

Double baseline measures were obtained for depression severity (BDI) in both studies, and for all outcomes in Study 2. In both studies where double baseline scores were available, baseline scores remained stable from T1 to T2 (intervention start). This implies that while waiting for the intervention to start, receiving their ongoing treatment (if they had any), the participants did not change significantly in levels of depression severity (BDI), anxiety (STAI-SS), positive affects (PANAS-PA), perceived stress (PSS), perceived attentional capacity (AFI), rumination (Brooding) or sense of coherence (SOC) as an existential issue.

#### 7.1.2 Change in mental health outcomes during the intervention

Overall research aims were to investigate improvements in mental health outcome measures during the intervention. All of the mental health outcome measures except for the measures of existential issues improved significantly during the 12-week TH intervention. There was no

significant main effect of Year or Time x Year across the two samples for BDI, STAI-SS, PANAS-PA or PSS, which indicates that the findings concerning the mental health outcomes were replicated from Study 1 to Study 2.

The fact that there was a larger decline in BDI in Study 1 than in Study 2 might be due to several reasons. First, mean BDI values were lower at baseline in Study 2 than Study 1, implying that there was less potential for decline in Study 2. A second reason might be that the participants in Study 2 were more chronically depressed, as they were partly recruited from the Norwegian Labour and Welfare Administration (NAV) rather than referring themselves to an advertisement. A third reason might be the fact that weather conditions during the intervention were worse for Study 2 than for Study 1. This could mean, for example, that worse growth conditions in 2009 (Lippestad 2010) meant that there was less to be fascinated about in the intervention period. However, the significant changes in BDI in a positive direction in both studies suggest that the participants benefitted from the intervention.

It is interesting, however, that despite the fact that the average AFI scores at baseline were higher in Study 1 than in Study 2 the increase in AFI scores after 12 weeks intervention were exactly the same in both studies (Table 2). The replication of the findings in AFI across the two samples gives some indication that a TH intervention has the potential to improve perceived attentional capacity in clinical depression.

The fact that Brooding scores changed significantly gives an indication that the intervention to some degree offered disengagement from rumination. That Brooding continued to decrease during the whole intervention suggest that a prolonged intervention period with further exposure to positive distractions might reduce rumination even more.

The research further aimed to investigate when the most significant changes took place. BDI changed most during the first 4 weeks in both studies, while AFI changed most during the first four weeks in Study 1 and the first 8 weeks in Study 2. The latter might also be due to lower mean values on baseline BDI scores or poorer weather conditions.

Another aim of this research was to identify changes in existential issues due to a TH intervention. There were no significant changes in the existential outcomes measuring life regard (LRI-R) and sense of coherence (SOC) during the intervention. However, despite the non-significant changes in existential issues, the significant correlation between change in BDI and change in Sense of Coherence (SOC) in Study 2 gives some indication that those participants who changed most in BDI also showed some improvement on existential issues.

### 7.1.3 Levels of being away, fascination and group cohesiveness

The active components of a TH intervention that were addressed in this TH intervention study were the restorative qualities being away (BA) and fascination (FA) as well as group cohesiveness (TFI-CS) as the psychosocial or group component.

The high and stable levels of BA and FA both in Study 1 and Study 2 (Table 2) with the significant change in restorative qualities from baseline to the 4 week measurement point (T3) in Study 2, suggested that the participants perceived the environment and activities at the farm as having restorative qualities in lines with attention restoration theory (ART) (Kaplan & Kaplan 1989; Kaplan & Kaplan 1990), and to a much higher degree than activities at home.

Likewise the reported levels of group cohesiveness (TFI-CS) were rather high, and the levels did not differ between the two studies (Table 2). These rather high levels of TFI-CS suggested that the participants felt a sense of belonging, acceptance, trust and group cooperation while they were in the intervention (Strauss *et al.* 2008).

### 7.1.4 Active components in the intervention – evidence of mediation and moderation

This research aimed at investigating components in the TH intervention that could contribute to improvement in mental health.

For being away (BA) as a hypothesized active component, the non-significant correlations in Study 1 did not give any support to assume that being away (BA) had a strong influence on change in BDI or on change in perceived attentional functioning (AFI). However, in more directly investigating BA as a possible mediator in the intervention, the significant findings that are in line with mediation of change in both BDI and AFI in Study 2 indicate that BA may have acted as an active component in the TH intervention.

Looking at fascination (FA) as a possible active component, the significant correlation between FA and decline in BDI in Study 1, and the evidence of significant mediation by FA of change in both BDI and AFI in Study 2 support the idea that FA was an active component in the TH intervention.

The findings of BA and FA as possible active mediators or components in the TH intervention speak to the utility of attention restoration theory (ART) (Kaplan & Kaplan 1989; Kaplan 1995). That theory addresses a general problem of resource depletion, and the present research has articulated a novel application of that theory to a pressing mental health problem. The present findings affirm the value of this novel application. The findings also respond to the request by Hartig *et al.* (1999) for investigation of the active components in gardening

interventions, and to Ebmeier's (2006) request for investigation of new strategies for depression.

It was further hypothesized in this research that the social aspect of the therapeutic horticulture intervention would be a beneficial component in the intervention. The rather high and stable levels of group cohesiveness (TFI-CS) underline that the participants felt comfortable in the groups and that the groups developed benign group processes. The slight increase in TFI-CS during the intervention indicated that the groups became more important for the participants as time went by. Because the studies lacked a very early measure on group cohesiveness (for example after one week), it was not possible to investigate if group cohesiveness was a mediator in the intervention, as such an analysis requires a pre-intervention or baseline measure. The uniformly positive correlations between level of group cohesiveness (TFI-CS) and change in BDI, STAI-SS, PANAS-PA and SPSS, however, give some support for the idea that the social part of the therapeutic horticulture intervention was important, even though the correlations were not significant and at most moderate in size. The reported qualitative data support such an interpretation. The findings concerning the importance of the social part of TH are in line with other literature and research in the area (Perrins-Margalis 2000; Richards & Kafami 1999; Sempik *et al.* 2003; Stepney & Davis 2004).

In sum, the evidence from the two studies offers some support for the idea that the measured changes in the diverse mental health outcomes are due to active components in the intervention such as a change in environment (being away), positive distractions (fascination) and a social reinforcing and valuable group membership.

#### 7.1.5 Persistence of change after the intervention

The research also aimed to assess to which degree the changes in outcome measures persisted at 3-month follow-up. Except for BDI, all of the outcome measures tended to move in the direction of baseline at 3-month follow-up. The still significant persistence of the decline in BDI from baseline at 3-month follow-up in both studies might be due to having participated in the intervention, but other reasons cannot be excluded, such as the mere passage of time, improvement in psychotherapy and medication, change in working situation or sick leave status, or other improvements in private life. On the other hand, the fact that the participants experienced a relapse in mental health as reflected in the other measures when the intervention was taken away suggests that the intervention was influential.

### 7.1.6 Exploration of data on the therapeutic horticulture experience

The research also aimed to investigate how the participants experienced the intervention in terms of the social dimension and existential issues. The participants responded that they regarded the social dimension in therapeutic horticulture as important. This was supported by the qualitative data reported on the significance of group membership. Likewise, they regarded both the existential and aesthetic issues as important. The fact that the qualitative data here are inconsistent with the findings on the self-reported existential outcome measures is interesting. Moreover the qualitative data are in line with findings from other qualitative studies in which existential and spiritual issues are reported as essential in gardening activities (Clark *et al.* 1998; Heliker *et al.* 2000; Trombly 1995; Unruh 2000; Unruh 2004). The qualitative data from this research on existential issues further give some indication that it is following the growth process from seeds to plants that is experienced as meaningful and important in the TH intervention. From this follows that activities can be experienced meaningful however without significant changes on existential outcome measures.

### *7.2 Main results in relation to relevant research*

Depression severity, anxiety, stress and rumination declined during the intervention, while positive affect and perceived attentional capacity increased (Table 2). These findings are in line with evidence that indicate that a TH intervention might alleviate anxiety and depressive symptoms in a heterogeneous mental health population (Stepney & Davis 2004) and a chronic schizophrenia population (Son *et al.* 2004). Reduced anxiety is also reported from a young healthy population (Lee *et al.* 2004); however, in a population of incarcerated offenders with substance abuse, there were no improvements in anxiety and depression. The findings further fit with the findings reported by Kohlleppel *et al.* (2002) that a walk in a botanic garden may reduce depression symptoms and alleviate stress. The findings also fit well with studies on depression and pleasant activities (Lewinsohn & Graf 1973; Zeiss *et al.* 1979) and a meta-analysis related to behavioural activation treatments of depression (Cuijpers *et al.* 2007).

Most of the participants (72 % in Study 1 and 50 % in Study 2) experienced a decline in BDI score greater than 6 points, which is clinically significant according to Bright and colleagues (1999). These findings correspond with Dalgard's (2004) findings from a psycho-educational intervention in clinical depression. He found that a majority of the intervention group participants responded to a psycho-educational group program designed to promote positive thinking, pleasant activities, social skills and social support with a decline in BDI

score greater than 6 points. Dalgard's sample from a Norwegian metropolitan population is comparable with the samples in the present research. However, the participants in Dalgard's study who also received psychotherapy as well as the psycho-educational intervention did not respond to the latter. This was not the case in the present studies; almost all of the participants were receiving psychotherapy, yet a large percentage of them at the same time showed a clinically significant decline in BDI score during the intervention. Although the present research and Dalgard's study have some cognitive theoretical underpinnings in common, the difference in change suggests that the two interventions have different active cognitive components for change. In the present TH studies, it was assumed that being away and fascination would involve attentional switching from cognitively demanding and attentionally fatiguing negative thought patterns to attentionally effortless engagement in restorative activities. The difference in results suggests that, at least initially, there is a potential for a greater improvement from therapeutic horticulture as a supplement to treatment as usual than from a psycho-educational program. It is reasonable to assume that a psycho-educational intervention might impose more attentional demands on clinically depressed patients receiving psychotherapy than a TH intervention.

We assumed in this research that fascination with the TH activities and environment as an active component in the intervention would promote attentional restoration (Kaplan 1995). The mean AFI scores at baseline in Study 1 and Study 2 were less than half of the maximum possible score (Table 2), indicating that the participants perceived their attentional capacity to be rather low. This is in line with the literature describing problems with attentional capacity during depression (Porter *et al.* 2003; Zimmermann & Leclercq 2002). The fairly quick increase in AFI scores during the intervention, suggest that the perceived capacity to direct attention did improve during the intervention. These findings correspond in some respects with findings reported by Cimprich (1993). From a nature intervention study in a breast cancer sample, Cimprich reported that AFI scores rose earlier, and increased more, in the intervention group than the control group. Even if reduced capacity to direct attention may have different causes in depression and cancer, it is tempting to associate the two studies, as clinical depression occurs in 20 – 25 % of the breast cancer cases (Fann *et al.* 2008).

Brooding scores declined significantly during the period of the intervention. This corresponds with findings from earlier research from distractive interventions aiming to reduce rumination (Craft 2005; Watkins *et al.* 2000), and it is in line with theories which propose that distracting activities are beneficial in depression (Nolen-Hoeksema *et al.* 2008).

The main findings suggest that a group-based TH intervention has a potential to alleviate depression. All ten groups in this research developed high levels of group cohesiveness (Table 2). The high levels of group cohesiveness suggest that the participants were committed to the group task (Mullen & Copper 1994). The strongest correlations between group cohesiveness were for change in anxiety during the intervention. Given the associations between depression and social skill difficulties (Huprich *et al.* 2004; Joiner & Timmons 2009), participation in the TH group activities might have led to decreased social anxiety and increased social skill. This might explain why the participants evaluated the social aspect of the TH intervention so positively. It might also explain why social activity had increased for more than a third of the participants by the end of the intervention and at the 3-month follow-up.

The declines in BDI in both studies were not accompanied by significant changes in LRI-R and SOC as existential outcome measures. A plausible explanation could be that these measures cover more trait-like personal dimensions and so were not sensitive to declines in BDI. SOC is reported to be a more trait-like measure in depressed rheumatologic patients (Schnyder *et al.* 2000); however, Debats (1998) has considered the LRI-R to have both trait and state dimensions. Moreover, it is also plausible that a TH intervention do not influence on existential outcome measures, at least over a relatively brief period as in the present studies. This said, in their evaluations of the intervention the participants generally agreed that the TH experience was meaningful to them and that it had influenced their view of life. They also evaluated highly the aesthetic experience and the experience of taking care of nature. These experiences fit with the existential perspectives on TH presented in this thesis and are in lines with earlier research (Heliker *et al.* 2000; Irvine & Warber 2002; Kidd & Brascamp 2004; Trombly 1995; Unruh 2000; Unruh 2004; Waliczek *et al.* 2005).

### *7.3 Methodological issues*

The discussion by Shadish, Cook and Campbell (2002) is used as a frame of reference for the discussion here of the major methodological issues in this research. Among other quasi-experimental designs, those authors deal with methodological and validity issues in intervention studies using single-group designs, as in the present research. It should be noted that according to Shadish, Cook and Campbell (Shadish *et al.* 2002) reliability is considered being a part of construct validity issues, and reliability will be treated as such in the following discussion.

### 7.3.1 Statistical conclusion validity

Statistical conclusion validity refers to the appropriate use of statistics in order to identify the validity of inferences about the relation between an intervention and scores on outcome measures (Shadish *et al.* 2002). Relevant threats to statistical validity are related to low statistical power, clustering, and violation of statistical assumptions (Shadish *et al.* 2002).

With regard to statistical power, some of the effect sizes (partial eta squared values) were not negligible, and yet not statistically significant. On some of the outcome measures studied, it is important to bear in mind that it might be unreasonable to expect large changes. In particular, the existential outcome measures (LRI-R and SOC) capture issues that may be resistant to change by a short TH intervention that does not change the participants' overall life circumstances. The small samples provided too little power to confirm that the changes in these outcome measures between T2 and T5 were greater than zero (see Table 2) even though the use of RM-ANOVA increased statistical power by increasing the degrees of freedom. Low power due to the small sample sizes implies a need for caution in the conclusions that these outcomes did not change.

The intervention was designed and implemented as a group intervention. Group nesting implies that the scores from the individuals in a given group might be correlated with each other with an attendant increase in risk for Type I errors (Baldwin *et al.* 2005). For this reason, the individual scores were aggregated and the groups were treated as cases in follow-up analyses (Paper I, II and III). With the groups as cases, the main conclusions were checked. The fact that with few exceptions the conclusions with groups as cases confirmed the results with the individuals as cases increases confidence in the conclusions, thereby contributing to statistical validity.

Finally, with regard to meeting statistical assumptions, the standard checks and corrections were performed following guidelines available in Tabachnick and Fidell (2007). These included, for example, examination of the Mauchly test of sphericity in the RM-ANOVA, and, when it was significant ( $p \leq 0.05$ ), reporting of the Greenhouse-Geisser corrected degrees of freedom. Standard procedures were similarly used to check whether statistical assumptions for the regression analyses were met and to identify eventual problems with collinearity and outliers (Tabachnick & Fidell 2007).

### 7.3.2 Internal validity

Internal validity refer to whether the observed covariation between the independent variable (intervention) and the dependant variables (outcome measures) is causal (Shadish *et al.* 2002). In this empirical work both studies used repeated-measures, single-group design with multiple pre-intervention scores. The single-group design in the two studies hinders causal conclusions. It may however be of interest to discuss to which degree the covariations in a study using single-group design reflects causal relationships (Shadish *et al.* 2002). This will be done in the following.

Both studies were originally approved by the Regional Committees for Medical and Health Research Ethics (REK) as randomized controlled trials (RCTs). An RCT typically has strong internal validity; the design allows researchers to rule out many alternative explanations for findings of change in measured outcomes, so it allows for substantial confidence in conclusions that an intervention has caused the measured changes. Great problems were however experienced in recruiting sufficient participants for four different research settings in different geographical areas for an intervention scheduled to coincide with the short Norwegian growing season. Due to the challenges and realities in recruiting participants to the studies, and the restrictions related to a season-dependent intervention, including the inability to extend the recruitment period, both studies had to be run with the single-group design.

According to Shadish, Cook and Campbell (2002), however, the internal validity in a single-group design can be improved by multiple pre-test scores and by a design that obtains measures after the removal of the treatment. In this research there were double baseline scores on BDI prior to the intervention in Study 1 (baseline), and double baseline scores on all outcome measures in Study 2. The non-significant changes in the baseline scores gave an indication that mental health remained relatively impaired while receiving treatment as usual. Likewise the relapse in scores after the intervention in the outcome measures gave an indication that when the intervention was removed, the scores changed towards baseline scores. The contrast between stability before the intervention, change during the intervention and relapse after the intervention is one reason why the change might be attributed to the intervention and played some causal role, and so contributes to internal validity (Shadish *et al.* 2002).

The research was run over two seasons (Study 1 in 2008 and Study 2 in 2009). The fact that the key findings from Study 1 were more or less replicated in Study 2 and that there

were no significant differences in the patterns of change in outcomes across samples and years, lends further confidence in the attribution of cause to the intervention, and so further contribute to internal validity.

However, there were several threats or other factors that also could interfere and threaten internal validity, such as important life events during the period of the intervention, benefits from the participants' ordinary treatment (*history*) or just *maturation* as a naturally occurring change related to the passing of time (Shadish *et al.* 2002). The use of multiple measurement points in this research is also a threat to internal validity as the *testing* itself might have biased scores on the outcome measures upward or downward. The participants might have learned something from the testing itself or they might have been bored or bothered by the testing (Shadish *et al.* 2002). The participants were further included in the studies on the basis of a BDI score  $\geq 15$ , implying that *regression* also could be considered a threat to internal validity (Shadish *et al.* 2002). It should be noted that scores on the other outcome measures all spoke of psychological distress, cognitive impairment or low scores on existential issues. However, these scores on BDI were elevated for an extended period – stable at a high level.

Despite the limitations of the single-group design, the two studies had some strengths that contributed to internal validity. However, given the threats to internal validity in the research, it is not possible to draw causal conclusions with confidence. In this thesis, as in the articles, the results have therefore been described as changes that occurred in connection with the intervention, and not as effects of the intervention to avoid use of causal language.

### 7.3.3 Construct validity

Construct validity refers to the validity of inferences about the higher order constructs and the theorized psychological constructs that represent sampling particulars (Shadish *et al.* 2002). In this empirical work all the outcome measures used were found to be suitable for the research purposes. Except for the Attention Function Index (AFI), which has been relatively little used, well-established and well-validated self-report outcome measures were used. The authors of the outcome measures also report acceptable construct validity, and the reported internal consistency (Cronbach's  $\alpha$ ) from this research with the exception of the Perceived Stress Scale was acceptable.

The construct validity in this research is regarded to be strengthened by the theoretical consistency between theoretical perspectives on depression, the choice of outcome measures,

and the investigation of active components that are relevant to theoretical perspectives related both to depression and the intervention.

The research targeted clinically depressed individuals. The diagnostic procedure used was the Mini International Neuropsychiatric Interview (M.I.N.I). Sheehan *et al.* (1998) report that the reliability and validity of the M.I.N.I. in relation to the Composite International Diagnostic Interview (CIDI), a more comprehensive diagnostic procedure, are supported. In the present research the M.I.N.I. was used in a telephone interview with the potential participants in the inclusion process. The reliability of such a telephone interview has been demonstrated in different studies (Cacciola *et al.* 1999; Crippa *et al.* 2008; Rohde *et al.* 1997). It is considered that the diagnostic reliability in the research is acceptable, and that the research sample actually targeted individuals fulfilling the criteria for DSM IV major depressive disorder. This contributes to the general construct validity in the research as reliability according to Shadish, Cook and Campbell (2002) is treated as a construct validity issue.

The intervention went over twelve weeks, twice a week in 3-hour sessions. The intervention was outlined as a group intervention. A tentative TH program on suggested activities and a list of recommended seeds and plants was provided. As the TH program was tentative, it was however taken through somewhat different on the four farms, implying that it was not a standardised procedure. This is considered a threat to construct validity (Shadish *et al.* 2002). However, the variations across the four farms in the implementation of the intervention were in a narrow range of activities; the clear emphasis was consistently on therapeutic activities, and the greatest portion of the participants' time was spent in TH activities. It is further considered to strengthen construct validity that the participants mean attendance in the intervention was 18.4 of 24 possible sessions (76.7 %).

Several threats to construct validity are relevant in this research despite its use of standardised outcome measures and the careful diagnostic and inclusion process. For one, the participants might have 'guessed' the hypothesis and acted to confirm or disapprove the hypothesis. Likewise they might have responded positively on the outcome measures in order to confirm the researchers' expectations (Shadish *et al.* 2002). There are also reasons to believe that the observed changes in the outcome measures could have been caused by factors other than the intervention (Shadish *et al.* 2002). Change might have been influenced primarily by the general attention that was given to the participants both by the farmers and

the researcher, regardless of whether the intervention involved horticultural activities or learning how to paint or any number of other activities.

It is not possible to say to what degree these threats could have biased scores upward or downward, but they should be evaluated in light of the overall pattern of change looking across the measured outcomes.

#### 7.3.4 External validity

External validity concerns the extent to which the findings can be generalised above individuals, situations or time related to the present research (Shadish *et al.* 2002).

This research targeted adults with clinical depression recruited mainly through advertisements and in Study 2 also from the Norwegian Labour and Welfare Organisation (NAV). The inclusion criteria and diagnostic procedure were similar across the samples. Although several participants suffered from severe depression ( $BDI \geq 30$ ), the levels of BDI both in Study 1 and Study 2 indicated that the participants on average were moderately depressed ( $20 \leq BDI \leq 30$ ) (see Table 2). No participant had an initial BDI score less than 15.

There are several reasons to question the representativeness of the participants in the research for the population of clinically depressed people in general. First, the recruiting procedures imply that the participants were obviously motivated in that they addressed themselves to the researcher in order to do something they thought they would like. The TH intervention program might have been experienced as too demanding for seriously depressed participants, who thus did not address themselves to the researcher. It is however difficult to imagine that this intervention could be carried through with a group of unmotivated depressed individuals.

Second, there was an overrepresentation of women in the studies (Study 1: 83%; Study 2: 75%). It is suggested in epidemiological studies that, on average, there is a two-fold greater prevalence of unipolar depression among women than in men (Nolen-Hoeksema 1987). Despite the fact that the prevalence of depression is higher for women than men worldwide (Fletcher *et al.* 2007) and in Oslo (Kringlen *et al.* 2001), the studies had an overrepresentation of women.

Third, the research did not include foreign speaking participants despite the fact that the intervention as such could have been implemented across cultural borders and nationalities. However, the recruiting procedure, the extensive written information and the self-report measures all were in Norwegian, and the sample accordingly consisted of

participants who were fluent in Norwegian. It is to be concluded that the separate samples of the two studies and the pooled sample cannot be regarded as representative for a clinically depressed population in the multicultural counties of Oslo and Akershus.

Taken together, there are several reasons to question the representativeness of the sample as a basis for generalisation to clinical depression in general.

Another external validity issue is to which degree it is possible to generalise above situation. This research was part of a larger 'Green Care' project concerned with the viability of therapeutic activities in farm settings for people with mental health problems. Ten farms in the counties of Oslo and Akershus in Norway were evaluated for their appropriateness for the present therapeutic horticulture intervention. The four farms chosen were used in both studies. Despite their similarities, the farms also differed from each other in terms of size, green house facilities, indoor facilities, the farmers' personalities and the farmers gardening competence. All this might have had an influence on the participants' experience of the intervention and ultimately influenced their scores on the outcome measures. Outcomes might thus differ if the intervention is run on other farms.

Finally it is also an external validity issues to which degree it is possible to generalise above time. The TH interventions were run during Spring and Summer 2008 and 2009. It is assumed that the weather did have an influence on the intervention, and it was an unpredictable factor in the two studies, although its effect would have been similar at all four farms in the given year. The research settings were the same across the two seasons, but the two seasons had some differences in weather conditions. There was higher precipitations and more rainy days in May and partly also in July in 2009 than in 2008 (Lippestad 2010). The differences in weather and temperatures may have influenced the germination and production processes between the two seasons, and might have had impacts on the participants' experience of fascination, the possibilities for some activities, and the general well-being on the farm. As there were no significant effects of year on the overall levels of outcomes, no significant differences in the pattern of change in outcomes across the years, and replication of findings from Study 1 to Study 2, it is however tempting to assume that the findings can be extended beyond season and weather conditions.

The differences in the research settings, the interventions and the groups imply that this TH intervention was not standardised. However, these differences are fairly similar to those seen in other research settings with complex interventions related to psychotherapy, psychotherapy groups, milieu therapy or different cultures within the psychiatric field

(Tansella *et al.* 2006). The fact that the TH intervention was run on real farms, with the application of a TH program that is easy to facilitate and perform, contributes to ecological validity (Bronfenbrenner 1977) in the research. This supports generalisation beyond the present four research settings.

Summing up, it is not possible to assume from this research that a TH intervention or TH program will be beneficial for all depressed individuals. However, given moderate depression and motivation for participation, the findings should generalise beyond the specific individuals, years, and situations (farm or other context) covered in this research. As always, just how far the findings can be generalised is an empirical question.

#### 7.3.5 Validity issues in the further exploration of the therapeutic horticulture experience

When exploring and analyzing qualitative data, there is always a possibility that the interpretations made might be coloured by the researcher's own assumptions. The qualitative data that were used in this research were the participants' own written formulations, implying that the manifest content was relatively 'straight forward'. This means that the manifest content was quite specific, and an in-depth analysis of latent meaning of data was not necessary. This implied that the data were not reformulated from the participant's own written data, and the data were not interpreted before they were clustered.

The further exploration of the qualitative data did not follow any stringent procedure for analysis of the qualitative data. The process of grouping and clustering of the phrases was done by the researcher only. This implies that the process of grouping and clustering of the data was not validated by the participants themselves or by other researchers, something that would have improved the credibility of the data (Erlandson 1993) and contributed to optimal validity and reliability. However, the fact that the content was fairly manifest and specific and that the text data did not undergo any interpretation contribute to trustworthiness in the data, despite the fact that the process was performed of only one researcher (Graneheim & Lundman 2004).

The purpose of the further exploration of the text data in this research was to shed light on the quantitative data, and despite some limitations in the validation aspect in analyzing the data, the qualitative data did give some additional information on how the participants experienced the TH intervention. The contrast between the quantitative data and the qualitative data on the existential issues also gave some indication to assume that TH might be considered a spiritual leisure activity. The qualitative data also corresponded with other

qualitative findings in the field (Fredrickson & Anderson 1999; Kidd & Brascamp 2004; Unruh 2000; Unruh 2004).

#### *7.4 Ethical issues*

All participants in the research provided written informed consent and the research was approved by the Regional Committees for Medical and Health Research Ethics (REK). Despite this, several ethical issues were faced in the research.

In addressing the autonomy principle (Beauchamp & Childress 2001), it can be questioned whether advertising in newspapers is an ethical approach to recruiting participants for health research, as it is difficult to judge on telephone the participants consent competence. However, the fact that the participants themselves chose to address the researcher without the influence of health professionals is in line with the autonomy principle. It cannot however be excluded that the participants were influenced by their family members.

In the inclusion process, the participants were assessed for a DSM IV diagnosis by telephone. This can be ethically questioned, as the standardised items in the M.I.N.I. interview are very personal, and the interviewer at this stage was a completely unknown person for the participants. To honour the autonomy principle, prior to the interview the participants were asked if they were comfortable with a diagnostic interview on telephone. With two exceptions, the participants answered positively to this telephone assessment. In the two mentioned exceptions the participants came to the researcher's office for a diagnostic interview.

As the researcher in this research performed the whole recruiting and inclusion procedure herself, and met the participants at several occasions on the farm, the researcher was not blinded in the research. The lack of blinding, and the relationship between the researcher and the participants, might have influenced the participants' answers, though difficult to say in which direction. However, it should be added that the participants filled out the questionnaires at home, implying that the researcher did not directly influence them in that situation.

Another ethical issue involves the principle of non-maleficence; that is, do no harm, or avoid and reduce risk (Beauchamp & Childress 2001). The number of outcome measures and so the number of items to be filled out across the measurement points might have burdened the participants. Comments on this issue were also made from the participants on some occasions when the researcher was out visiting the farms. The participants might have

experienced a conflict between a wish to stay in the project and the burden it was to fill out the questionnaires. It was also considered that the termination of the project after 12 weeks was experienced as harmful by several of the participants. Most of the participants experienced some sadness that the TH program came to an end, which meant to terminate the contact with the farm and with the group. This was expressed to the farmers, and it was reported in the written notes on the open question. The project obviously filled a gap in their lives, and the removal of this boon can be regarded as harmful, especially for those participants for whom the TH intervention on the farm was the only activity they had, and the only place to go.

The ethical principle of justice (Beauchamp & Childress 2001) is often at stake in a randomised controlled trial, as half of the participants end up in the control group and do not get the same benefits as those in the intervention group. In the single-group designs in this research, all of the participants who fulfilled the inclusion criteria were included. The participants could also to a large extent choose what farm they wanted to stay on. Those participants who did not fulfil the requirements, and because of this were not included in the research, might however have felt some injustice in that they experienced themselves as depressed and in need of help.

The main hypothesis in this research was that a therapeutic horticulture program would be beneficial to participants with clinical depression. The findings and the participants own evaluations gave some support to the hypothesis, with the caveat given earlier regarding the inability to draw causal inferences. Given this, it is likely to judge that the ethical principal of beneficence (Beauchamp & Childress 2001) was taken care of in the research.

To sum up, several ethical principles were challenged in the research. However, as an overall judgement, the principle of respect for autonomy, the principle of non-maleficence, the principle of beneficence and the principle of justice were taken care of sufficiently well in the research.

## **8 Conclusion**

### *8.1 Main findings*

The findings from this research offer some support to claim that therapeutic horticulture can be a beneficial supplementary intervention or program in clinical depression. Significant beneficial changes are reported for depression severity (BDI), anxiety (STAI-SS), positive

affects (PANAS-PA), perceived stress (PSS), perceived attentional functioning (AFI) and rumination (Brooding). The most significant change took place in BDI after the first four weeks, whereas in AFI after the first eight weeks. Brooding continued to change over the entire period of the intervention. There were no significant changes in the existential issues measured with Life regard Index – Revised (LRI-R) and Sense of Coherence Scale 13 (SOC) during and after the intervention. However, further exploration of the therapeutic horticulture experience gave some indication that the existential dimension was important. BDI remained significantly lower than baseline at 3-month follow-up.

In order to understand why TH might be beneficial in clinical depression, the research aimed to investigate some of the plausible active components in the intervention. Being away (BA) and fascination (FA) were two hypothesized active components in the present research, and it was found that they mediated decline in both BDI and AFI. These findings speak to the utility of attention restoration theory for understanding the benefits of nature-based interventions in clinical depression. It was also hypothesized that the social dimension or group dimension was an active component in the group-based TH intervention. It was found that the average levels of group cohesiveness (TFI-CS) correlated uniformly positively, but not significantly with change in BDI, STAI-SS, PANAS-PA and PSS. The positive correlations were supported by the data from the further exploration of the social dimension. With regard to the active components, the research offers evidence that BA, FA and group cohesiveness all worked as active components in the intervention.

### *8.2 Theoretical implications*

As TH is a complex intervention and clinical depression a multidimensional disorder, several theoretical perspectives on depression were taken into consideration in this research. Likewise several theories were elaborated in order to explain why TH might be beneficial in clinical depression. The definitions of therapeutic horticulture (TH) and horticultural therapy (HT) both ask for theoretical explanations for why and how TH or HT works and for whom.

This research offers some evidence that TH and HT have active components related to the cognitive and psychosocial dimensions of clinical depression. The significant findings on increase in positive affects, and decrease in perceived stress also give some support to theoretical perspectives on the affective and stress dimensions. According to the further exploration related to the existential dimension, it is attempting to assume that TH or HT has an existential dimension.

However, TH and HT need to be more fully theoretically elaborated both as a clinical intervention in rehabilitation and as a health promoting leisure activity within mental health care both for clinical depression and for mental health more generally.

### *8.3 Implications for further research*

The promising findings should encourage further research on the effects of therapeutic horticulture in clinical depression. Further research could seek to implement an experimental design that would better support causal conclusions. The most desirable design in this regard could be an RCT design, and this might be possible given that recruiting sufficient participants was made possible. A single-group design could also be improved by investigating baseline stability with a longer standardized period from recruiting to intervention start. It is also possible to have a waiting list control group on hold for four weeks, during which change can be assessed in an intervention group that started without delay. It is further suggested to include an outcome measure on motivation, and to investigate motivation both as a possible mediator or moderator in these intervention studies.

In order to more fully investigate if group cohesiveness operates as a mediator or moderator in a TH or HT program it is necessary to add an early measure for this variable. In the present research we had our first measurement point after four weeks of intervention, which actually did not allow for a real change score ( $\Delta$ ) from intervention start. It is recommended to have a measure after the first or second group session on group cohesiveness in order to have a relevant change value ( $\Delta$ ) for use in the statistical mediation analyses (see Judd *et al.*, 2001).

As existential issues tend to be vital issues in qualitative research, it is recommended to further investigate the outcome of a TH intervention on existential issues by developing a suitable outcome measure that captures existential issues within a nature-based intervention. Results obtained with such a measure could be joined with findings from qualitative research and theoretical texts.

Taking into consideration the promising findings in clinical depression, it would be interesting to investigate if a TH program also was beneficial to other homogenous (diagnosed) mental health populations. Yet another interesting topic for further research within the field of environmental psychology would be to investigate what kinds of environments people suffering from clinical depression would prefer (preference study) when they are in need of restoration.

Ultimately, as there is a need for theoretical development in the field, theoretical hypotheses should be tested in order to offer an evidence-based TH or HT program to different user groups.

#### *8.4 Clinical implications*

The experiences and findings from this research give some indications on how to initiate and perform a TH program in clinical practice. It was experienced that good gardening competence was of vital importance to succeed with such a program. It was further found that the intervention could be well facilitated by people without formal health education, given support from someone with clinical and therapeutic competence. The Green Care farms seemed to be suitable contexts for the therapeutic horticulture intervention. This implies that the intervention could be run both as a program in primary care as well as in specialist care for clinical depression, again, given supervision and support from a clinically competent person.

The findings suggest that 4-8 weeks is a sufficient time for a TH program to be beneficial; however, to prevent relapse in the mental health outcomes apart from BDI, the findings suggest that it might be beneficial for a depressed person to remain in a program like therapeutic horticulture to maintain the improvements. As changes in BDI and AFI occurred after 4-8 weeks, it is tempting to assume that this is sufficient time to stay in the program. However, it is more likely to assume that it was important for the participants to know that they could stay in the program for twelve weeks. This implies that as an out-patient clinical practice, TH program or TH activities should be offered on a long-term basis in order to keep the depressed users activated with pleasant activities that are beneficial both for their distress and their attentional problems.

The findings support the idea that organising a TH program or TH activities for implementation with groups is to be recommended. However, care should be taken in order to avoid groups with a single man or a single woman or perhaps with single individuals distinguishable by some characteristic other than gender, such as ethnicity or social competence. In order to compose well functioning groups, care should be taken in composition of the groups especially in order to avoid isolation of individuals (Yalom 1995).

The experience was that the farms had basic facilities for running a TH intervention program, and that a TH program was fairly easy to facilitate and to implement. This should encourage clinicians and their leaders to use their institutional outdoor facilities for

therapeutic reasons, and to consider offering gardening activities as part of their therapeutic program both for in-patient and out-patient organisations.

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# PAPER I



# Therapeutic Horticulture in Clinical Depression: A Prospective Study

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Clinically depressed persons suffer from impaired mood and distortion of cognition. This study assessed changes in depression severity and perceived attentional capacity of clinically depressed adults ( $N = 18$ ) during a 12-week therapeutic horticulture program. The Beck Depression Inventory (BDI) and Attentional Function Index (AFI) were administered at baseline, twice during (4 and 8 weeks), and immediately after the intervention (12 weeks), and at a 3-month follow-up. Experiences of being away and fascination related to the intervention were measured at 4, 8, and 12 weeks. The mean BDI score declined 9.7 points from pretest (27.3) to posttest ( $p < .001$ ) and were clinically relevant ( $\Delta BDI \geq 6$ ) for 72% of the cases. The mean AFI score increased 10.2 points from pretest (68.8) to posttest ( $p = .06$ ). The greatest change in BDI and AFI scores occurred in the initial weeks of the intervention. The reduction in BDI scores remained significant and clinically relevant at the 3-month follow-up ( $N = 16$ ). The decline in depression severity during the intervention correlated strongly with the degree to which the participants found that it captured their attention. Therapeutic horticulture may decrease depression severity and improve perceived attentional capacity by engaging effortless attention and interrupting rumination.

**Keywords:** major depression; attention; supplementary intervention; nature intervention; horticultural therapy

**W**orldwide, depression affects 5.8% of all men and 9.5% of all women in any given year (Fletcher et al., 2007). Clinically depressed persons suffer from impaired mood and distortion of cognition (American Psychiatric

Association, 1994; Porter, Gallagher, Thompson, & Young, 2003), including attentional impairment (Delaloye et al., 2008; Gollan, Pane, McCloskey, & Coccaro, 2008; Keilp, Gorlyn, Oquendo, Burke, & Mann, 2008; Porter et al., 2003; Wells & Matthews, 1994). Depression tends to recur and become chronic (Evans & Charney, 2003; World Health Organization, 2001), followed by increased risk for work disability (Lopez & Murray, 1998; Ustun, 1999). Recurrent episodes are characterized by increases in severity, duration, and frequency (Thase, 1992). The majority of depressed clients are treated in primary care only (Fletcher et al., 2007), and management of depressive disorders tends to be suboptimal (Gilbody, Whitty, Grimshaw, & Thomas, 2003).

Cognitive-behavioral or interpersonal psychotherapies and antidepressant medications are beneficial as separate treatments (Butler, Hatcher, Price, & von Korff, 2007). However, a substantial number of patients do not respond to conventional treatments. Given the individual and societal consequences of clinical depression, it is important to open for a wide range of treatment and care strategies (Ebmeier, Donaghey, & Steele, 2006) and to investigate the active components in those strategies (Fletcher et al., 2007).

A comparatively small amount of research has been done on complementary or supplementary interventions in depression (Ernst, Rand, & Stevinson, 1998; Jorm, Christensen, Griffiths, & Rodgers, 2002). Several studies report positive effects due to an increase in pleasant activities (Cuijpers, van Straten, & Warmerdam, 2007; Hammen & Glass, 1975; Jorm et al., 2002; Lewinsohn & Graf, 1973; Zeiss, Lewinsohn, & Munoz, 1979). Music therapy is associated with improvements in mood (Ernst et al., 1998; Maratos, Gold, Wang, & Crawford, 2008), and different relaxation therapies like yoga, meditation, and progressive relaxation appear promising (Jorm, Morgan, & Hetrick, 2008). Other evidence suggests that physical exercise alleviates depression (Babyak et al., 2000; Martinsen & Stephens, 1994).

Less effort has been invested in examining the degree to which exposure to natural environments or activities performed in natural environments might alleviate depression. In light of the link between attentional impairment and depression, it is of interest that attentionally restorative effects of nature-based interventions are reported in nursing research for patients recovering from cancer (Cimprich, 1993; Cimprich & Ronis, 2003) and in research on healthy adults and students (e.g., Hartig, Evans, Jamner, Davis, & Garling, 2003). The present study investigates self-reported changes in the severity of depression and the perceived attentional capacity of clinically depressed adults over the course of a therapeutic horticulture intervention and at a 3-month follow-up.

## **THERAPEUTIC HORTICULTURE**

Historically, asylums were placed in rural districts and surrounded by gardens, parks, and open landscapes (Alexander & Selesnick, 1966; Baxter, 1994; Dunkel, 1983; Major, 1845). Similarly, gardening and horticulture activities were prescribed by asylum doctors for recovery and restorative reasons (Foucault, 1965; Relf & Lohr, 2003; Rush, 1812).

Horticultural therapy programs have been used in American psychiatric institutions since the early 1900s (Flagler & Poincelot, 1994; Kim, 2003). Gardening was described as vocational training and therapy in England in the early 1900s, in Germany from 1920, and in Sweden from 1940 (Söderback, Söderström, & Schäländer, 2004). Horticultural therapy was applied both as a treatment intervention and in rehabilitation of soldiers from World Wars I and II (Sullivan, 1979).

Horticultural therapy and therapeutic horticulture are often used interchangeably; however, some researchers and clinicians distinguish between them. Horticultural therapy (HT) is linked to explicit client goals and implemented by trained therapists, whereas therapeutic horticulture (TH) is a more open program defined as “a process that uses plant-related activities through which participants strive to improve their well-being through active or passive involvement” (Sempik, Aldrige, & Becker, 2003). Both TH and HT may be useful in a variety of clinical settings and for a broad range of clinical populations, and both may serve as a nursing intervention or strategy (Infantino, 2004; Page, 2008); however, TH can more easily be implemented and performed by a greater variety of health care providers. The present study focuses on TH.

Despite the long clinical tradition of TH, formal research on the psychological and social impacts of gardening activities did not appear until the 1970s (Relf & Lohr, 2003). Sempik et al. (2003) concluded in a descriptive review of research in the field that few accessible studies have explored the effect of TH on mental health issues. In heterogeneous mental health samples, however, beneficial effects have been reported for anxiety (Lee, Ro, & Lee, 2004; Stepney & Davis, 2004) and depressive symptoms (Stepney & Davis, 2004). Yet, to our knowledge, after having made an extensive search through the literature, no published empirical studies have investigated how clinically depressed clients respond to a TH or other nature-based intervention.

## COGNITIVE PERSPECTIVES ON DEPRESSION

Two cognitive perspectives on depression are relevant in this study. A more general cognitive perspective focuses on issues related to attention. Attention has an overall cognitive command function and is classified as a mental activity variable involved in general cognitive operations in normal conditions (Lezak, Howieson, & Loring, 2004). The capacity to focus or direct attention in situations demanding concentration, working memory, and goal-directed work is of importance in everyday life. Attentional capacity, however, is assumed to be limited, implying that only a certain amount of cognitive processing can take place at a given time (Lavie, 2001; Lavie, Hirst, de Fockert, & Viding, 2004). Despite its vital importance, directed attention can easily be distracted and disturbed by interference from external and internal stimuli (Carr, 2004). To sustain directed attention, a capacity to control or inhibit interference from distractions is needed (Joormann, Yoon, & Zetsche, 2007; Lavie, 2001; Lavie et al., 2004).

It is assumed that cognitive processing in depression is associated both with temporarily limited or reduced capacity to direct attention (Zimmermann & Leclercq, 2002) and with impairments of inhibitory mechanisms (Lemelin, Baruch, Vincent,

Everett, & Vincent, 1997), and depression is often characterized as a cognitive-deficit state (Mialet, Pope, & Yurgelun-Todd, 1996).

Another cognitive perspective relevant here is represented in particular by the work of Beck (e.g., 1976), which deals with thought patterns or rumination focused on loss and failure and negative views of oneself, the world, and the future. When filtering stimuli from the environment, clinically depressed patients tend to direct their attention toward information that is congruent with their already established negative memory representations (Joormann, 2009). Negative thought patterns and rumination are further associated with impairments of inhibitory mechanisms normally deployed to prevent irrelevant negative information entering from working memory (Joormann & Gotlib, 2008). Depressed people do not necessarily direct their attention to negative information more than nondepressed people, but when ruminating, they have more difficulties in disengaging from negative material (Joormann, 2009). Negative thoughts and rumination consume (Wells & Matthews, 1994) and occupy cognitive resources (Ellis & Ashbrook, 1988) and working memory (Joormann, 2009).

Given that depression is associated with diminished attentional capacity, negative rumination, and weakened cognitive inhibitory mechanisms, interventions that address these issues by enabling restoration of directed attention and disengagement from rumination should support the ordinary treatment of depression.

## ATTENTION RESTORATION THEORY

Under normal conditions of use, the inhibitory mechanism on which directed attention depends can become depleted or fatigued, leading to difficulties in problem solving and reduced effectiveness in daily activities (Kaplan, 1995). The problem of ordinary attentional fatigue has been addressed by attention restoration theory (ART) (Kaplan, 1995; Kaplan & Kaplan, 1989). At the same time, ART offers an explanation for why TH interventions might provide relief in clinical depression by improving attentional capacity and contributing to disengagement from rumination.

ART posits four restorative components in the experience of environments. According to ART, restoration from attentional fatigue can occur when a person gains psychological distance from tasks, the pursuit of goals, and other routine mental contents to which he or she directs attention (*being away*). However, being away is not sufficient for attentional restoration; attentional switching should occur in which an effortless, interest-driven form of attention (*fascination*) becomes engaged in the encounter with the environment. This allows the person to rest the inhibitory mechanism required for effortful, directed attention. The experience of fascination can be sustained if the person experiences the environment as rich in stimuli yet coherently structured and with substantial scope for exploration (*extent*). Finally, the theory also acknowledges the importance of the match between the person's inclinations at the time, the demands imposed by the environment, and the environmental supports for intended activities (*compatibility*). Thus, fascination is indicated as the core restorative component, and it is supported by other aspects of the encounter with the environment.

The engagement of effortless attention by particular environmental features and the process of exploration implies a switch from effortful directed attention, or positive distraction (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Watkins, Teasdale, & Williams, 2000). It is this positive distraction, with fascination as the core active ingredient, that we take advantage of in the present TH intervention study.

In terms of ART, then, participating in a TH intervention program implies a change in environment and so a better possibility for a sense of being away. Furthermore, it opens for attentional engagement; participants can become fascinated by features in the environment, by following the development from seed to flowering plants, and by the more general gardening activities. In that fascination with environmental features and gardening activities contributes to disengagement from rumination and negative thought patterns, we expect that participation in a TH program is attended by decline in depression severity and improvement in the capacity to direct attention.

## AIMS OF THE STUDY

The primary aims of the study were to assess the change in severity in clinical depression and perceived attentional capacity during a TH intervention and to assess the persistence of these expected benefits at a 3-month follow-up. Additional aims were to identify when in the course of the intervention the most substantial changes took place and to assess the degree to which change in depression severity and perceived attentional capacity covaried with experiences of being away and fascination afforded by the intervention.

## METHOD

### DESIGN AND PARTICIPANTS

We employed a single-group within-subject design with multiple measurement points. The recruitment process targeted adults with DSM-IV major depression, dysthymia, or depressive phase of bipolar II disorder according to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) and a Beck Depression Inventory (BDI) score  $\geq 15$ . We excluded people with borderline personality disorder, eating disorders, posttraumatic stress disorder schizophrenia, addictive problems out of control for the past 6 months, present hospitalization in a psychiatric unit, or having gardening as a leisure activity.

Participants were recruited from general practitioners and through advertisements in newspapers. Potential participants addressed themselves directly to the researcher by telephone and received by mail information on the project, an informed consent sheet, and the BDI. On receiving their informed consent and completed BDI (screening, baseline 1, T1), the researcher contacted the potential participant by telephone and completed an additional diagnosis by using the Norwegian version of the Mini International Neuropsychiatric Interview (Sheehan et al., 1998). The reliability of such a telephone interview has been demonstrated in different studies

(Cacciola, Alterman, & Rutherford, 1999; Crippa et al., 2008; Rohde, Lewinsohn, & Seeley, 1997).

Twenty-two people ( $N = 22$ ) fulfilled the criteria and entered the study. Three of them dropped out of the project in the first week of the intervention because of, respectively, the recurrence of serious cancer, a vocational rehabilitation opportunity, and unhappiness in the group. Nineteen patients completed the intervention; however, one did not complete the questionnaires. The remaining 18 participants (3 men, 15 women) ranged in age from 27 to 65 years ( $M = 49.7$ ). Sixteen had recurrent depression (range 3–30 episodes), and two had bipolar II. Ongoing treatment, during and after the intervention, consisted of regularly psychotherapy for 15 (83%), antidepressant medication for 13 (72%), and a combination of the two for 12 (67%). Three (17%) of the participants did not receive any treatment. These participants were advised to consult their physician. At the 3-month follow-up, 16 participants completed and sent in the questionnaires.

### RESEARCH SETTINGS

The present study is part of a larger project concerned with the viability of therapeutic activities in farm settings for people with mental health problems (“green care”). For that reason, farms were selected as settings for the intervention. Ten urban farms were evaluated for appropriateness for the intervention, and four of these were selected. The farms were easy to access by bicycle, private cars, or bus from where the participants lived. All the farms have strong historical and cultural identity and are situated in open, hilly, natural landscapes. The farms further offered indoor facilities for changing and drying clothes and boots. The participants could choose which farm they wanted to attend. The farmers facilitated the TH group activities. They were given basic instructions and received continuing support from the researcher.

### INTERVENTION

A 12-week TH program was developed that included ordinary and easy gardening activities, both active and passive. The active parts of the TH program included sowing, germinating, potting, planting, composing beds, cultivating vegetables, and rooting various cuttings of flowers and herbs. The passive parts included walking around, sitting on benches, picking flower bouquets, and watching and listening to birds, insects, butterflies, the weather, and the landscape. Participation implied attendance twice a week in 3-hour TH sessions. The intervention was outlined as a group activity with three to five participants in each group, but it also provided possibilities for being alone. The composition of groups was subordinate to the scheduling preferences of the farmers and participants. At the start of the intervention, the participants received an overview of which plants and seeds would be used in the program as well as a sheet with “good advice” concerning clothing, shoes, sun, wind, and so forth. The participants brought their packed lunches, while tea and coffee were served at the farm. They were advised to keep communication among themselves to the horticultural activities while attending the program. The intervention took place during the spring and summer of 2008 and was led and coordinated by the farmers. The participants continued their ongoing treatment during the intervention.

## MEASURES

Severity of depression was measured with the BDI, a 21-item self-report questionnaire initially developed to assess depth in depression (Beck, 1967). Each item consists of four statements of depressive symptoms, ranging from 0 (*normal*) to 3 (*most severe*). The BDI has a maximum score of 63. The internal consistency and stability of the BDI is well established. The instrument further demonstrates good discrimination between patients with varying degrees of depression, and it accurately reflects changes in depression intensity over time (Beck, Steer, & Garbin, 1988; Richter, Werner, Heerlein, Kraus, & Sauer, 1998).

Perceived attentional capacity was measured with the Attentional Function Index (AFI) (Cimprich, 1993). The questionnaire is inspired by ART and designed to measure perceived effectiveness in cognitive activities requiring directed attention, such as planning, deciding, following a train of thought, and concentrating on details (Cimprich, 1992). The AFI consists of 16 linear analogue scales (0–10) labeled at either end with “not at all” and “extremely well.” The maximum possible sum score of 160 indicates a strong perceived capacity to direct attention. Validity and reliability have been established in cancer populations, and Cronbach’s alpha was shown to be high (.89–.94) in a breast cancer sample (Cimprich, 1992, 1993). Cimprich (1992) has reported positive correlations between mood levels and AFI levels and that the AFI is sensitive to change over time (Cimprich, 1993).

The experience of restorative qualities of the environment and TH activities was measured with the Perceived Restorativeness Scale (PRS; Hartig, Kaiser, & Bowler, 1997). The scale was designed to measure the constructs in ART (Kaplan & Kaplan, 1989). The version of the PRS used in the present study includes 23 items concerning how a respondent experiences a given environment at that time. Responses are given with a 10-point scale (0 = *not at all*; 10 = *completely*). We selected 10 items for measuring being away (BA) (e.g., *Being here gives me a break from my everyday routine*) and fascination (FA) (e.g., *There is much to explore and discover here*). Differences in PRS scores have been found to distinguish reliably among scenes reported to have supported attention restoration to different degrees in laboratory experiments (Berto, 2005). Scores for being away and fascination have also reliably distinguished between places with different affective valences (i.e., favorite, neutral, unpleasant) (Korpela & Hartig, 1996).

## PROCEDURE

After recruitment and inclusion at T1, the participants were sent descriptions of the TH program and the questionnaires by mail together with information on practical issues just before the start of the intervention (T2, baseline 2). The questionnaires were thereafter sent to the participants by mail at each measurement point and returned by mail to the researcher within a couple of days. On occasion, participants were reminded by telephone. Beyond T1 and T2, the measurement points were as follows for BDI and AFI: after 4 weeks of the intervention (T3), after 8 weeks (T4), after 12 weeks (i.e., termination of the intervention) (T5), and at a 3-month follow-up (T6). BA and FA were measured at T3 to T5. The use of the BDI as a screening parameter at inclusion (T1, baseline 1) implies that there was a double baseline on BDI score.

## ETHICAL CONSIDERATIONS

The study was approved by the Regional Committee for Medical Research Ethics in Norway (South East) and the Norwegian Social Science Data Services. The participants received printed information about the project with the invitation to participate, and they provided written informed consent.

## STATISTICAL ANALYSIS

A paired-sample *t* test was used to determine whether baseline BDI scores changed from T1 to T2. Changes over the course of the intervention in BDI and AFI scores were assessed with repeated-measures analyses of variance (RM-ANOVAs), each with four measurement points (T2–T5). We report Greenhouse–Geisser corrected degrees of freedom where appropriate. Planned contrasts (Helmert) were used to determine whether change was greater during particular periods of the intervention.

Bivariate correlations (Pearson *rs*) were calculated to assess the degree to which change in BDI scores covaried over the course of intervention with the degree of change in AFI and with the general levels of being away (BA) and fascination (FA). Change scores for BDI ( $\Delta$ BDI) and AFI ( $\Delta$ AFI) were calculated by taking the differences between T2 and T5. The general levels of BA and FA were represented with the mean of the scores from the three occasions when those constructs were measured (i.e., T3–T5).

Finally, paired-sample *t* tests were used to assess the persistence of change in BDI and AFI scores at the 3-month follow up (T6) relative to the scores from the start of the intervention (T2).

Because the intervention was administered to individuals nested in groups, the scores from the individuals in a given group may have been correlated. Such dependencies can increase the risk of type I errors (Baldwin, Murray, & Shadish, 2005). Statistical procedures ordinarily used to deal with nested data, such as hierarchical modeling, require larger samples than the present one. For this reason, as a check on our main conclusions, we applied a method available for use with small samples, namely, analysis of change using scores aggregated by group (Baldwin et al., 2005).

Altogether, there were 10 missing values. Missing values for the three BDI items and seven AFI items were replaced by the mean of the remaining scale items for the given individual at the given measurement point.

The data were analyzed using SPSS version 16.

## RESULTS

### CHANGE IN BDI AND AFI SCORES OVER THE COURSE OF THE INTERVENTION

At T1 (recruitment), BDI scores ranged from 18 to 38 ( $M = 28.4$ ), while at T2 (intervention start) they ranged from 17 to 35 ( $M = 27.3$ ). The change in BDI scores between T1 and T2 was not statistically significant,  $t(17) = 0.99$ ,  $p = .337$  (see Table 1).

**TABLE 1. Means (Standard Deviations) for Scores on Beck Depression Inventory (BDI), Attentional Function Index (AFI), Being Away (BA), and Fascination (FA) Over the Six Measurement Points (T1-T6)**

	Measurement Point					
	T1 Baseline 1 Recruitment	T2 Baseline 2 Start	T3 4-Week Intervention	T4 8-Week Intervention	T5 12-Week Intervention	T6 3-Month Follow-Up
BDI	28.4 (6.3)	27.3 (6.8)	20.5 (6.2)	19.3 (6.9)	17.6 (7.4)	20.8 (9.0)
AFI	—	68.8 (18.4)	77.9 (20.6)	76.3 (18.7)	79.0 (14.8)	74.5 (25.4)
BA	—	—	8.0 (1.0)	8.0 (1.1)	8.2 (1.2)	—
FA	—	—	7.9 (1.1)	8.1 (1.5)	8.1 (1.4)	—

*Note.* For T1 to T5,  $N = 18$ . For T6,  $N = 16$ .

Over the course of the intervention (T2–T5), BDI scores on average declined 9.7 points (see Table 1). This change was significant,  $F(2.08, 35.27) = 18.74, p \leq .001$ , partial  $\eta^2 = .52$ . Planned contrasts indicated that the mean BDI score at T2 was on average higher than the scores at T3–T5 during the intervention, that the mean BDI score at T3 was higher than the BDI scores at T4–T5, and that the mean BDI score at T4 and T5 did not differ (see Table 2). Thus, it appears that the most significant change occurred during the first 4 weeks of the intervention. A change in BDI score greater or equal to 6 points ( $\Delta\text{BDI} \geq 6$ ) was the case for 72% of the cases.

At T2, AFI scores ranged from 45.0 to 103.0 ( $M = 68.8$ ). As expected, perceived attentional capacity improved over the course of the intervention; the mean AFI score increased 10.2 points (see Table 1). This increase was marginally significant overall,  $F(2.84, 48.21) = 2.66, p = .062$ , partial  $\eta^2 = .14$ . The planned contrasts however indicated that the mean AFI score at T2 was significantly lower than the combined average of the scores from T3 through T5, that the mean AFI score at T3 was not higher than the combined average of the AFI scores from T4 and T5, and that the mean AFI score at T4 and T5 did not differ (see Table 2). The greatest improvement in AFI scores thus, as with BDI, occurred during the initial stage of the intervention.

#### OUTCOMES IN RELATION TO RESTORATIVE QUALITIES

Participants reported rather high levels of both being away (BA) and fascination (FA) throughout the intervention (Table 1), and the levels remained stable over time. The RM-ANOVAs indicate that the levels did not vary significantly over time for either variable (for BA,  $p = .68$ ; for FA,  $p = .81$ ). The general level of BA and FA over T3 to T5 correlated modestly but not significantly,  $r = .16, p = .52$ , indicating that BA did not necessarily entail FA with the TH setting or activities.

Those participants who experienced more psychological distance from their everyday routines (BA) over the course of the intervention showed slightly though not significantly more decline in BDI score over the course of intervention ( $\Delta\text{BDI}$ ),  $r = -.16, p = .54$ , and a slight but not significant increase in perceived attentional capacity ( $\Delta\text{AFI}$ ),  $r = .10, p = .70$ .

Those participants who found the intervention to engage their attention (FA) at a higher level showed a significantly greater decline in BDI score over the course of intervention ( $\Delta\text{BDI}$ ),  $r = -.57, p = .014$ , but little increase in perceived attentional capacity ( $\Delta\text{AFI}$ ),  $r = .08, p = .76$ .

The changes in BDI and AFI scores between T2 and T5 were moderately correlated in the expected direction,  $r = -.32$ , suggesting that severity in depression declined slightly as the perceived attentional capacity improved. Despite its moderate size, however, the correlation was not significant ( $p = .20$ ).

#### PERSISTENCE OF CHANGE IN BDI AND AFI SCORES OVER TIME

For the 16 participants that provided data at the 3-month follow-up (T6), there was a significantly lower mean BDI score relative to baseline (T2),  $t(15) = 3.44, p = .004$ . The mean decline in BDI scores between T2 and T6 was 6.7 and clinically significant ( $\Delta\text{BDI} \geq 6$ ) (see Table 1). The mean AFI score, however, had decreased

**TABLE 2. Results of Planned Comparisons Indicating Concentration of Change in Depression Severity (BDI) and Perceived Attentional Capacity (AFI) During the Initial Weeks of the Intervention**

Measure	Contrast	$F(df\ 1, 17)$	$p$	Partial $\eta^2$
BDI	T2 vs. later	29.597	.000	.635
	T3 vs. later	8.009	.012	.320
	T4 vs. later	1.814	.196	.096
AFI	T2 vs. later	6.871	.018	.288
	T3 vs. later	0.003	.960	.000
	T4 vs. later	0.597	.450	.034

somewhat after the intervention terminated (see Table 1). Note that the T2 BDI and AFI means for these 16 participants deviate only slightly ( $\pm 0.2$ ) from those given in Table 1 for all 18 participants.

#### ANALYSIS OF AGGREGATED DATA

When addressing the concern of inflated type 1 error rate with analysis of data from individuals nested in groups, we checked our conclusions about change in the severity of depression by treating the five groups as cases. Taking the group means from T2 to T5 as the data, the RM-ANOVA affirmed the results obtained with the individual-level data; the decline in aggregated BDI scores over the course of the intervention was statistically significant,  $F(1.79, 7.14) = 24.71, p \leq .001, \eta^2 = .86$ . The same did not hold for AFI,  $F(2.26, 9.02) = 1.64, p = .25, \eta^2 = .29$ . We obtained a similar pattern of results for the analysis of persistence of change in the BDI and AFI scores from T2 to T6. For BDI,  $t(4) = 3.06, p = .04$ , and for AFI,  $t(4) = -0.71, p = .52$ . The results of these extremely conservative tests strengthen confidence in the individual-level BDI results, and they recommend caution with regard to the individual AFI results.

#### DISCUSSION

One of the primary aims of the study was to assess the development in depression during a therapeutic horticulture intervention. We assumed that fascination would promote disengagement from rumination, followed by reduction in depression severity (Joormann, 2009; Joormann & Gotlib, 2008). The fairly high mean score on fascination (FA) was quickly established and remained stable throughout the TH intervention. Our data suggest that the participants were regularly fascinated by the TH activities and the environment over the course of the intervention.

The mean BDI score at baseline was in the upper level of moderate depression, close to severe depression. The mean BDI score was stable during the pretreatment baseline period, followed by a substantial decline during the course of intervention. This suggests that the participants responded positively to the intervention. Moreover, the extent to which they perceived the intervention as fascinating was strongly correlated with the decline in depression scores.

Most of the participants (72%) experienced a decline in BDI score greater than 6 points, which is clinically significant according to Bright, Baker, and Niemeyer (1999). One might like to know how such a change corresponds to change with treatment as usual, but we could not identify relevant comparison groups from other studies with BDI measures obtained at the intervals used in the present study. It is noteworthy, however, that in a randomized controlled trial ( $N = 155$ ), Dalgard (2004) found that 69% of the 81 intervention group participants responded to a psychoeducational group program designed to promote positive thinking, pleasant activities, social skills, and social support with a decline in BDI score greater than 6 points. This result appears comparable to that which we obtained with a sample from the same Norwegian metropolitan population. Dalgard reports, however, that the participants in his study who also received psychotherapy did not respond to the psychoeducational intervention. This was not the case in our study, in which almost all our participants were receiving psychotherapy and at the same time showed a clinically significant decline in BDI score. Although the present study and Dalgard's study have some cognitive theoretical underpinnings in common, the difference in change suggests that the two interventions have different active cognitive ingredients for change. In the present TH study, we assumed that an active ingredient would involve attentional switching from cognitively demanding and attentionally fatiguing negative thought patterns to attentionally effortless engagement in restorative activities. The difference in results suggests that, at least initially, there is a potential for a greater improvement from therapeutic horticulture as a supplement to treatment as usual than from a psychoeducational program that may impose attentional demands on clinically depressed patients receiving psychotherapy.

We further assumed that, as an active component in the intervention, fascination with the TH activities and environment would promote attentional restoration (Kaplan, 1995). Therefore, another aim of the study was to assess development in perceived attentional capacity. At baseline (T2), the mean AFI score was less than half the maximum possible score, indicating that the participants perceived their attentional capacity to be rather low. This is in line with the literature describing problems with attentional capacity during depression (Porter et al., 2003; Zimmermann & Leclercq, 2002). The fairly quick increase in AFI scores during the intervention, as confirmed with the planned contrasts of the T2 versus T3–T5 scores, and the stability of the scores from T3 to T5 suggest that the perceived capacity to direct attention did improve during the intervention. These findings correspond in some respects with findings reported by Cimprich (1993). From a nature intervention study in a breast cancer sample, Cimprich reported that AFI scores rose earlier and increased more in the intervention group than the control group. Even if reduced capacity to direct attention may have different causes in depression and cancer, it is tempting to associate the two studies, as clinical depression occurs in 20% to 25% of the breast cancer cases (Fann et al., 2008).

A third aim here was to assess the persistence of benefits after the intervention. At the 3-month follow-up, there was a slight increase in BDI scores from T5. However, the overall reduction in BDI scores from baseline was still significant. AFI scores decreased somewhat after T5 and no longer differed significantly from baseline. These findings indicate that TH may be a useful strategy in long-term

care and treatment of depressed clients, bearing in mind that sustaining attentional resources may require ongoing participation in attentionally restorative activities.

We assumed that, as an active component in the intervention, fascination with the TH activities and environment would promote attentional restoration (Kaplan, 1995). We further assumed that fascination would promote disengagement from rumination, followed by reduction in depression severity (Joormann, 2009; Joormann & Gotlib, 2008). The fairly high mean score on fascination (FA) was quickly established and remained stable throughout the TH intervention. Our data suggest that the participants were regularly fascinated by the TH activities and the environment over the course of the intervention. Moreover, the extent to which they perceived the intervention as fascinating was strongly correlated with the decline in depression scores.

The study has several limitations. First, obviously, we do not have a randomized controlled trial design. Such a design would of course allow stronger statements about causation. The study was planned and approved as a randomized controlled trial; however, several factors made it impossible to implement this design. Despite extensive efforts at recruiting participants, we did not succeed in enrolling a large number of participants. Interested candidates for participation also expressed hesitation about the possibility of entering the control group. Given the likelihood of losing a large proportion of an already small sample, we decided to adopt a single-group design, with a multiple measurement structure (Shadish, Cook, & Campbell, 2002). This decision was necessitated by the fact that the growing season in Norway is short and gave minimal possibilities for extending the recruitment process.

A second limitation, already indicated, is the small sample size. A larger sample would have allowed for investigation of subgroup differences, related to gender, age, onset of depression, and treatment.

A third limitation is the lack of a measure on rumination. Our data are consistent with the idea that fascination contributed to decline in depression severity. We assumed that fascination facilitated attentional improvement and disengagement from ruminating. However, without a measure of rumination, we could not explicitly address the potential association between fascination and rumination.

Despite its limitations, this study has several important strengths. To our knowledge, this is the first study investigating TH with a properly diagnosed clinical depression sample. The study is theoretically consistent looking across perspectives on depression, the active ingredients in the TH intervention (especially fascination), the selection of measures, and the statistical analyses. The use of multiple measurement points, including a double baseline in BDI scores and a follow-up, provided some leverage for distinguishing change due to the intervention from change per se (e.g., with ongoing psychotherapy and medication). It also allowed for determining when the most substantial changes took place.

## CONCLUSIONS AND RECOMMENDATIONS

The findings suggest that the participants with clinical depression responded positively to a TH intervention. The main findings are a quick and significant decline in

BDI and an increase in AFI scores during the course of the TH intervention and still a statistically and clinically significant decline in BDI score at 3-month follow-up. Moreover, the degree to which the participants experienced the TH intervention as fascinating correlated strongly with the decline in depression severity.

The study helps to fill the gap in the research on nature and restorative interventions in mental health care and responds to recommendations for further research on depression made by Ebmeier et al. (2006) and Gilbody (2003). Looking ahead, the present findings encourage further research and theory development concerning the respective roles of fascination and rumination. This may enhance our understanding of active ingredients in nature and horticulture interventions in clinical depression.

Clinically depressed clients may benefit from interventions supplementary or supportive to ongoing treatment. The reported findings might inspire clinicians of any profession dealing with clinical depression to inform clients about horticultural or other nature-based activities and perhaps to facilitate these activities.

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## **PAPER II**



## ORIGINAL RESEARCH

**Therapeutic horticulture in clinical depression: a prospective study of active components**

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**Abstract**

**Aim.** This paper is a report of a study conducted to assess change in depression severity, perceived attentional capacity and rumination (brooding) in individuals with clinical depression during a therapeutic horticulture programme and to investigate if the changes were mediated by experiences of being away and fascination.

**Background.** Individuals with clinical depression suffer from distortion of attention and rumination. Interventions can help to disrupt maladaptive rumination and promote restoration of depleted attentional capacity.

**Method.** A single-group study was conducted with a convenience sample of 28 people with clinical depression in 2009. Data were collected before, twice during, and immediately after a 12-week therapeutic horticulture programme, and at 3-month follow-up. Assessment instruments were the Beck Depression Inventory, Attentional Function Index, Brooding Scale, and Being Away and Fascination subscales from the Perceived Restorativeness Scale.

**Findings.** Mean Beck Depression Inventory scores declined by 4.5 points during the intervention ( $F = 5.49$ ,  $P = 0.002$ ). The decline was clinically relevant for 50% of participants. Attentional Function Index scores increased ( $F = 4.14$ ,  $P = 0.009$ ), while Brooding scores decreased ( $F = 4.51$ ,  $P = 0.015$ ). The changes in Beck Depression Inventory and Attentional Function Index scores were mediated by increases in Being Away and Fascination, and decline in Beck Depression Inventory scores was also mediated by decline in Brooding. Participants maintained their improvements in Beck Depression Inventory scores at 3-month follow-up.

**Conclusion.** Being away and fascination appear to work as active components in a therapeutic horticulture intervention for clinical depression.

**Keywords:** clinical depression, clinical practice, nature-based intervention, nursing, prospective study, therapeutic horticulture

## Introduction

Individuals with clinical depression suffer from depressed mood, cognitive distortions, reduced interest in activities (American Psychiatric Association 2000), weakened working memory (Christopher & MacDonald 2005) and attentional impairment (Porter *et al.* 2003, Delaloye *et al.* 2008, Gollan *et al.* 2008, Keilp *et al.* 2008). Low levels of behavioural activation, high levels of behavioural inhibition (behavioural avoidance) (Kasch *et al.* 2002, Stone & Quartermain 2005) and loss of reinforcing leisure-time activities (Barge-Schaapveld *et al.* 1995) often occur with depression.

Conventional treatments for depression are cognitive-behavioural or interpersonal psychotherapies and antidepressant medication, and these appear beneficial when given as separate treatments (Butler *et al.* 2007). Unfortunately, a substantial number of patients do not respond to conventional treatments. Research on adjunctive, complementary or supplementary interventions in depression is still relatively sparse (Ernst *et al.* 1998, Jorm *et al.* 2002); however, several studies have shown positive effects following an increase in pleasant activities (Lewinsohn & Graf 1973, Hammen & Glass 1975, Zeiss *et al.* 1979, Jorm *et al.* 2002, Cuijpers *et al.* 2007) and physical exercise (Mead *et al.* 2009).

Nature-based interventions in health care typically involve pleasant activities and moderate physical activity in pleasant surroundings, but the degree to which such interventions alleviate depression is little investigated. Some research suggests, however, that nature-based interventions address some of the cognitive mechanisms implicated in depression. Attentionally restorative effects of nature-based interventions are reported for patients recovering from cancer (Cimprich 1993, Cimprich & Ronis 2003). Also, experiments with healthy young adults have identified more attentional restoration after a walk in natural vs. urban surroundings (Hartig *et al.* 2003, Berman *et al.* 2008).

One nature-based intervention, therapeutic horticulture (TH), has long clinical traditions, but there are few published studies of its use in mental health care (Sempik *et al.* 2003). TH includes different gardening activities. It is both a new and an old strategy in nursing practice and research across cultural and national borders (Meehan 2003, Maller *et al.* 2006, Page 2008, Hansen-Ketchum *et al.* 2009).

In heterogeneous mental health samples, beneficial effects of TH have been reported for anxiety (Lee *et al.* 2004, Stepney & Davis 2004) and depressive symptoms (Stepney & Davis 2004). Apart from the heterogeneity in their samples, these studies lacked theoretical anchoring. Recently, however, Gonzalez *et al.* (2009) reported decline in depression

severity and improvement in perceived attentional capacity with a theory-guided assessment of a TH intervention in clinical depression. The present study extends that study by investigating the active components thought to mediate the benefits of a TH intervention.

## Background

### Depression and attention

The capacity to focus or direct attention in situations demanding concentration, cognitive processing, working memory and goal-directed work is important in everyday life. To sustain directed attention, a capacity to inhibit interference from distractions is needed (Lavie 2001, Lavie *et al.* 2004, Joormann *et al.* 2007). Cognitive processing in depression is associated both with temporarily limited or reduced capacity to direct attention (Zimmermann & Leclercq 2002) and impairments of inhibitory mechanisms (Lemelin *et al.* 1997, MacQueen *et al.* 2000). Depression is thus often characterized as a cognitive deficit state (Mialet *et al.* 1996).

### Depression and rumination

A ruminative response style can be described as a behavioural and attentional pattern in which the person intently focuses on depressive symptoms, their causes, and possible consequences, without taking action to change the situation (Nolen-Hoeksema *et al.* 1993). Rumination and negative thought patterns consume (Wells & Matthews 1994) and occupy cognitive resources (Ellis & Ashbrook 1988) and working memory (Joormann 2009), leading to weakening of executive functions (Ward *et al.* 2003). As depression is associated with weakened and impaired inhibitory mechanisms, individuals with depression have problems with protecting working memory from being disturbed by irrelevant negative information (Davis & Nolen-Hoeksema 2000, Joormann & Gotlib 2008). Because rumination tends to keep cognitions, memories and interpretations negatively focused, it may sustain and amplify depression (Nolen-Hoeksema 1987, Raes & Hermans 2008).

Rumination can be characterized by two distinct components: brooding and reflection (Treyner *et al.* 2003). Brooding refers to self-critical moody pondering, while reflection refers to more neutral pondering (Treyner *et al.* 2003). Brooding is seen as the maladaptive component of rumination (Crane *et al.* 2007), and it has been found to mediate depression (Lo *et al.* 2008). It is thus an appropriate target for intervention.

### Depression and behavioural activation

Behavioural activation as an intervention for depression is rooted in the behavioural tradition in psychology. Established by Lewinsohn (1974) among others, it is a cognitive psychotherapeutic process that promotes positively reinforcing activities and addresses behavioural avoidance patterns (Hopko *et al.* 2003). There are numerous strategies for assisting depressed persons to increase mastery and pleasure and to disengage from problems and rumination (Martell *et al.* 2001). The key ingredient in strategies aiming to increase activity levels is helping the patient to move from a lifestyle of behaviour avoidance into an activity-based lifestyle (Hopko *et al.* 2003, Dimidjian *et al.* 2006). In the study reported in this paper we investigated TH as one such strategy.

### Depression and distracting activities

While a ruminative response style to depressed mood is hypothesized to prolong and intensify depression, a distractive response style is hypothesized to alleviate, shorten and diminish episodes of depression (Morrow & Nolen-Hoeksema 1990, Nolen-Hoeksema 1991). Distracting responses are thoughts and behaviours that switch attention from the depressed mood to pleasant or neutral activities. Distraction may weaken depressive symptoms or episodes (Morrow & Nolen-Hoeksema 1990, Nolen-Hoeksema & Morrow 1993, Nolen-Hoeksema *et al.* 2008), and may open the person for positive reinforcement through engagement and absorption in activities (Nolen-Hoeksema *et al.* 2008). In the present study, we addressed positive distraction as an active component in TH.

### Theoretical framework for the intervention – attention restoration theory

Under normal conditions, the inhibitory mechanism on which directed attention depends can become depleted or fatigued, leading to difficulties in problem-solving and effectiveness in daily activities (Kaplan 1995). The problem of ordinary attentional fatigue has been addressed by attention restoration theory (ART), which proposes that restoration of depleted capacity to direct attention can proceed when attention can follow interest, without effortful inhibition of other thoughts and stimuli (Kaplan & Kaplan 1989, Kaplan 1995). As Gonzalez *et al.* (2009) observed, this theoretical account can be used to explain why TH interventions might provide relief in clinical depression.

ART proposes four components in the experience of environments that enhance restoration from attentional

fatigue. The first component involves psychological distance from daily tasks, the pursuit of goals, and other routine mental contents to which the person ordinarily directs attention (being away). The second component of a restorative experience is an effortless, interest-driven form of attention (fascination) that becomes engaged in the encounter with the environment. This allows the person to rest the inhibitory mechanism required for effortful, directed attention. Third, to sustain fascination, the environmental setting should be rich in content and structure and provide substantial scope for exploration (extent). Fourth and finally, the theory acknowledges the importance of a match between a person's inclinations at the time, the demands imposed by the environment, and the environmental supports for intended activities (compatibility). Thus, fascination is indicated as the core cognitive mechanism, supported and sustained by other aspects of the encounter with the environment. A TH intervention might provide relief in clinical depression by affording opportunities for switching from capacity-consuming rumination to effortless attention, with consequent restoration of depleted attentional capacity.

## The study

### Aim

The aim of the study was to assess change in depression severity, perceived attentional capacity and rumination (brooding) in individuals with clinical depression during a TH programme and to investigate if the changes were mediated by experiences of being away and fascination. Additional aims were to identify when in the course of the 12-week intervention the most substantial changes took place and to assess the persistence of possible benefits at a 3-month follow-up.

### Design

We employed a single-group design with multiple measurement points and a convenience sample in 2009. The measurement points were recruitment (T0), baseline (T1 and T2), after 4 weeks of the intervention (T3), after 8 weeks (T4), after 12 weeks (T5) and at a 3-month follow-up (T6).

### Participants

We recruited adults with DSM-IV major depression, dysthymia, or depressive phase of bipolar II disorder, and a Beck Depression Inventory (BDI) score  $\geq 15$ . We excluded people with borderline personality disorder, eating disorders,

post-traumatic stress disorder, schizophrenia, addictive problems out of control for the last 6 months, present hospitalization in a psychiatric unit, or having gardening as a leisure activity.

Participants were recruited through the Norwegian Labour and Welfare Administration and through advertisements in newspapers. Potential participants contacted the researcher by telephone, and were sent information on the project, an informed consent sheet and the BDI. Upon receiving their informed consent and completed BDI (recruitment, T0), the researcher contacted the person by telephone and completed an additional diagnosis of depression using the Mini-International Neuropsychiatric Interview (Sheehan *et al.* 1998). The reliability of a diagnostic interview by telephone has been demonstrated in multiple studies (Rohde *et al.* 1997, Cacciola *et al.* 1999, Crippa *et al.* 2008).

Thirty people, all White, met the criteria and entered the study. One withdrew after the first session because of massive psychological distress, and one dropped out after 4 weeks without giving any reason. Twenty-eight people (21 women) completed the intervention. They ranged in age from 25 to 64 years (Mean = 44.1). Five had bipolar II disorder with the most recent episode being depressive, 22 had major depression disorder – recurrent, and one had major depressive disorder – single episode.

Information from the general practitioner (GP) on ongoing treatment was provided for 22 participants. Nine received psychotherapy only at varying frequency, one received antidepressant medication only, and ten had a combination of the two. Two did not receive any treatment and were encouraged to contact their GP.

### Research settings

Research settings for the study were four farms in different areas of Oslo, earlier evaluated for appropriateness and used for a TH intervention (Gonzalez *et al.* 2009). The participants could choose the farm where they wanted to participate. All the farms have strong historical and cultural identity and are situated in natural landscapes.

### Intervention

The 12-week programme had 24 TH sessions, which included ordinary and easy gardening activities, both active and passive. The active parts of the programme included sowing, germinating, potting, planting and cultivating vegetables, flowers and herbs. The passive parts included sitting on benches, and watching and listening to birds, the weather, and the landscape. Participation implied attendance twice a week at

3-hour TH-sessions. The intervention was outlined as a group activity, but also provided possibilities for being alone. For further details, see Gonzalez *et al.* (2009). The present study included five groups with 4–7 participants. The mean degree of attendance was 18.7 of 24 possible sessions (SD = 4.9).

### Data collection

After recruitment and inclusion at T0, participants were sent questionnaires for baseline 1 (T1) by post. Questionnaires were then sent at 4-week intervals until the programme concluded, and again at the 3-month follow-up (T6). These were returned by post to the researcher as soon as possible. Use of the BDI in screening (T0) means that there was a triple baseline on the BDI.

### Instruments

#### *Depression severity*

The BDI is a 21-item self-report questionnaire (Beck 1967). Each item consists of four statements about depressive symptoms, ranging from 0 (normal) to 3 (most severe), with a total maximum score of 63. The BDI demonstrates good discrimination between patients with varying degree of depression, and accurately reflects changes in depression intensity over time (Beck *et al.* 1988, Richter *et al.* 1998). A decline in BDI score  $\geq 6$  has been described as clinically significant (Bright *et al.* 1999). In the present study, values for  $\alpha$  fell between 0.81 and 0.91 (T0–T6).

#### *Perceived attentional capacity*

The Attentional Function Index (AFI) (Cimprich 1993) is designed to measure perceived effectiveness in cognitive activities requiring directed attention, such as planning, following a train of thought, and concentrating on details (Cimprich 1992). The AFI consists of 16 linear analogue scales (0–10) labelled at either end with 'Not at all' and 'Extremely well'. The maximum possible score of 160 indicates strong perceived capacity to direct attention. The AFI is sensitive to change over time (Cimprich 1993), and validity and reliability have been established in samples of individuals with cancer (Cimprich 1992, 1993). In the present study, values for  $\alpha$  fell between 0.89 and 0.92 (T1–T6).

#### *Rumination (Brooding)*

The Brooding Scale used in this study is a subscale of a revised version (Treyner *et al.* 2003) of the Ruminative Response Scale (Nolen-Hoeksema & Morrow 1991). The Brooding Scale consists of five items assessing the degree to which individuals passively focus on the reasons for their distress

(e.g. ... think 'What do I do to deserve this?') (1 = almost never; 2 = sometimes; 3 = often; 4 = almost always), with a possible maximum score of 20. Treynor *et al.* (2003) reported an  $\alpha$  of 0.72 and test-retest correlation of 0.62. In the present study, values for  $\alpha$  fell between 0.82 and 0.87 (T1-T6).

#### Perceived restorativeness

The experience of restorative qualities of the environment and TH activities was measured with the Perceived Restorativeness Scale (PRS) (Hartig *et al.* 1997b). The scale was designed to measure the constructs in attention restoration theory (ART) (Kaplan & Kaplan 1989). We selected 10 items for measuring being away (BA) (e.g. Being here gives me a break from my everyday routine) and fascination (FA) (e.g. There is much to explore and discover here) from the version published by Hartig *et al.* (1997a). Responses were given on an 11-point scale (0 = not at all; 10 = completely). Scores for being away and fascination have reliably distinguished between places with different affective valences acquired through personal experiences (i.e. favourite, unpleasant) (Korpela & Hartig 1996, Korpela *et al.* 2001). In the present study, values for  $\alpha$  fell between 0.73 and 0.91 for BA and between 0.89 and 0.96 for FA (T1-T6).

#### Ethical considerations

Approval to conduct the study was obtained from the appropriate ethics committee.

#### Data analysis

The data were analysed using SPSS version 17. In a first set of repeated measures analyses of variance (RM-ANOVA), we assessed the stability across baseline measurement points for BDI, AFI, Brooding, BA and FA. In a second set of RM-ANOVA, we assessed changes over the course of the intervention in BDI, AFI, Brooding, BA and FA. For these two sets of analyses, we report Greenhouse-Geisser corrected degrees of freedom where appropriate. Planned contrasts (Helmert) were used in the second set to determine when during the intervention BDI, AFI and Brooding scores changed most. In a third set of RM-ANOVA we assessed the persistence of change in BDI, AFI and Brooding at 3-month follow-up (T6), relative to the start of the intervention (T2).

To test whether change in BA and FA would mediate change in BDI, AFI and Brooding and to determine whether change in Brooding would mediate change in BDI and AFI, we applied the analytic approach recommended by Judd *et al.* (2001) for within-subjects experiments with small samples such as ours. The regression analysis they prescribe

has a dependent variable that is the amount of change ( $\Delta$ ) across measures obtained before and after the intervention has been introduced. This analysis includes two main predictors. One is also a change score; change across measures of the presumptive mediator obtained before and after the intervention is used to predict change across measures of the outcome. The coefficient for this predictor provides the test of mediation. This coefficient should be estimated with adjustment for variation attributable to the general level over measurement points of the presumptive mediator. This second predictor, a sum score ( $\Sigma$ ), is in effect a moderator; it indicates whether the degree of change in the outcome depends on the general level of the mediator. Taken together, we calculated T5-T2 difference scores for BDI, AFI and Brooding for use as dependent variables in respective analyses (with Brooding, also for use as a mediator in two analyses); change from the average value of BA and FA at home to the average values of BA and FA on the farm during the intervention ( $\Delta BA = BA_{\text{FARM}} - BA_{\text{HOME}}$  and  $\Delta FA = FA_{\text{FARM}} - FA_{\text{HOME}}$ ) as mediators of change in BDI, AFI, and Brooding; and the sum across the relevant measurement points ( $\Sigma BA = BA_{\text{FARM}} + BA_{\text{HOME}}$  and  $\Sigma FA = FA_{\text{FARM}} + FA_{\text{HOME}}$ ) as the moderator of change in BDI, AFI, and, for the relevant analyses, Brooding. Because BA and FA were strongly correlated ( $r = 0.69$ ,  $P \leq 0.001$ ), separate sets of regression analyses were performed with only one of them treated as the mediator. We followed standard procedures to check whether statistical assumptions were met and to identify eventual problems with collinearity and outliers (Tabachnick & Fidell 2007).

We applied a method available for small samples to check for type I errors related to nesting of participants within small groups receiving the intervention (Baldwin *et al.* 2005). Given the small number of cases (i.e. five participant groups), this approach was only used to follow up on the RM-ANOVA initially done with individuals as cases.

Missing values on single items were replaced by the mean of the scores on the remaining items for the given individual. In one case during the intervention, an entire questionnaire was not completed; the missing score was replaced with the previous data carried forward. Three participants did not complete the 3-month follow-up and were excluded from analysis involving T6 scores.

## Results

### Stability over baseline measures

Initial RM-ANOVA confirmed the stability of the scores during baseline; for depression severity (BDI),  $F(1,38, 37.23) = 0.77$ ,

$P = 0.427$ , partial  $\eta^2 = 0.03$ ; for perceived attentional capacity (AFI),  $F(1, 27) = 0.11$ ,  $P = 0.744$ , partial  $\eta^2 < 0.01$ ; and for rumination (Brooding),  $F(1, 27) = 0.01$ ,  $P = 0.931$ , partial  $\eta^2 < 0.01$ . Participants reported fairly low levels of both being away (BA) and fascination (FA) at home. These remained stable across T1 and T2; for BA,  $F(1, 27) = 0.04$ ,  $P = 0.848$ , partial  $\eta^2 < 0.01$ ; for FA,  $F(1, 27) = 0.84$ ,  $P = 0.369$ , partial  $\eta^2 = 0.03$ .

**Change in outcomes over the course of the intervention**

Over the course of the intervention (T2 to T5), BDI on average declined 4.5 points (see Table 1). This change was statistically significant,  $F(3, 81) = 5.49$ ,  $P = 0.002$ , partial  $\eta^2 = 0.17$ . Planned contrasts indicated that mean BDI at T2 was higher than at T3–T5 during the intervention; that mean BDI at T3 was higher than BDI at T4–T5; and that mean BDI at T4 and T5 did not differ (see Table 2). Thus it appears that the greatest change occurred during the first 4 weeks of the intervention. We found a clinically significant decline ( $\Delta$ BDI  $\geq 6$ ) for 50% of the participants.

As expected, perceived attentional capacity (AFI) improved over the course of the intervention; mean AFI increased 10.2 points (see Table 1). The change was statistically significant overall,  $F(3, 81) = 4.14$ ,  $P = 0.009$ , partial  $\eta^2 = 0.13$ . The planned contrasts indicated that mean AFI at T2 was lower than the scores from T3 through T5; that mean AFI at T3 was lower than the scores from T4 to T5; and that mean AFI at T4 was not significantly lower than the mean at T5 (see Table 2). The greatest improvement in AFI thus occurred during the first 8 weeks of the intervention.

Mean Brooding declined 1.6 points over the course of the intervention (see Table 1). The overall change was statistically significant,  $F(2.02, 54.57) = 4.51$ ,  $P = 0.015$ , partial  $\eta^2 = 0.14$ . The planned contrasts indicated that mean Brooding at T2 was higher than the scores from T3 through T5; that mean Brooding at T3 was higher than

**Table 2** Results of planned contrasts indicating concentration of change in depression severity (BDI), perceived attentional capacity (AFI), rumination (Brooding), being away (BA) and fascination (FA) during the intervention (T2–T5) ( $N = 28$ )

Measure	Contrast	$F(1,27)$	$P$	Partial $\eta^2$
BDI	T2 vs. Later	10.72	0.003	0.28
	T3 vs. Later	2.70	0.112	0.09
	T4 vs. Later	0.01	0.943	< 0.01
AFI	T2 vs. Later	4.85	0.036	0.15
	T3 vs. Later	5.07	0.033	0.16
	T4 vs. Later	0.73	0.399	0.03
Brooding	T2 vs. Later	4.49	0.044	0.14
	T3 vs. Later	3.95	0.057	0.13
	T4 vs. Later	5.53	0.026	0.17
BA	T2 vs. Later	41.00	< 0.001	0.60
	T3 vs. Later	0.08	0.782	< 0.01
	T4 vs. Later	2.61	0.118	0.09
FA	T2 vs. Later	66.98	< 0.001	0.71
	T3 vs. Later	0.03	0.858	< 0.01
	T4 vs. Later	0.01	0.913	< 0.01

the scores from T4 to T5; and that mean Brooding at T4 was higher than the mean at T5 (see Table 2). Thus, Brooding continued to decline during the entire 12-week intervention.

**Restorative quality of the TH intervention**

Both BA and FA were at much higher levels on the farm than at home, and the levels on the farm remained higher over the course of the intervention (see Table 1). Respective RM-ANOVA found statistically significant changes overall for both BA [ $F(1.61, 43.55) = 31.67$ ,  $P < 0.001$ , partial  $\eta^2 = 0.54$ ] and FA [ $F(1.65, 44.48) = 50.62$ ,  $P < 0.001$ , partial  $\eta^2 = 0.65$ ]. The planned contrasts indicated that the effect is attributable to the change from home (T2) to farm (T3). Specifically, mean BA and FA at T2 were significantly lower than the corresponding scores from T3 through T5 (Table 2). The

**Table 1** Means (SDs) for scores on Beck Depression Inventory (BDI), Attentional Function Index (AFI), Ruminative Response Scale – Brooding Subscale (Brooding), Being Away (BA) and Fascination (FA) over the seven measurement points (T0–T6)

	T0 Recruitment 1	T1 Baseline 1	T2 Baseline 2 Start	T3 4 weeks	T4 8 weeks	T5 12 weeks End	T6 3-month follow-up
BDI	25.2 (7.3)	25.2 (7.8)	24.1 (8.4)	21.6 (7.0)	19.6 (7.7)	19.6 (8.0)	20.4 (10.3)
AFI	–	64.4 (21.6)	63.4 (23.0)	66.3 (18.11)	71.5 (20.2)	73.6 (18.6)	67.0 (17.7)
Brooding	–	13.4 (3.6)	13.4 (3.2)	12.9 (3.4)	12.5 (3.4)	11.8 (3.3)	12.3 (3.8)
BA	–	4.6 (2.1)	4.5 (2.1)	7.5 (1.4)	7.6 (1.5)	7.3 (1.6)	4.6 (1.7)
FA	–	3.2 (2.0)	3.4 (2.3)	7.0 (1.3)	7.1 (1.8)	7.1 (1.9)	3.3 (1.9)

$N = 28$ , except for T6 with  $N = 25$ .

contrasts also confirmed that BA and FA did not differ across T3 through T5. Thus, perceptions of restorative quality at the farms remained at roughly the same level during the intervention.

**Mediation of changes in outcome variables**

In separate regression analyses, we found that change in depression severity ( $\Delta$ BDI) was mediated by change in both BA and FA (Table 3). As expected, the greater the increase in BA and FA from home to farm, the greater the decline in BDI from T2 to T5. We also found that change in perceived attentional capacity ( $\Delta$ AFI) was similarly mediated by change in both BA and FA. This was in line with expectations that the greater the increase in BA and FA from home to farm, the greater the increase would be in AFI from T2 to T5.

Further, we found that the decline in Brooding was not mediated by change in either BA or FA; however, the overall level of FA significantly moderated change in Brooding (Table 3). These results did not align with our expectations; we had anticipated that the greater the increase in BA and FA from home to farm, the greater the decrease in Brooding from T2 to T5. Going further, we found that change in Brooding did not mediate change in either BDI or AFI, but the average level in Brooding acted as a moderator of change in BDI. This means that the higher the level of Brooding across all measurement points (T2 to T5), the greater the decline in BDI.

The final regression analysis showed that change in AFI significantly mediated change in BDI (Table 3); the greater the increase in perceived attentional capacity, the greater the decline in depression severity.

**Persistence of improvement after the intervention**

At the 3-month follow-up (T6), BDI remained lower on average than at baseline (T2),  $F(1, 24) = 4.19, P = 0.052$ , partial  $\eta^2 = 0.15$ . In contrast, AFI and Brooding had relapsed at T6 to the point that they were not statistically different from their respective T2 levels (Table 1); for AFI,  $F(1, 24) = 1.17, P = 0.289$ , partial  $\eta^2 = 0.05$ ; for Brooding,  $F(1, 24) = 2.49, P = 0.128$ , partial  $\eta^2 = 0.09$ .

**Analysis of aggregated data**

Given the possibility of inflated type 1 error rate with analyses of data from individuals nested in groups, we checked our conclusions about change in BDI, AFI and Brooding by treating the five groups as cases. Treating the group means for each of the relevant measurement points (T2 through T5) as the data, the RM-ANOVA showed that the decline in BDI over the course of the intervention remained statistically significant,  $F(3, 12) = 5.32, P = 0.015$ , partial  $\eta^2 = 0.57$ . The same did not hold true for AFI [ $F(3, 12) = 2.06, P = 0.159$ , partial  $\eta^2 = 0.34$ ] or Brooding [ $F(1.15, 4.59) = 3.87, P = 0.110$ , partial  $\eta^2 = 0.49$ ]. These very

**Table 3** Results of regression analyses used to test the mediation models of interest ( $N = 28$ ). In each model, the intervention (I) is depicted as affecting a mediating variable, which is the difference ( $\Delta$ ) between a preintervention and an intervention score. The mediators of interest are change in the experience of being away while at home vs. on the farm ( $\Delta$ BA), change in the experience of fascination while at home vs. on the farm ( $\Delta$ FA), and change in rumination from before (T2) to just after the intervention (T5) ( $\Delta$ Brooding). The mediator is in turn depicted as affecting the difference ( $\Delta$ ) between the T2 and T5 scores for depression severity ( $\Delta$ BDI), perceived attentional capacity ( $\Delta$ AFI), or rumination ( $\Delta$ Brooding). For each model tested, the moderator is the general level of the variables used to calculate the mediator, summing across preintervention and intervention scores

Mediation model	Mediator ( $\Delta_{T2-T5}$ )		Moderator ( $\Sigma_{T2-T5}$ )		Model summary		
	B (SE)	P	B (SE)	P	$R^2$ ( $R^2_{adj}$ )	F (2,25)	P
I $\rightarrow$ $\Delta$ BA $\rightarrow$ $\Delta$ BDI	1.82 (0.58)	0.004	0.55 (0.24)	0.029	0.35 (0.30)	6.80	0.004
I $\rightarrow$ $\Delta$ FA $\rightarrow$ $\Delta$ BDI	2.19 (0.64)	0.002	0.15 (0.20)	0.445	0.32 (0.26)	5.84	0.008
I $\rightarrow$ $\Delta$ BA $\rightarrow$ $\Delta$ AFI	3.81 (1.46)	0.015	1.13 (0.61)	0.075	0.27 (0.21)	4.55	0.021
I $\rightarrow$ $\Delta$ FA $\rightarrow$ $\Delta$ AFI	6.00 (1.38)	< 0.001	0.78 (0.43)	0.079	0.45 (0.40)	10.09	< 0.001
I $\rightarrow$ $\Delta$ BA $\rightarrow$ $\Delta$ Brooding	-0.05 (0.22)	0.812	-0.18 (0.09)	0.064	0.14 (0.07)	2.01	0.155
I $\rightarrow$ $\Delta$ FA $\rightarrow$ $\Delta$ Brooding	-0.21 (0.24)	0.372	-0.15 (0.07)	0.044	0.16 (0.10)	2.41	0.110
I $\rightarrow$ $\Delta$ Brooding $\rightarrow$ $\Delta$ BDI	-0.80 (0.54)	0.154	0.28 (0.12)	0.032	0.21 (0.15)	3.31	0.053
I $\rightarrow$ $\Delta$ Brooding $\rightarrow$ $\Delta$ AFI	-1.08 (1.43)	0.458	0.16 (0.32)	0.631	0.03 (-0.05)	0.36	0.698
I $\rightarrow$ $\Delta$ AFI $\rightarrow$ $\Delta$ BDI	0.27 (0.07)	< 0.001	-0.00 (0.02)	0.874	0.64 (0.41)	8.74	< 0.001

To obtain positive values, the difference scores ( $\Delta$ ) are calculated as (T2 - T5) for BDI and Brooding; as (T5 - T2) for AFI; and as (Mean<sub>FARM</sub> - Mean<sub>HOME</sub>) for BA and FA. Higher values for the moderator variables indicate higher levels of BA, FA, AFI and Brooding over the course of the intervention.

conservative tests thus encourage caution in interpretation of change in AFI and Brooding.

## Discussion

### Study limitations

The study had two major limitations. It extended the study by Gonzalez *et al.* (2009), which also had a single-group design. Although the present study included an additional baseline measure to strengthen the design (Shadish *et al.* 2002), it still does not give the same support for causal inference as provided by a randomized controlled trial (RCT). Both the present study and the earlier study by Gonzalez *et al.* were approved as RCT designs; however, despite extensive recruiting efforts, we did not succeed in enrolling adequate numbers of participants for both intervention and control groups for each of the four farms. Without a control group, we cannot be certain that the measured changes are due to the TH intervention. They may be due to the passage of time *per se*, attention from those delivering the intervention, or change in circumstances unrelated to the intervention. However, the stability in baseline scores prior to the intervention, the pattern of mediation findings, and the relapse after the intervention suggest that the changes we measured are not only due to such alternatives.

The second major limitation is the small sample size. With a substantially larger sample, we could have tested the complete causal model, and not only its component parts. We could also have investigated possible subgroup differences related to gender, age and ongoing treatment.

### Changes measured in connection with the intervention

In this study we aimed to assess the development in depression severity, perceived attentional capacity and rumination (brooding) during a TH intervention. BDI, AFI and Brooding scores were stable before the intervention and then changed to a statistically significant degree in the expected direction during the period of the intervention. The BDI and AFI findings are consistent with those of Gonzalez *et al.* (2009). That Brooding declined throughout the intervention is in line with the expectation that it would distract the person and disengage them from maladaptive rumination. This corresponds with findings from earlier intervention research related to depression and pleasant activities (Lewinsohn & Graf 1973, Lewinsohn 1975, Ludman *et al.* 2003, Cuijpers *et al.* 2007) and depression and distraction (Craft 2005), and is in line with theories which propose that distracting activities are beneficial in

depression (Watkins *et al.* 2000, Nolen-Hoeksema *et al.* 2008).

The low levels of being away and fascination at home and the fairly high levels on the farm suggest that participants' opportunities for attentional restoration improved when changing to the farm environment and engaging in TH activities. Moreover, it appears that the perception of those restorative qualities at the farm remained stable throughout the intervention. FA and BA were, however, somewhat lower than reported by Gonzalez *et al.* (2009). This might be due to poorer weather and conditions for cultivating during the present intervention, which may have meant relatively restricted activities and possibilities for engagement of effortless attention.

We also aimed to investigate the mediating roles of being away and fascination. Our data are in line with the expectation that an increase in BA and FA from home to farm would mediate decline in depression severity and improvement in attentional capacity. We did not find similar evidence for mediation of decline in rumination.

We further expected that decline in rumination would mediate decline in depression severity. In this respect, our results did not match expectations; the decline in Brooding did not predict the amount of decline in BDI. Expectations regarding rumination were also not fulfilled in other respects; the decline in Brooding did not predict increase in AFI, nor was it predicted by the increases in BA and FA. These results may owe to relatively low levels and limited variability in measured Brooding.

Finally, with regard to assessment of active components, we expected that increase in perceived attentional capacity would promote decline in depression severity. The results of the regression analysis are in line with this expectation. Increase in AFI did appear to mediate decline in BDI scores.

We also aimed to assess the persistence of benefits after the intervention. BDI remained statistically significantly lower at T6 than T2, which implies that change during the intervention persisted 3 months later. AFI decreased and Brooding increased after T5; each differed only moderately from its T2 level. The participants appeared to benefit from the TH intervention while participating, but to maintain improvement it may be necessary to stay in a programme like TH.

Despite its limitations, this study has important strengths. To our knowledge, this is the first prospective study using mediation analysis in investigating active components in TH. As such, it answers the call for new strategies in depression care (Ebmeier *et al.* 2006) and for investigation of active components in these therapeutic approaches (Fletcher *et al.* 2007). In important respects the study replicates the findings of Gonzalez *et al.* (2009). Further, the sample was relatively

### What is already known about this topic

- Increase in pleasant activities alleviates depression.
- Beneficial effects of therapeutic horticulture have been reported for anxiety and depressive symptoms in heterogeneous mental health populations.
- Therapeutic horticulture appears to alleviate depression severity and improve perceived attentional capacity in clinical depression.

### What this paper adds

- Psychological distance from everyday demands, together with positive distraction and engagement of effortless attention, appear to mediate decline in depression severity and increase in perceived attentional capacity when using therapeutic horticulture.
- Reduction of severity of depression persisted for up to 3 months after the conclusion of the therapeutic horticulture intervention.

### Implications for practice and/or policy

- Therapeutic horticulture is easy to implement as a nursing strategy for clients suffering from clinical depression.
- In- and outpatient clinic staff should consider the therapeutic potential in their surrounding environment and gardens.

homogeneous for a study of TH and was comprised of people diagnosed according to accepted procedures. The use of multiple measurement points, including a double baseline for all measures, a triple baseline for BDI scores, and follow-up at 3 months allowed us to look at stability and change in outcomes in comparison with taking part vs. not taking part in the intervention.

### Conclusion

Our study replicates and extends the study reported in Gonzalez *et al.* (2009). Thus, it helps to fill the gap in research on TH in mental health care and further illustrates the potential utility of attention restoration theory for the design and assessment of nature-based interventions. Researchers could further examine being away and fascination as potential mediators of rumination, and this should be done with larger samples and comparison conditions. Given the ease with which TH activities can be facilitated, the findings might inspire clinicians of any profession dealing

with clinical depression to inform clients and colleagues about the potential benefits of horticultural or other nature-based activities.

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### Conflict of interest

None of the authors had economic interests in the project.

### Author contributions

MTG, TH, GGP, EWM and MK were responsible for the study conception and design. MTG performed the data collection. MTG, TH and GGP performed the data analysis. MTG and TH were responsible for the drafting of the manuscript. TH, GGP, EWM and MK made critical revisions to the paper for important intellectual content. TH provided statistical expertise. TH and GGP obtained funding. MTG, TH, GGP, EWM and MK provided administrative, technical or material support. TH, GGP, EWM and MK supervised the study.

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## **PAPER III**



1 FEATURE ARTICLE

2  
3 A prospective study of group cohesiveness in  
4 therapeutic horticulture for clinical depression  
5  
6

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14  
15 **ABSTRACT:** This study aimed to assess changes in psychological distress and social participation in  
16 clinically-depressed adults during and after participating in a therapeutic horticulture programme,  
17 and to investigate if the changes covaried with levels of group cohesiveness during the intervention. An  
18 intervention with a single-group design was repeated with different samples in successive years  
19 (pooled n = 46). In each year, five groups of 3–7 participants went through the intervention. Data were  
20 collected before, twice during, and immediately after a 12-week therapeutic horticulture programme,  
21 as well as at 3-months' follow up. Mental health assessments included the Beck Depression Inventory,  
22 the State Subscale of Spielberger State-Trait Anxiety Inventory, the Positive Affect Scale from the  
23 Positive and Negative Affect Scale, the Perceived Stress Scale, and the Therapeutic Factors Inventory–  
24 Cohesiveness Scale. The analysis of the pooled data confirmed significant beneficial change in all  
25 mental health variables during the intervention. Change from baseline in depression severity persisted  
26 at 3-months' follow up. Increased social activity after the intervention was reported for 38% of the  
27 participants. The groups quickly established strong cohesiveness, and this continued to increase during  
28 the intervention. The average level of group cohesiveness correlated positively, but not significantly,  
29 with change in all mental health outcome variables.

30 **KEY WORDS:** affect, anxiety, depression, group process, perceived stress.

31  
32 **BACKGROUND**

33 Depression is a serious health issue that has a tendency to  
34 recur and become chronic (Evans & Charney 2003;

35  
36  
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43 Author contributions: All authors contributed to the conception and  
44 the design of the study; MTH performed the data collection. MTH, TH,  
45 and GGP performed the data analysis. All of the authors contributed to  
46 the writing of this article.

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World Health Organization 2001); it is often associated  
with work disability (Lopez & Murray 1998; Ustun 1999).  
Beneficial treatments include cognitive behavioural and  
interpersonal psychotherapies and antidepressant medi-  
cations (Butler *et al.* 2007). Therapies based on behav-  
ioural activation (Cuijpers *et al.* 2007; Gawrysiak *et al.*  
2009; Hopko *et al.* 2004; Lejuez *et al.* 2001) and an  
increase in enjoyable activities are also reported to be  
beneficial (Hammen & Glass 1975; Jorm *et al.* 2002;  
Lewinsohn & Graf 1973; Zeiss *et al.* 1979). Evidence also  
suggests that physical exercise alleviates depression  
(Mead *et al.* 2009).

Therapeutic horticulture (TH) is a nature-based inter-  
vention that involves social and behavioural activation,  
participation in enjoyable activities, and moderate levels

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97

of physical activity in pleasant surroundings. The present paper reports on change in mental health assessed in a TH intervention for clinical depression that was implemented within small groups. The study addresses the possibility that group cohesiveness promotes beneficial change.

**Therapeutic horticulture**  
TH is 'a process that uses plant-related activities through which participants strive to improve their well-being through active or passive involvement' (GrowthPoint 1999, p. 4). It includes easy gardening activities, in which a person engages with nature and gains distance from everyday demands. Across cultural and national borders, TH is both a new and old strategy in nursing practice and research (Cooper Marcus & Barnes 1999; Hansen-Ketchum *et al.* 2009; Maller *et al.* 2006; Meehan 2003; Page 2008). In the UK, the term 'social horticulture' is often used instead of TH, indicating that beside its horticultural aspect, it also has a relational and social therapeutic potential (Sempik *et al.* 2003). This makes it even more relevant for nursing practice.

Despite its long clinical tradition in mental health care, there are few published studies of the use of TH for mental health problems (Sempik *et al.* 2003). Beneficial effects have been reported for anxiety (Lee *et al.* 2004; Stepney & Davis 2004) and depressive symptoms (Stepney & Davis 2004) in heterogeneous samples. Declines in depression severity, together with improvement in perceived attentional capacity, were reported for a TH intervention in clinical depression by Gonzalez *et al.* (2009). Increased social interaction was reported to be associated with levels of group integration in healthy individuals (Cho & Mattson 2004).

#### Depression and psychosocial issues

Depression is characterized by low levels of positive affect (Joiner & Timmons 2009). It is also highly comorbid with anxiety (Boland & Keller 2009) and associated with stress (Bergdahl & Bergdahl 2002; Melchior *et al.* 2007; Pedrelli *et al.* 2008) and reduced interest in activities (American Psychiatric Association 2000). Depression also has notable interpersonal and social aspects, including shyness (Alfano *et al.* 1994; Elovainio *et al.* 2004), interpersonal dependency (Mazure *et al.* 2000; Sanathara *et al.* 2003), and an anxious attachment style (Reinecke & Rogers 2001; Roberts *et al.* 1996). Interpersonal stress and excessive reassurance seeking are reciprocally involved with depression (Joiner & Timmons 2009). Depression is further characterized by social withdrawal

and low self-reported social skills ratings (Huprich *et al.* 2004; Joiner & Timmons 2009). Poor social skills have been reported to predict depression recurrence (Bos *et al.* 2007).

#### Depression and behavioural activation

Depression is also associated with inactivity, high levels of behavioural inhibition (behavioural avoidance) (Kasch *et al.* 2002; Stone & Quartermain 2005), and a lack of socially reinforcing activities related to 'active leisure' (Barge-Schaapveld *et al.* 1995).

Behavioural activation as a strategy in the treatment of depression is rooted in the behavioural tradition in psychology and was established by Lewinsohn (1974). Behavioural activation aims to move the patient from a lifestyle of behaviour avoidance into a lifestyle that is activity based (Dimidjian *et al.* 2006; Hopko *et al.* 2003). This psychotherapeutic process combines activation through positively reinforcing activities with psychotherapy sessions addressing behavioural avoidance patterns (Hopko *et al.* 2003). In the present study, we look at TH as a single behavioural activation strategy, without the coordinated psychotherapy sessions. Behavioural activation alone might be as effective as the therapeutic strategy that also includes psychotherapy for behavioural avoidance (Jacobson & Gortner 2000).

#### Group cohesiveness as a therapeutic quality in group activities

Group psychotherapy is effective in alleviating symptoms of depression (McDermut *et al.* 2001). Group participation has the potential to address a core variable in the course of depression, namely interpersonal functioning and support (Brown & Moran 1994).

The primary therapeutic factor related to psychotherapy in groups is group cohesiveness (Yalom 1995). Group cohesiveness involves a sense of belonging, experience of acceptance, mutual trust, and group cooperation (Lese & MacNair-Semands 2000). As group cohesiveness represents the investments in and commitment to the group by its members, it is a quality that any group formation might develop, no matter its task or focus. In cohesive groups, the members feel engaged and mutually rewarded with a feeling of being uplifted and affirmed after the group meeting (Hornsey *et al.* 2009). Following this, the development of cohesiveness might yield therapeutic benefits and facilitate social skills improvement (Bernthal & Insko 1993; Ettin 1999). In this study, we investigate the contribution of cohesiveness in a group-based TH intervention for clinical depression.

(1 = not at all; 4 = to a great degree), with a possible maximum score of 80. The test has good construct validity and test-retest reliability. In the present study,  $\alpha$  fell between 0.88 and 0.93 across the measurement points.

We measured positive affect with seven items from the Positive and Negative Affect Scale (PANAS-PA) (Watson *et al.* 1988). Participants rated the extent to which they currently experienced the following affects: interested, strong, enthusiastic, inspired, proud, alert, strong, and active (1 = very little; 5 = extremely). The PANAS-PA has good internal consistency and is sensitive to mood fluctuations. In the present study,  $\alpha$  fell between 0.89 and 0.92 across the measurement points for the seven items.

The Perceived Stress Scale (PSS) contains 14 items concerning the degree to which general situations in one's life are appraised as stressful (Cohen *et al.* 1983). The four-item version that we used exhibits good predictive validity (Cohen & Williamson 1988). It includes two positively- and two negatively-stated items, aimed at assessing the frequency of experiences of stress during the preceding 4 weeks (0 = never; 4 = very often), with a maximum possible score of 16. In the present study,  $\alpha$  fell between 0.53 and 0.66 across the measurement points.

The Therapeutic Factors Inventory Cohesiveness Scale measures socio-emotional aspects of group cohesion (Lese & MacNair-Semands 2000) and addresses group therapeutic factors described by Yalom (1995). Of the subscale's nine items, we selected seven that reflect a group member's general sense of belonging and experience of acceptance, trust, and group cooperation (Strauss *et al.* 2008). Responses are rated on a seven-point scale (1 = strongly disagree; 7 = strongly agree). A test-retest reliability of 0.93 over 1 week and  $\alpha = 0.90$  were reported for this measure with all nine items (Lese & MacNair-Semands 2000). In the present study, with seven items,  $\alpha$  fell between 0.90 and 0.93 across the measurement points.

The social aspect of TH was also addressed with a single question about whether the participants considered the social dimension of TH as important (1 = totally agree; 5 = totally disagree). Further, at the end of the intervention, the participants were asked to report whether the level of their social activity had increased. At the 3-month follow up, they reported on the level of their social activity after the intervention. The participants were also asked to answer, in writing, one open question: How did you experience taking part in the TH project?

#### Procedure

Potential participants addressed themselves directly to the lead researcher by telephone, and they received information about the project, an informed consent sheet, and

the BDI by mail. Upon receiving their informed consent and completed BDI (screening, baseline 1, T1), the researcher contacted the potential participant by telephone and obtained a DSM-IV diagnosis with the Mini-International Neuropsychiatric Interview (MINI) (Sheehan *et al.* 1998). Different studies have demonstrated the reliability of such a telephone interview (Cacciola *et al.* 1999; Crippa *et al.* 2008; Rohde *et al.* 1997). Those who satisfied the MINI criteria for depression were included in the study.

After recruitment and inclusion, the participants were sent questionnaires by mail. In 2008, we had only two baseline assessments (T1 and T2) for BDI. In 2009, we also had double-baseline (T1 and T2) for all the outcome measures. The questionnaires at the intervention start (T2) were sent together with information on practical issues and information about the farm. Beyond T1 and T2, the measurement points were as follows: after 4 weeks (T3) and 8 weeks (T4) for BDI and TFI-CS (cohesiveness), after 12 weeks (i.e. termination of the intervention) (T5) for all variables, and at 3-months' follow up (T6) for the BDI, STAI-SS, PANAS-PA, and PSS. Questionnaires were sent at each measurement point and returned by mail to the researcher within a couple of days. On occasion, a participant was called and reminded to return the completed forms.

#### Ethical considerations

The study was approved by the Regional Committee for Medical Research Ethics in Norway and the Norwegian Social Science Data Services. The participants received printed information about the project with the invitation to participate, and they provided written, informed consent.

#### Statistical analysis

We used repeated measures ANOVA (RM-ANOVA) to assess stability across baseline measurement points (T1, T2) for depression severity (BDI), anxiety (STAI-SS), positive affect (PANAS-PA), and perceived stress (PSS). As a double baseline was available for BDI in both 2008 and 2009, we used the data from both samples for the check of stability in that measure, and included year as a between-subject factor to check the comparability of the samples in levels of and pre-intervention change in depression severity. The assessment of pre-intervention stability in the other outcomes was made with the data for the 2009 sample only.

In a second set of RM-ANOVA, we assessed change over the course of the intervention for the BDI, STAI-SS, PANAS-PA, PSS, and TFI-CS. Using the pooled data, we

1 **Study aims**

2 The primary aim of this study was to assess the covariation  
3 of changes in depression severity, anxiety, positive affect,  
4 and perceived stress levels with the level of group cohe-  
5 siveness in a clinically-depressed sample during and after  
6 a TH intervention. Another aim was to investigate how  
7 the participants evaluated the social dimension of TH.  
8 This study used data from an intervention implemented  
9 with two separate samples. Pooling of the data enabled us  
10 to address an additional aim: to determine whether  
11 change measured during and after the TH intervention  
12 varied across samples.

13  
14 **METHODS**

15 **Design**

16 We employed a single-group, within-subjects design with  
17 two samples in two successive years (2008 and 2009).

18 **Participants**

19 We included adults with DSM-IV major depression, dys-  
20 thymia, or depressive phase of bipolar II disorder, and a  
21 Beck Depression Inventory (BDI) score  $\geq 15$ . We  
22 excluded people with borderline personality disorder,  
23 eating disorders, post-traumatic stress disorder, schizo-  
24 phrenia, addictive problems that could not be controlled  
25 6 months prior to the commencement of the study, those  
26 presently hospitalized in a psychiatric unit, and those who  
27 enjoyed gardening as a leisure activity. Participants were  
28 mainly recruited through advertisements in newspapers,  
29 but in 2009, they were also recruited from the register of  
30 the Norwegian Labour and Welfare Administration.  
31 Fifty-one participants fulfilled the criteria: 21 in 2008, and  
32 30 in 2009. In the 2 years, five participants dropped out  
33 early in the intervention, one due to the recurrence of  
34 serious cancer, one due to a vocational rehabilitation  
35 opportunity, two because of psychological distress, and  
36 one for an unknown reason. The remaining 46 completed  
37 the intervention ( $n_{2008} = 18$ ,  $n_{2009} = 28$ ). The participants  
38 (10 men, 36 women) ranged in age from 25 to 65 years  
39 (mean = 46.3, SD = 11.6). Seven had bipolar II disorder,  
40 with the most recent episode depressive; 38 had major  
41 depressive disorder (recurrent); and one had major  
42 depressive disorder (single episode). The 2008 and 2009  
43 samples were statistically equivalent in terms of sex com-  
44 position ( $P = 0.717$ ) and mean age ( $P = 0.112$ ). At the  
45 3-month follow up, 41 participants completed and sent in  
46 the questionnaires.

47 Medical information from a general practitioner (GP)  
48 on ongoing treatment was obtained for 40 participants.

50 Each participant brought a form to his or her GP, who  
51 thereafter filled out the form in cooperation with the  
52 participant. The participant then sent the form to the  
53 researcher. Thirteen participants attended psychotherapy  
54 of varying intensity as the only treatment, one received  
55 antidepressant medication only, and 24 received a com-  
56 bination of these. Two participants who did not receive  
57 any treatment at the time of recruitment were advised to  
58 consult their GP.

59 **Research settings**

60 The present study was part of a larger 'green care' project  
61 on mental health benefits of therapeutic activities in farm  
62 settings. Four urban farms with strong historical and cul-  
63 tural identity were selected for the TH project. The farms  
64 were easy to access either by bicycle, car, or bus from  
65 where the participants lived. The farmers were given  
66 basic instructions prior to the intervention and received  
67 continuing support from the researcher during the inter-  
68 vention periods. For more information on 'green care'  
69 approaches, see Hassink *et al.* (2010).

70 **Intervention**

71 The 12-week TH intervention included ordinary and easy  
72 gardening activities. The activities were not part of the  
73 ordinary farm work. Participation implied attendance  
74 twice a week in 3-hour TH sessions as a group activity.  
75 The TH sessions also allowed alone time. The participants  
76 continued their ordinary treatment during the interven-  
77 tion. The groups included 3–7 participants. Mean atten-  
78 dance was 18.4 for 24 sessions. For more details about the  
79 intervention and research setting, see Gonzalez *et al.*  
80 (2009).

81 **Outcome measures**

82 The BDI was used to measure depression severity (Beck  
83 & Steer 1987). Each of the 21 items consists of four  
84 response options that are statements about current  
85 depressive symptoms. The value assigned to each state-  
86 ment ranges from 0 (normal) to 3 (most severe). Thus, the  
87 maximum score on the BDI is 63. The internal consis-  
88 tency and stability of the BDI are well established. It  
89 discriminates between patients with varying degrees of  
90 depression, and it accurately reflects changes in depres-  
91 sion intensity over time (Beck *et al.* 1988; Richter *et al.*  
92 1998). In the present study,  $\alpha$  fell between 0.79 and 0.90  
93 across the measurement points.

94 The State-Trait Anxiety Inventory–State Subscale  
95 (STAI-SS) was used to measure current anxiety (Spiel-  
96 berger *et al.* 1983). Participants rate how much they feel  
97 in line with 20 descriptions of possible present states

included year as a between-subject factor to assess whether change measured during the TH intervention was similar across years/samples, as reflected in a non-significant time-year interaction. For these analyses, we report Greenhouse-Geisser corrected degrees of freedom where appropriate. We used planned contrasts (Helmert) to determine when during the intervention BDI and TFI-CS changed most.

In a third set of RM-ANOVA, we assessed the persistence of change in the BDI, STAI-SS, PANAS-PA, and PSS at 3-months' follow up (T6), relative to the start of the intervention (T2). Again, pooling the data, we included year as a between-subject factor to assess whether the persistence of change after the TH intervention was similar across years/samples, as reflected in a non-significant time-year interaction.

Bivariate correlations (Pearson *r*) were calculated to assess the degree to which change in outcomes during the intervention, and persistence of change after the intervention, covaried with the average level of TFI-CS measured during the intervention (T3-T5). Change scores for the outcomes ( $\Delta$ BDI,  $\Delta$ STAI-SS etc.) were the differences between T2-T5 and T5-T6, calculated so that positive scores reflected improvement in mental health.

We applied a method proposed for small samples to check for type I errors stemming from the nesting of patients within groups (Baldwin *et al.* 2005). We repeated some analyses using group mean scores instead of individual scores. Given the small number of 'cases' (i.e. five

groups of patients in each year), this is a very conservative assessment of change.

Missing values on single items were replaced by the mean of the scores on the remaining items for the given individual. Five people did not complete the 3-months' follow up and were excluded from analyses involving T6 scores. The data were analyzed using SPSS version 17 (SPSS, Chicago, IL, USA).

In the examination of the written answers to the open question about the experience of participation in the TH project, we looked for significant statements, recurrent themes, and phrases related to the social component of the TH experience.

## RESULTS

### Stability in baseline scores

Over the two baseline measurement points, depression severity remained at a moderate level (Table 1). BDI scores declined modestly, but not significantly from T1 to T2,  $F(1,44) = 3.53$ ,  $P = 0.067$ , partial eta  $\eta^2 = 0.07$ . Neither the main effect of year nor the time-year interaction was significant ( $P = 0.152$  and  $P = 0.948$ , respectively), implying that the two samples had similar, stable levels of depression severity before the intervention.

In the 2009 sample, anxiety did decline modestly from T1 to T2, but the change was not significant ( $F(1,27) = 3.80$ ,  $P = 0.062$ , partial eta  $\eta^2 = 0.12$ ). Levels

TABLE 1: Means (standard deviations) for scores on the Beck Depression Inventory (BDI), Spielberger State Trait Anxiety-State Subscale (STAI-SS), Positive and Negative Affect Scale-Positive Affect (PANAS-PA), Perceived Stress Scale (PSS), and the Therapeutic Factor Inventory-Cohesiveness Subscale (TFI-CS) over the six measurement points (T1-T6)†

Measure	Year	T1	T2	T3	T4	T5	T6
		Baseline 1	Baseline 2 start	4 weeks	8 weeks	12 weeks' end	3-month follow up
BDI	Pooled	26.5 (7.4)	25.4 (7.9)	21.2 (6.6)	19.5 (7.4)	18.8 (7.8)	20.9 (9.5)
	2008	25.3 (6.3)	27.3 (6.8)	20.5 (6.2)	19.3 (7.0)	17.6 (7.4)	20.8 (9.0)
	2009	25.2 (7.8)	24.1 (8.4)	21.6 (7.0)	19.6 (7.7)	19.6 (8.0)	20.4 (10.3)
STAI-SS	Pooled	53.3 (11.4)	55.9 (10.4)			51.4 (9.3)	53.6 (10.8)
	2008		56.8 (8.8)			49.3 (9.4)	53.1 (10.4)
	2009		55.4 (11.4)			52.7 (9.2)	52.7 (11.4)
PANAS-PA	Pooled	2.09 (0.72)	2.25 (0.82)			2.51 (0.79)	2.36 (0.89)
	2008		2.37 (0.75)			2.75 (0.79)	2.42 (0.87)
	2009		2.18 (0.86)			2.36 (0.77)	2.34 (0.88)
PSS	Pooled	14.2 (2.4)	14.1 (2.3)			13.0 (2.3)	13.3 (2.4)
	2008		14.2 (2.4)			13.0 (2.4)	12.9 (2.7)
	2009		14.0 (2.2)			13.0 (2.3)	13.6 (2.3)
TFI-CS	Pooled			5.66 (0.97)	5.81 (0.94)	5.89 (0.96)	
	2008			5.78 (0.92)	5.57 (1.03)	5.82 (0.91)	
	2009			5.72 (0.95)	5.83 (0.98)	5.93 (0.99)	

†For T1-T5, pooled  $n = 46$ . For T6,  $n = 41$ .

also remained stable over the baseline measures for positive affect ( $F(1,27) = 1.17, P = 0.289$ , partial  $\eta^2 = 0.04$ ) and perceived stress ( $F(1,27) = 0.16, P = 0.692$ , partial  $\eta^2 = 0.01$ ).

### Change in mental health outcomes during the intervention

Change in all of the outcomes indicated improvement in mental health during the intervention in each of the two samples/years (Table 1). The main effect of time in the RM-ANOVA confirmed that the improvement from T2 to T5 was statistically significant for the BDI, STAI-SS, PANAS-PA, and PSS (Table 2). The overall levels of the outcomes and the patterns of change in the outcomes did not vary substantially across the samples/years, as reflected, respectively, in the non-significant main effect of year and the non-significant time-year interaction in each analysis (Table 2). Looking only at the BDI, planned contrasts indicated that the T2 mean BDI was significantly higher than the mean for T3–T5 ( $F(1,45) = 32.75$ ,

$P < 0.001$ , partial  $\eta^2 = 0.42$ ); the T3 mean was significantly higher than the mean for T4 and T5 ( $F(1,45) = 6.60, P = 0.014$ , partial  $\eta^2 = 0.13$ ), and the T4 and T5 means did not differ ( $F(1,45) = 0.86, P = 0.358$ , partial  $\eta^2 = 0.02$ ) (Table 1). These tests confirm the impression given by the means that most of the decline in depression severity occurred during the first 4 weeks of the intervention.

### Persistence of change in mental health outcomes after the intervention

Relative to baseline (T2), depression severity remained significantly lower at 3-months' follow up (Tables 1,2). The improvements in perceived stress, anxiety and positive affect had, however, dissipated to levels that no longer differed significantly from their respective T2 levels. The main effects of year and the time-year interactions were not significant (Table 2), indicating that the overall levels of the outcomes and the persistence of improvement at 3-months' follow up were similar across the two samples/years.

**TABLE 2:** Tests of change in scores on the Beck Depression Inventory (BDI), Spielberger State Trait Anxiety-State Subscale (STAI-SS), Positive and Negative Affect Scale-Positive Affect (PANAS-PA), and Perceived Stress Scale (PSS) during (T2–T5) and after (T2–T6) the therapeutic horticulture (TH) intervention†

Measure	Measurement point	Effect	F	P-value	Partial $\eta^2$
BDI	T2–T5	Time	20.94	<0.001	0.32
		Year	0.00	0.975	<0.01
		Time $\times$ year	3.59	0.065	0.08
	T2–T6	Time	13.76	0.001	0.26
		Year	0.52	0.474	0.01
		Time $\times$ year	0.94	0.339	0.02
STAI-SS	T2–T5	Time	9.49	0.004	0.18
		Year	0.16	0.696	<0.01
		Time $\times$ year	2.15	0.150	0.05
	T2–T6	Time	2.82	0.101	0.07
		Year	0.24	0.629	0.01
		Time $\times$ year	0.29	0.595	0.01
PANAS-PA	T2–T5	Time	5.48	0.024	0.11
		Year	1.94	0.170	0.04
		Time $\times$ year	0.75	0.391	0.02
	T2–T6	Time	1.52	0.225	0.04
		Year	0.80	0.378	0.02
		Time $\times$ year	0.16	0.687	<0.01
PSS	T2–T5	Time	9.63	0.003	0.18
		Year	0.02	0.899	<0.01
		Time $\times$ year	0.10	0.758	<0.01
	T2–T6	Time	3.67	0.063	0.09
		Year	0.00	0.983	<0.01
		Time $\times$ year	2.14	0.151	0.05

†For BDI, degree of freedom (df) = 2.46, 108.42 for the analysis of T2–T5 change. For the other measures, df = 1, 44 for analyses of T2–T5 change, and df = 1, 39 for the analyses of T2–T6 change. Year is included as a between-subject factor to determine whether the pattern of change varies across groups taken through the TH intervention in the two successive years.

Change in group cohesiveness during the intervention

The level of group TFI-CS (cohesiveness) was high after 4 weeks of treatment, and it increased slightly during the following weeks (T3–T5:  $F(1,69,76.2) = 3.21, P = 0.054, \eta^2 = 0.067$ ). Planned contrasts showed that the mean TFI-CS score at T3 was significantly lower than the mean T4–T5 scores ( $F(1,45) = 4.04, P = 0.050$ , partial  $\eta^2 = 0.08$ ); the T4 and T5 means did not differ ( $F(1,45) = 1.30, P = 0.260$ , partial  $\eta^2 = 0.03$ ) (Table 1). Neither the main effect of year nor the time–year interaction was significant ( $P = 0.714$  and  $P = 0.836$ , respectively); levels of and change in TFI-CS were similar across samples/years.

Correlations between cohesiveness and changes in the outcome measures

The level of group TFI-CS correlated positively with improvements in each of the mental health outcome measures (Table 3); however, none of the correlations were significant. This might have resulted from the restriction of range in the TFI-CS variable; scores were, with only one exception, above the mid-point of the scale (see Table 1).

Analysis of aggregated data

To address the concern of the inflated type 1 error rate with the analysis of data from individuals nested in groups, we checked our conclusions about change in the mental health outcome measures by treating the 10 different groups over the two seasons as cases. Taking the group means from T2–T6 as the data, the RM-ANOVA largely affirmed the results obtained with the individual-level data; the decline in aggregated scores over the course of the intervention (T2–T5) was statistically significant for the BDI ( $F(3,24) = 25.57, P < 0.001$ , partial  $\eta^2 = 0.76$ ), STAI-SS ( $F(1,8) = 9.19, P = 0.014$ , partial  $\eta^2 = 0.55$ ), and for PSS ( $F(1,8) = 21.66, P = 0.002$ , partial  $\eta^2 = 0.73$ ). The same could not be said for the PANAS-PA ( $F(1,8) = 2.87, P = 0.129$ , partial  $\eta^2 = 0.26$ ).

TABLE 3: Correlations between the average level of scores on the Therapeutic Factor Inventory–Cohesiveness Scale during the therapeutic horticulture (TH) intervention and change in scores on the Beck Depression Inventory ( $\Delta$ BDI), Spielberger Trait Anxiety State Subscale ( $\Delta$ STAI-SS), Positive and Negative Affect Scale–Positive Affect ( $\Delta$ PANAS-PA), and Perceived Stress Scale ( $\Delta$ PSS) between T2 and T5, and between T5 and T6†

Time	$\Delta$ BDI	$\Delta$ STAI-SS	$\Delta$ PANAS-PA	$\Delta$ PSS
T2–T5				
r	0.043	0.242	0.235	0.059
P-value	0.778	0.104	0.116	0.697
T5–T6				
r	0.230	0.291	0.146	0.073
P	0.147	0.065	0.362	0.651

†From T2–T5,  $n = 46$ . From T5–T6,  $n = 41$ .

The RM-ANOVA with the group-level data also affirmed the persistence of change in some of the mental health outcomes from baseline to 3-months' follow up (T2–T6). For the BDI,  $F(1,8) = 21.02, P = 0.002$ , partial  $\eta^2 = 0.72$ ; for the STAI-SS,  $F(1,8) = 4.98, P = 0.056$ , partial  $\eta^2 = 0.38$ ; for the PANAS-PA,  $F(1,8) = 2.35, P = 0.16$ , partial  $\eta^2 = 0.23$ ; and for the PSS,  $F(1,8) = 7.75, P = 0.024$ , partial  $\eta^2 = 0.49$ . The results of these conservative tests strengthen confidence in the individual-level results for the BDI, STAI-SS, and PSS. They do suggest, however, that the individual PANAS-PA results should be regarded with some caution.

Exploration of the group dimension

The majority of the participants (93%) answered from 'agree' to 'totally agree' that the social component of TH intervention was important. After 12 weeks of intervention (T5), 38% of participants reported that their social activity level had increased. Of those who provided data at T6, 31% still had increased social activity at the 3-month follow up, implying that the increase was stable over the period.

The qualitative data related to the theme 'significance of group membership' emphasized that being in a group was important. Participants expressed appreciation of the group atmosphere and group composition. Mutual trust and respect, possibilities for being oneself in the group, being together with people in the same situation, and improvement in social security were highlighted. However, some participants felt that participation in the group had been challenging, especially as a sole man in a group. The participants would have wanted to continue in the TH programme, expressed sadness that it had concluded, and hoped for it to become permanent in the future.

DISCUSSION

We found no significant changes across baseline BDI scores in the pooled data set, and no significant changes across baseline scores for anxiety, positive affect, and perceived stress in the 2009 data. This implies that the level of distress was stable during the period prior to the intervention, and that receiving treatment as usual during that period did little to reduce symptoms.

1 Depression severity, anxiety, and stress declined  
2 during the intervention, while positive affect increased.  
3 Depression severity had already declined significantly  
4 after 4 weeks of TH intervention and continued to do so  
5 in the following 4 weeks. These findings are in line with  
6 the results of Stepney and Davis (2004) and Lee *et al.*  
7 (2004) in TH research. The findings also fit well with  
8 studies on depression and enjoyable activities (Lewinsohn  
9 & Graf 1973; Zeiss *et al.* 1979) and a meta-analysis related  
10 to behavioural activation treatments of depression  
11 (Cuijpers *et al.* 2007).

12 At the 3-month follow up, the mean BDI still remained  
13 significantly lower than baseline. In contrast, scores on  
14 the STAI-SS, PANAS-PA, and PSS showed some relapse.

15 We did not find that the pattern of change differed  
16 from one year to the next in any of the analyses of change.  
17 This was true for the analyses of change during the interven-  
18 tion, as well as for the analyses of the persistence of  
19 change after the intervention. This means that despite  
20 different weather conditions, participants, group cultures,  
21 and so on, the findings were in essence replicated. This  
22 reinforces confidence in the results.

23 **07** The high and fairly stable levels of group TFI-CS  
24 (cohesiveness) underline the importance of the group  
25 throughout the intervention. The slight increase in  
26 TFI-CS during the intervention suggests that the groups  
27 became still more important to their members as time  
28 went by, which might also explain the sadness experi-  
29 enced when concluding the project. However, it is impor-  
30 tant to bear in mind that the intent of the TH intervention  
31 was not to strengthen group processes, as it also provided  
32 possibilities for being alone. Despite this, considering that  
33 all 10 groups developed high levels of group cohesiveness  
34 and acted as well-functioning groups, it is tempting to  
35 assume that the TH activities fostered benign group pro-  
36 cesses. This assumption is supported by the fact that com-  
37 mitment to the group task is the strongest component in  
38 establishing group cohesiveness (Mullen & Copper 1994).

39 The uniformly positive correlations between improve-  
40 ment in the mental health outcomes and the general level  
41 of group cohesiveness are consistent with the idea that  
42 group cohesiveness serves beneficial change. The correla-  
43 tions were, however, uniformly non-significant, and the  
44 strongest was only moderate in size. Arguably, any contri-  
45 bution of group cohesiveness to beneficial change would,  
46 according to the present results, have been quite modest  
47 at most. However, the severely restricted range of cohe-  
48 siveness scores might have worked against the detection  
49 of stronger correlations with change in the outcomes. The  
50 change in outcomes might of course also be due to  
51 reasons other than group cohesiveness. The strongest cor-

relations between group cohesiveness were for change in  
anxiety during and after the intervention. Given the asso-  
ciations between depression and social skills difficulties  
(Huprich *et al.* 2004; Joiner & Timmons 2009), participa-  
tion in the TH group activities might have led to  
decreased social anxiety and increased social skills. This  
might explain why the participants evaluated the social  
aspect of the TH intervention so positively. It might also  
explain why social activity had increased for more than  
one-third of the participants by the end of the interven-  
tion and at the 3-months' follow up.

The qualities of the experience of participating in the  
group, reported in the open-ended data, appear to be  
closely related to an important therapeutic factor in group  
psychotherapy, namely, universality (Yalom 1995). Uni-  
versality has to do with the participants' experience of  
sharing much in common, and it can work to strengthen  
group cohesion. The sadness the participants expressed  
concerning the end of the project, as well as their hopes for  
it to be permanent, also give an indication that the partici-  
pants attached significance to each other and to the group  
as a whole. The fact that 93% answered that the social  
component of the TH intervention was important gives  
some indication of how to organize a TH programme for  
clinically-depressed clients in clinical settings.

The present study has several limitations. First, we did  
not have a control group, and this limits conclusions about  
causation. The data collection was planned and approved  
as a randomized control design, but despite extensive  
efforts at recruiting participants in both intervention  
periods, we did not succeed in enrolling a large number of  
participants. In addition, candidates for participation  
expressed hesitation about entering a control group.  
Given the likelihood of losing a large proportion of an  
already small sample, we decided in each season to adopt  
a single-group design. Although the multiple measure-  
ment structure we adopted enabled us to track change in  
conjunction with participation (Shadish *et al.* 2002), we  
still cannot with complete confidence attribute the mea-  
sured changes to the TH intervention. Likewise, with the  
recruitment procedure we used, we have to assume that  
the participants were motivated to change their condition,  
and so were likely to notice some improvement. Despite  
this, even highly-motivated participants can become  
demotivated by aspects of an intervention. We observed  
few such problems with our participants.

Another limitation of the study has to do with the lack  
of an early measure of group cohesiveness (e.g. obtained  
after one or two sessions). This hindered investigation of  
the development of group cohesiveness as a possible  
mediator of beneficial change.

## THERAPEUTIC HORTICULTURE IN DEPRESSION

9

1 Despite its limitations, this study has important  
2 strengths. First, the use of multiple measurement points,  
3 including double baselines and a follow up, provided  
4 some leverage for distinguishing change due to the inter-  
5 vention from change per se (i.e. with ongoing psycho-  
6 therapy and medication). Second, the multiple measures  
7 also enabled a determination that the most substantial  
8 change in depression severity took place in the initial  
9 weeks of the intervention. Third, when implemented with  
10 two different samples in successive years, the intervention  
11 yielded similar results. This indicates that despite the  
12 various differences across years, mental health improved  
13 following the start of the intervention, after a period of  
14 relatively stable symptoms of distress prior to the inter-  
15 vention. Fourth, responses to the open question about the  
16 group experiences affirm the importance assigned to the  
17 group, as also seen in the high cohesiveness scores.

## 18 CONCLUSIONS AND RESEARCH 19 RECOMMENDATIONS

20 The findings suggest that TH can be a beneficial supple-  
21 mentary intervention in clinical depression. Organizing  
22 TH as a group activity is relevant and feasible. It can easily  
23 be implemented in inpatient and outpatient nursing prac-  
24 tice, bearing in mind that participants at times have a  
25 need for being and working alone.

26 Further research can sharpen the focus on social  
27 aspects of TH by investigating the development of group  
28 cohesiveness as a mediator of beneficial change in the  
29 therapeutic process. It can also consider whether TH, as  
30 group-based behavioural activation, contributes to  
31 improved interpersonal style and social skills. Studies with  
32 a randomized control trial design would be helpful, but in  
33 our experience, it is difficult to implement, especially with  
34 a long TH programme in an area with a short growing  
35 season. An alternative approach that might be imple-  
36 mented in lower latitudes or in greenhouse settings could  
37 involve staggering the start dates, so that some partici-  
38 pants start the programme 4 weeks before others. Our  
39 data indicate that most of the reduction in depression  
40 severity occurs during the first 4 weeks of intervention.

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## **PAPER IV**



Running head: Therapeutic Horticulture in Clinical Depression

**A Prospective Study of Existential Issues in Therapeutic Horticulture for Clinical Depression**

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**ABSTRACT**

Two studies with single-group design ( $N_{\text{Study1}} = 18$ ,  $N_{\text{Study2}} = 28$ ) addressed whether horticultural activities ameliorate depression severity and existential issues. Measures were obtained before and after a 12-week therapeutic horticulture program and at 3-month follow-up. In both studies, depression severity declined significantly during the intervention and remained low at the follow-up. In both studies the existential outcomes did not change significantly; however, the change that did occur during the intervention correlated ( $\rho > .43$ ) with change in depression severity. Participants' open-ended accounts described the therapeutic horticulture experience as meaningful and influential for their view of life.

Keywords: horticultural therapy; major depression; life regard; sense of coherence; rehabilitation

Depression affects 5.8 % of all men and 9.5 % of all women worldwide in any given year (Fletcher et al., 2007). Depression tends to recur and become chronic (Evans & Charney, 2003; WHO, 2001), followed by increased risk for work disability (Lopez & Murray, 1998; Ustun, 1999). Cognitive-behavioural therapies, interpersonal psychotherapies and antidepressant medications are beneficial as separate treatments (Butler, Hatcher, Price, & von Korff, 2007). The evidence of beneficial treatments of depression within both cognitive-behavioural and bio-chemical theoretical frameworks fits with a conception of major depression as a multi-dimensional disorder. However, these treatment approaches, like the diagnostic procedures behind them, often ignore the existential dimension in depression (Close, 2000; Cullberg, 1996a, 1996b; Maxman & Ward, 1995). The potential significance of this dimension has also been addressed in empirical studies. For example, existential meaning is reported to be inversely associated with depression severity and positively associated with hope (Mascaro & Rosen, 2006).

The present research addresses the possibility that therapeutic horticulture (TH) can ameliorate existential issues while reducing the severity of depression. TH can be defined as “a process that uses plant-related activities through which participants strive to improve their well-being through active or passive involvement” (GrowthPoint, 1999, p.4). TH is a clinical strategy that has been widely used, across cultural and national borders throughout the history of psychiatry (Hansen-Ketchum, Marck, & Reutter, 2009; Maller, Townsend, Pryor, Brown, & St Leger, 2006; Meehan, 2003; Page, 2008). Despite its long clinical traditions, research on the use of TH in mental health care is scarce (Sempik, Aldrige, & Becker, 2003)

Some evidence indicates that TH may alleviate anxiety (Lee, Ro, & Lee, 2004; Stepney & Davis, 2004) and depression (Gonzalez, Hartig, Patil, Martinsen, & Kirkevold, 2009, 2010; Stepney & Davis, 2004). The results from studies regarding the influence of TH on quality of life vary; both non significant (Richards & Kafami, 1999; Sempik, 2007) and significant changes (Heliker, Chadwick, & O'Connell, 2000; Waliczek, Zajicek, & Lineberger, 2005) have been reported. Participants in TH programs have often reported that participation was a positive experience (Fieldhouse, 2003; Perrins-Margalis, 2000; Sempik, Joe, & Becker, 2005). Activities in gardens and the experience of nature more generally involve spiritual and existential issues, in non-clinical as well as clinical groups (Fredrickson & Anderson, 1999; Irvine & Warber, 2002; Kidd & Brascamp, 2004; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Unruh, 2000, 2004; Waliczek et al., 2005).

The present paper reports on two studies concerned with change in existential issues during a TH program for people with clinical depression. The studies were performed respectively in 2008 (Study 1) and 2009 (Study 2). In the following, we elaborate on the theoretical and empirical basis for the research.

## **EXISTENTIAL PERSPECTIVES ON DEPRESSION**

The existential paradigm addresses the “ultimate concerns” of human beings related to the thoughts, emotions and sensations that accompany the experience of existence (Frankl, 1963; King & Valle, 1978; Yalom, 1980). According to Frankl (1963, 1978), striving for meaning is a basic human need, a purpose and a life force. He looked upon lack of meaning as a worldwide problem, characterised by lack of interest and initiative, boredom and apathy (Frankl, 2000). Frankl (1978) named the phenomena existential frustration or existential vacuum and related them to the gap in modern life between nature and humans. Crumbaugh and Maholick (1964) found existential frustration or lack of purpose in life to be associated with depression. In an existential perspective in lines with Frankl’s theorizing, depression can be regarded as a crisis of meaning in life (Close, 2000).

Another existential perspective has been provided by Antonovsky (1979). A key concept in his salutogenic orientation to mental health is sense of coherence (SOC). This is an individual’s global view on how comprehensible, manageable and meaningful life is experienced to be with meaningfulness treated as its core dimension (Antonovsky, 1987). Depression can be looked upon as a breakdown in SOC (Carstens & Spangenberg, 1997).

## **EXISTENTIAL PERSPECTIVES ON THERAPEUTIC HORTICULTURE**

Existential issues have personal, social and physical dimensions. According to van Deurzen (1988) the physical dimension, or the natural world, is the most fundamental of these. Likewise the phenomenology of existence is concerned with “being in the world” (Heidegger, 1990; King & Valle, 1978). Meaning, or more specifically ‘terrestrial meaning’, can be created or discovered within the observable universe and involves experiencing oneself as part of a wider and greater existence (O’Connor & Chamberlain, 2000). For some people, tuning in to and acting within the natural world gives an existential sense of being, and is most often accomplished through leisure activities (Van Deurzen, 1988). Human existence might be attributed meaning as a dimension of belonging to nature and the biological world

(O'Connor & Chamberlain, 2000). Experienced continuity with nature and the biological world may be a particularly salient dimension of meaning in the context of TH.

Gardening is often described as a creative and spiritual leisure activity in which existential meaning can be achieved either through active (Clark, Wood, & Larson, 1998; Heliker et al., 2000; Trombly, 1995; Unruh, 2000) or passive experiences (Kaplan, 1973; Kaplan & Kaplan, 1989, 1990; Kaplan, 1995; Menninger, 1942). A garden can have personal meaning as a place of privacy, a place to anchor and understand nature, and a place where one can help care for the planet (Bhatti, 2006). Involvement with the natural environment may also activate a process of reflection that may help the person to extract meaning from the past and make plans for the future (Kaplan, 1983).

Meaning-making through gardening can also be described as a personal narrative involving the discovery of coherence in nature and one's own life story (Heliker et al., 2000; Kielhofner & Barrett, 1998; Ottosson & Grahn, 2008). Meaning may also be attached to aesthetic experiences through affective responses. According to Ulrich (1983), the human's first response to plants is affective, and this affective response, when it occurs, opens for the creation of meanings and memories. Nature and the garden, as environmental constructs, also serve as metaphors for diverse aspects of life: the great and the small, the beautiful and the ugly, growth and decay (Grut, 2003). Recognizing these metaphoric qualities of gardens might bring a person into closer contact with his or her own life cycle.

## **OBJECTIVES OF THE RESEARCH**

The present research stems from the convergence of two ideas. One is that depression has roots in existential issues such as a lack of meaning in life. The other is that people can create meaning through gardening and other forms of involvement with the natural world. These ideas converge on the possibility that TH can alleviate depression while at the same time addressing existential issues.

The research that we present here addressed this possibility in two successive studies. The aims of the studies were to assess changes in existential issues and depression severity in clinical depression during a 12-week TH intervention, as well as to assess the persistence of change at a 3-month follow-up. An additional aim was to investigate, through open-ended accounts, how the participants themselves experienced the TH intervention in existential terms. The two studies were methodologically identical in most respects, with the exception of the measure used to address the existential issues of interest here.

## **STUDY 1**

In the first study we addressed existential issues with the Life Regard Index – Revised version (LRI – R) (Debats, 1998). The items in the LRI-R tap issues regarding the degree to which the person has beliefs and values that provide a framework for life and experiences life as fulfilling. Several researchers have reported inverse associations between depression and existential issues measured with the LRI-R (Debats, 1990; Debats, Vanderlubbe, & Wezeman, 1993; Zika & Chamberlain, 1992).

### **Design and Participants**

We employed a single-group within-subject design with multiple measurement points. Recruitment targeted adults with DSM-IV major depression, dysthymia, or depressive phase of bipolar II disorder, and a Beck Depression Inventory (BDI) score  $\geq 15$ . We excluded people with eating disorders, PTSD, borderline personality disorder, schizophrenia, addictive problems out of control for the last 6 months, present hospitalization in a psychiatric unit, or having gardening as a leisure activity. Participants were mainly recruited through advertisements in newspapers. Eighteen participants fulfilled the criteria and completed the intervention. The participants (3 men, 15 women) ranged in age from 27 to 65 years ( $M = 49.7$ ). Of these, two had bipolar II disorder with most recent episode depressive and the remaining 16 had major depressive disorder. Medical information on ongoing treatment was obtained from their GPs. Four participants were receiving psychotherapy at varying frequency as their only treatment, and the remaining 11 were receiving a combination of psychotherapy and medication. Three participants did not receive any treatment and were encouraged to contact their GP. At the 3-month follow-up, 16 participants completed and sent in the questionnaires.

### **Research Setting**

The study was part of a larger “green care” project on the potential benefits of therapeutic activities in farm settings for people with mental health problems. For this study, four urban farms with strong historical and cultural identity were selected. The farms were easy to access either by bicycle, private cars or bus from where the participants lived. The farmers who facilitated the TH intervention were given basic instructions and received continuing support from the researcher during the project periods. For more information on “green care” see Hassink and colleagues (2010).

## Intervention

A 12-week TH program was developed for this project. It included ordinary and easy gardening activities, both active and passive. The active parts of the program included sowing, germinating, potting, planting, composing beds, cultivating vegetables, and rooting various cuttings of flowers and herbs. The passive parts included walking around, sitting on benches, picking flower bouquets, and watching birds, insects, butterflies, the weather and the landscape. Participation implied attendance in the TH activities twice a week in 3-hour group sessions with 3-5 participants. The TH sessions also allowed for being alone. The participants continued their ongoing treatment during the intervention. For more details on the intervention and research setting, see [AUTHOR NAME] et al. (2009).

## Outcome Measures

Severity of depression was measured with the Beck Depression Inventory (BDI), a 21-item self-report questionnaire (Beck & Steer, 1987). Each item consists of four statements about depressive symptoms, ranging from 0 (normal) to 3 (most severe). The maximum score on the BDI is 63. The internal consistency and stability of the BDI are well established. The instrument further demonstrates good discrimination between patients with varying degrees of depression, and it accurately reflects changes in depression severity over time (Beck, Steer, & Garbin, 1988; Richter, Werner, Heerlein, Kraus, & Sauer, 1998). In the present study,  $\alpha$  fell between 0.77-0.89 across the measurement points.

Existential issues were measured with the Life Regard Index – Revised version (LRI – R) (Debats, 1998), which was developed from the original LRI instrument of Battista and Almond (1973). The LRI-R consists of 28 items designed to assess the degree to which individuals have a framework for experience fulfilment of life (e.g., “*Life is deeply fulfilling*”; “*I just don’t know what I really want to do with my life*”). The measure is intended to be independent of particular values, and items do not refer to specific religious or political belief systems (Debats, 1999). Items are scored on a 3-point scale (1 = *disagree*; 2 = *neutral*; 3 = *agree*). The maximum possible score is 84. Reliability and construct validity are satisfactory (Debats, 1998), and the internal consistency on the LRI scale is reported to be high (Chamberlain & Zika, 1988; Debats et al., 1993). In the present study,  $\alpha$  fell between .79 - .92 across the measurement points.

The existential experience with TH was explored further with the following four items: “*Participation in therapeutic horticulture has contributed to change in my view of*

*life*”; “*Participation in therapeutic horticulture has given me aesthetic experiences*”; “*I have experienced working with plants and gardening as meaningful*”; “*Participation in therapeutic horticulture has given me a sense of taking care of nature*”. Responses to these items were given on 5-point scales (1 = *totally agree*; 5 = *totally disagree*). The participants were also asked to give written answers to one open-ended question: *How did you experience taking part in the therapeutic horticulture project?*

## **Procedure**

Potential participants addressed themselves directly to the researcher by telephone and received via post information on the project, an informed consent sheet and the BDI (screening). Upon receiving their informed consent and completed BDI, the researcher contacted the potential participant by telephone and completed the Mini-International Neuropsychiatric Interview (Sheehan et al., 1998). The interrater reliability of diagnoses through such a telephone interview has been demonstrated in multiple studies (Cacciola, Alterman, & Rutherford, 1999; Crippa et al., 2008; Rohde, Lewinsohn, & Seeley, 1997). After recruitment and inclusion (T1), the participants were sent questionnaires by post. The questionnaires sent just prior to the start of the intervention (T2) were sent together with information on practical issues and information about the farm. In Study 1 we had double baseline (T1 and T2) for BDI. Data collected at two other measurement points four and eight weeks into the program (i.e., T3 and T4) have been reported elsewhere [citations] and are not relevant for the present study. The remaining measurement points of relevance in this paper were at the conclusion of the 12-week program (T5) and three months after the conclusion of the program (T6). To avoid confusion with results reported in earlier papers, we will use the original nomenclature for measurement points. Thus, we will report results based on data collected at T1, T2, T5, and T6.

## **Ethical Considerations**

The studies were approved by the Regional Committee for Medical Research Ethics in [Country] and the [Country] Social Science Data Services. The participants received printed information about the project with the invitation to participate, and they provided written informed consent.

## Data Analysis

We used paired samples t-tests to assess stability across baseline measurement points (T1-T2), changes over the course of the intervention (T2-T5), and persistence of change at 3-month follow-up relative to the start of the intervention (T2-T6). Bi-variate correlations were calculated to assess the degree to which change in depression severity ( $\Delta$ BDI) from T2 to T5 and from T2 to T6 correlated with change in life regard ( $\Delta$ LRI-R) over the corresponding periods. The change scores for BDI and LRI-R were computed so that positive values would represent beneficial change. Non-parametric Spearman rho coefficients were calculated to reduce the influence of outlying values. Missing values on single items were replaced by the mean of the scores on the remaining items for the given individual. The data were analyzed using SPSS version 17.

A review of the responses to the open-ended question about the experience of the TH program was conducted, looking for recurrent themes and statements related to the existential issues of the experience of the TH.

## Results and Discussion

Depression severity remained stable over the baseline measurement points; the T2 BDI measure did not differ significantly from the measure at T1 (Table 1 and 2). This implies that the participants did not show diminished distress while waiting for the intervention to start and receiving their usual treatment.

BDI declined significantly over the course of the intervention and remained significantly lower at 3-month follow-up. This was however not accompanied by significant increase in life regard assessed with the LRI-R (Table 1 and Table 2).

To the extent that life regard did increase during the intervention (T2-T5), the change apparently corresponded with decline in depression severity. The correlation between  $\Delta$ LRI-R and  $\Delta$ BDI was moderate in size but not statistically significant ( $\rho = .44, p = .07$ ). We found a weaker positive correlation between  $\Delta$ LRI-R and  $\Delta$ BDI between the start of the intervention and the 3-month follow-up (T2-T6) ( $\rho = .24, p = .36$ ).

On the close-ended items about the TH intervention, 71.3% of the participants agreed with the statement "*Participation in therapeutic horticulture has contributed to change in my view of life*"; 94.4% agreed with the statement "*Participation in therapeutic horticulture has given me aesthetic experiences*"; 94.4% also agreed with the statement "*I have experienced working with plants and gardening as meaningful*"; and 83.3% agreed with the statement

*“Participation in therapeutic horticulture has given me a sense of taking care of nature”*. In responses to the one open-ended question, the participants described their participation in TH activities as meaningful, interesting and instructive. Their accounts especially focused on themes related to the excitement and absorption in following the growth process from seeds to plants, flowers, vegetables and herbs. Several of the participants discovered gardening as a new leisure activity for their future life.

The answers on these latter items were to a compelling degree positive; the participants apparently considered the TH experience as meaningful and reported that it had influenced their life regard. Their answers suggest that the TH program may indeed have offered them an existential experience of being in and taking part in TH as part of the natural world. The discrepancy between these answers and the outcomes measured with the LRI-R is however striking. Conceivably, the discrepancy was due to the choice of outcome measure. The LRI-R may have lacked sensitivity to change, or it may have treated existential issues more as trait-like phenomena than state-like phenomena. Given these possibilities, it was decided that the existential outcome measure should be changed for Study 2.

## **STUDY 2**

Study 2 was performed the year after Study 1. The methods used were in most respects the same. The major difference of relevance here was the change in outcome measure related to existential issues. We decided to use the Sense of Coherence Scale (SOC) (Antonovsky, 1987) for our further investigation of existential aspects of TH. The scale is meant to cover the construct (SOC) that is central to Antonovsky’s notion of salutogenesis. Previous research has reported inverse associations between SOC and depression severity (Carstens & Spangenberg, 1997; Sinikallio et al., 2006). Likewise suicidal ideation is associated and predicted by low levels of the SOC meaning subscale (Petrie & Brook, 1992).

### **Design and Participants**

Participants were recruited through advertisements in newspapers and the national register of the [Country] Labour and Welfare Administration. Twenty eight people fulfilled the criteria for inclusion (same as Study 1) and completed the intervention. They ranged in age from 25 to 64 years (Mean = 44.1). Of these, five had bipolar II disorder with most recent episode depressive, 22 had major depressive disorder – recurrent, and one had major depressive disorder – single episode. The sample in Study 2 was statistically equivalent to the

sample in Study 1 in terms of gender composition (Fisher's exact test,  $p = .72$ ) and mean age [ $t(44) = 1.62, p = .11$ ].

Medical information from their general practitioner on ongoing treatment was provided by 22 participants. Nine were receiving psychotherapy only at varying frequency, one was receiving antidepressant medication only, and 10 were receiving a combination of the two. Two participants were not receiving any treatment and were encouraged to contact their GP. At the 3-month follow-up, 25 participants completed and sent in the questionnaires.

### **Outcome Measures**

We again used the BDI to measure depression severity. In Study 2 the  $\alpha$  on BDI fell between .81 – .91 across the measurement points. In addition, we used the 13-item version of the Sense of Coherence Scale. The SOC13 (hereinafter SOC) was developed from the original 29-item version developed by Antonovsky (1987) and is reported to adequately represent the construct captured with the full version of the SOC scale (Antonovsky, 1993; Callahan & Pincus, 1995). The items address the degree to which participants experience various aspects of life as meaningful, comprehensible and manageable (e.g., *“In the past, have you been surprised by the behaviour of people whom you thought you knew well?; Do you feel that you are being treated unfairly?”* Responses are given on a 1-7 scale with verbal anchors at each end (e.g., for the above statements, respectively, *never happened – always happens; very often - very seldom*). The maximum total score of 91 indicates strong SOC. The SOC is well validated (Antonovsky, 1993; Flannery, Perry, Penk, & Flannery, 1994). Internal consistency and test-retest reliability are reported to be acceptable, e.g.,  $\alpha = .85$ ; (Eriksson, Lindstrom, & Lilja, 2007). In the present study,  $\alpha$  fell between .49 and .73 across the measurement points.

### **Results and Discussion**

As in Study 1, BDI scores remained stable over the baseline measurement points (T1-T2) (Table 3 and Table 4). The same was true for SOC scores. BDI declined significantly during the intervention and remained significantly lower at 3-month follow-up, relative to the measure at T2. SOC scores increased across measurement points, although not to a statistically significant degree (Table 3 and Table 4). The correlation between changes in SOC and BDI were however significant; for T2-T5,  $\rho = .43, p = .02$ ; for T2-T6,  $\rho = .50, p = .01$ .

On the close-ended items about the TH intervention, 60.0% of the participants agreed with the item "*Participation in therapeutic horticulture has contributed to change in my view of life*"; 92.0% agreed with the item "*Participation in therapeutic horticulture has given me aesthetic experiences*"; 96.0% agreed with the item "*I have experienced working with plants and gardening as meaningful*"; and 88.0% agreed with the item "*Participation in therapeutic horticulture has given me a sense of taking care of nature*". On the open-ended item, the participants' accounts were concurrent with the accounts in Study 1.

## GENERAL DISCUSSION

In each of the two studies we observed a significant decline in BDI during the intervention and at 3-month follow-up. The declines were however not accompanied by significant changes in existential outcomes in either study. This might indicate that LRI-R and SOC are not sensitive to the existential changes and experiences due to the TH intervention or that they cover more trait-like personal dimensions and so were not sensitive to declines in BDI. Others have reported that SOC was a more trait-like measure in a sample of depressed rheumatologic patients (Schnyder, Buchi, Sensky, & Klaghofer, 2000), and Debats (1998) considered the LRI-R to have both trait and state dimensions. Moreover it is also plausible that a TH intervention do not influence on existential issues, despite reports from qualitative studies on these issues (Heliker et al., 2000; Trombly, 1995; Unruh, 2000, 2004).

However, the moderate positive and significant correlations between change in BDI and change in LRI-R and change in SOC indicate that the more the participants declined in BDI, the more they improved on the chosen existential outcome measure or vice versa during the intervention. At 3-month follow-up, the correlation between change in BDI and change in LRI-R in Study 1 was no longer significant. In contrast, the correlation between the T2-T6 change in BDI and SOC was significant in Study 2. The latter correlation moreover appears to be substantially stronger than the corresponding correlation in Study 1 between change in BDI and change in LRI-R. This suggests that the two existential measures differed in their sensitivity to persistent change in BDI that occurred in conjunction with the TH intervention. That said, the fact that the mean values for the existential measures did not change significantly implies that they were fairly insensitive to the TH intervention relative to BDI. The absence of statistical significance for change in the existential measures may simply be due to small sample sizes. However, even with larger samples and possible statistically

significant changes, it is however questionable whether the small changes in both LRI-R and SOC during and after the intervention would be clinically relevant.

The correlations between change in BDI and existential issues during the course of the intervention are intriguing; however, the design of the studies allows for the possibility that in each case factors outside of the intervention might have induced the covariation. These include improvement in ordinary treatment, improvement in other life circumstances, positive life events and simply the passage of time. We cannot however say what factors might have affected both BDI and the different existential measures at the time the intervention was being provided. That the correlations were of more than moderate strength, were obtained with different existential measures and were found with different samples in successive years, all add some confidence to the idea that the changes have to do with the TH intervention.

The participants generally agreed that the TH experience was meaningful to them and that it had influenced their view of life. They also evaluated highly the aesthetic experience and the experience of taking care of nature. These experiences fit with the existential perspectives on TH presented in this paper and are in lines with earlier research (Irvine & Warber, 2002; Kidd & Brascamp, 2004; Unruh, 2000; Waliczek et al., 2005). The qualitative data thus give some support to the idea that TH addresses existential issues.

The studies have several limitations. First, and obviously, neither study had an RCT design which could allow for stronger statements about causation. Both studies were planned and approved as RCT trials, but the decision to adopt a single group design was necessitated by difficulties in recruiting enough interested participants to be able to randomise them to four different farms in different geographical areas in sufficient numbers. Likewise the short growing season in [Country] allowed little room for extending the recruitment process, as with waiting list controls.

Despite their limitations, the studies have several strengths. First, a double baseline in BDI scores in both studies, a double baseline in all outcome variables in Study 2, and a 3-month follow-up provided a possibility for distinguishing change due to the intervention from change *per se* (e.g., treatment as usual). Second, the replication of the intervention with different samples in different years made it possible to assess existential issues with different measures. As indicated above, these features of the research bolster confidence that the correlations between change in BDI and change in existential issues had to do with the TH intervention. Third, the studies have some qualitative data that are mutually supportive in the two studies and enlighten and support the quantitative data.

Further research might of course benefit from stronger research designs and larger samples. More theoretically interesting, however, is the relationship between depression severity and existential issues. We have in this paper avoided assuming a particular causal direction for that relationship. Future studies can address the question of how existential issues might mediate depression severity and vice versa over time.

We found TH to be easy to facilitate as a supplementary or complementary intervention or program for clinical depression. In-patient and out-patient clinics might consider using their available gardens for therapeutic activities.

## **CONCLUSION**

The main findings in the two studies were no significant changes in the Life Regard Index – Revised or the Sense of Coherence despite a significant decline in depression severity during and after a 12 week TH intervention for clinical depression. There were however moderate positive correlations between increase in existential measures and decline in depression severity during the TH intervention.

The participants evaluated participation in TH as a meaningful and aesthetic experience, and that it influenced their view of life. They also commented on excitement and absorption in following the growth process in the TH activities, which they found to be meaningful, interesting and instructive. These findings gave some support to assume that TH is experienced as an existential meaningful intervention in clinical depression and that TH can be considered as a spiritual leisure activity.

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**Table 1:** Means (Standard Deviations) on Beck Depression Inventory (BDI), Life Regard Index Revised (LRI-R) and Satisfaction with Life Scale (SWLS) over the Measurement Points (T1-T6) in Study 1.

Measure	T1	T2	T5	T6
	Baseline 1	Baseline 2, Start	12 Weeks, End	3-Month Follow-Up
BDI	28.4 (6.3)	27.3 (6.8)	17.6 (7.4)	20.8 (9.0)
LRI-R		48.8 (6.8)	50.2 (7.5)	49.8 (10.5)

Note: From T2–T5,  $N=18$ . For T6,  $N=16$ . BDI data from T3 and T4 are presented elsewhere. Data for LRI-R were not collected at T3 and T4

**Table 2:** *Tests of Change in Beck Depression Inventory (BDI) and Life Regard Index-Revised (LRI-R) over Baseline Measures (T1-T2), during the TH Intervention (T2-T5), and from Intervention Start to 3-Month Follow-up (T2-T6) in Study 1.*

Measure	Measurement point	<i>t</i>	<i>p</i>
BDI	T1-T2	0.987	.34
	T2-T5	6.021	<.01
	T2-T6	3.435	.01
LRI-R	T2-T5	0.887	.40
	T2-T6	0.516	.61

Note. From T1-T2 and from T2-T5,  $df = 17$ . From T2-T6,  $df = 15$ .

**Table 3:** *Means (Standard Deviations) on Beck Depression Inventory (BDI) and Sense of Coherence Scale (SOC13) over the Measurement Points (T1-T6) in Study 2.*

Measure	T1	T2	T5	T6
	Baseline 1	Baseline 2, Start	12 Weeks, End	3-Month Follow-Up
BDI	28.4 (6.3)	27.3 (6.8)	17.6 (7.4)	20.8 (9.0)
	25.2 (7.8)	24.1 (8.4)	19.6 (8.0)	20.4 (10.3)
SOC13	44.3 (6.1)	43.6 (6.6)	44.6 (7.5)	45.5 (7.0)

Note: For T2-T5,  $N = 28$ . For T6,  $N = 25$ . BDI data from T3 and T4 are presented elsewhere. Data for SOC13 were not collected at T3 and T4.

**Table 4:** *Tests of Change in Beck Depression Inventory (BDI) and Sense of Coherence Scale (SOC) across Baseline Scores (T1-T2), during the TH Intervention (T2-T5), and from Intervention Start to 3 Month Follow-up (T2-T6) in Study 2.*

Measure	Measurement	<i>t</i>	<i>p</i>
	point		
BDI	T1-T2	1.835	.08
	T2-T5	2.904	.01
	T2-T6	2.046	.05
SOC	T1-T2	0.702	.49
	T2-T5	0.840	.41
	T2-T6	1.677	.11

Note. From T1-T2 and from T2-T5, *df* = 27. From T2-T6, *df* = 24.

