

Farm animal-assisted interventions in clinical depression

Dyreassisterte intervensjoner med husdyr ved klinisk depresjon

Philosophiae Doctor (PhD) Thesis

Ingeborg Pedersen

Department of Animal and Aquacultural Sciences
Norwegian University of Life Sciences

Ås 2011



Thesis number 2011: 25
ISSN 1503-1667
ISBN 978-82-575-0989-7

Preface

The study presented in this thesis was carried out at The Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences in the time between 2006 and 2011. The project was funded by a grant from the Research Council of Norway and Agricultural Agreement.

I am very grateful for the farmers' enthusiasm towards, and engagement in this project. They received the participants with genuine interest and were willing to include them into their daily work. Appreciation should be noted to all the participants who were involved, for using their time to fill out questionnaires, participate in interviews and video recordings.

I want to express my sincere gratitude to my supervisors, Professor Bjarne O. Braastad and Professor Egil W. Martinsen. I greatly appreciated their time, efforts, and supportive attitude. During our many discussions, I trusted in their broad knowledge, and expertise. Their feedback on the required project papers and my thesis has always been constructive and useful. I have learned a great deal.

I would like to thank my co-authors for their motivating contribution to this work. Their involvement, ideas and experienced advices have improved the final result enormously. It has been a pleasure to work with them.

I am grateful to all my fantastic colleagues at the Department of Animal and Aquacultural Sciences and the Department of Plant and Environmental Sciences. Their support, encouragement and belief in me have been an invaluable contribution to completing this thesis.

My friends have made my life funnier and easier. I appreciated all the nice dinners, movie nights, concerts, quiz games, holiday trips abroad, and fantastic hiking trips into the Norwegian mountains. Their optimism on my behalf, their patient listening to my problems and support through all my challenges have carried me through the whole process.

I would like to thank my parents for bringing me up close to nature on a small farm with a variety of farm animals. Early in my childhood I understood that contact and interaction with animals would be an interest for life. The support and unconditional love I received from my parents has always been my most important asset through life.

Last but not least I would like to thank my two daughters, Michelle and Ine Marie. Their love and understanding has been a vital source of inspiration for finishing this work. They make my life complete.

Table of Contents

Summary	1
Sammendrag	3
List of papers	5
Abbreviations	6
1 Introduction	7
1.1 Depression - a public health issue	7
1.2 Treatment and care	9
1.3 Green care	10
1.3.1 Green care in Norway	12
1.3.2 Green care in Europe	13
1.3.3 Studies on Green care and Animal-assisted interventions	15
1.4 Theoretical framework	28
1.4.1 The Biophilia hypothesis	28
1.4.2 Social support theory	29
1.4.3 Self-efficacy theory	30
1.4.4 Aims of the thesis	31
2 Material and methods	31
2.1 Recruitment and participants	31
2.2 Classification	32
2.3 Research setting and intervention	33
2.4 Design and research methods	33
2.4.1 Randomized controlled trial	34
2.4.2 Video recordings and behaviour analyses	36
2.4.3 Thematic interviews	37
2.5 Outcome measures and measurement points	37
2.5.1 Beck Depression Inventory	38
2.5.2 State-Trait Anxiety Inventory	39
2.5.3 Generalized Self-Efficacy Scale	39
2.5.4 Measurement points	39
2.6 Statistical analyses	40
2.7 Ethical considerations	41
3 Summary of results from individual papers	41

4 Discussion	48
4.1 Change in depression	49
4.2 Change in anxiety	52
4.3 Change in generalized self-efficacy	54
4.4 Methodological issues	57
4.4.1 Statistical conclusion validity	57
4.4.2 Internal validity	58
4.4.3 Construct validity	58
4.4.4 External validity	59
4.4.5 Validity issues in qualitative research	60
5 Conclusions	61
5.1 Main findings	61
5.2 Theoretical implications	62
5.3 Implications for further research	62
5.4 Clinical implications	64
6 References	65
Papers I-III	

Pedersen, I. 2011. Farm animal-assisted interventions in clinical depression. Philosophiae Doctor Thesis 2011: 25, Norwegian University of Life Sciences, Department of Animal and Aquacultural Sciences.

Summary

Depression affects millions of people every year. Depressed individuals suffer from depressed mood, loss of interest and enjoyment, reduced energy, diminished activity, reduced attention and concentration and reduced self-esteem. The consequences are substantial both for each individual and for society, with depression as a major cause for sick leave and work disability. A wide range of treatments and health care pathways is needed, and within the agricultural sector a new service has developed, which could act as a supplementary treatment. Green care is a service which involves interventions implemented via normal farming activities. All parts of the farm are utilized, creating a diversity of interventions with one common basis; the use of nature and natural environment to promote health and well-being. Farm animals are a common part of the farm milieu, and the main aim of the present research was to examine change in mental health of persons with clinical depression participating in a twelve week farm animal-assisted intervention.

A randomized controlled trial was carried out with participants randomly assigned to a farm animal-assisted intervention at a dairy farm or a waiting-list control group. The intervention consisted of work and interaction with farm animals twice a week for twelve weeks. The intervention group experienced statistically significant decline in depression and improved self-efficacy, and a close to significant reduction in state anxiety from recruitment to the end of the intervention. Participants kept their gains at three-month follow-up. In the control group no significant changes were obtained. However, the differences between the groups were not statistically significant. Nine of 16 participants in the intervention group and 3 of 13 participants in the control group had a reliable change in depression, and clinical significant change was achieved by 6 of 16 participants in the intervention group and only one participant in the control group.

An objective was to examine associations between various work tasks during the intervention and change in mental health. Fourteen participants were video-recorded for a whole session early and late in the intervention. Different work tasks conducted in the cow shed and all

animal contact and dialog with the farmer were classified into behavioral categories. Pair-wise correlations between average time spent in various categories and changes in depression, anxiety and self-efficacy were calculated. Change in mental health scores were favorably correlated to time spent with milking procedures, feeding, cleaning, moving animals and dialog with farmer, and unfavorably correlated with mucking, grooming, sole animal contact and inactivity.

A last aim was to examine the participants' experiences with the intervention and what they perceived as important factors related to their mental health. Eight persons, who had completed the intervention, were interviewed. Central elements in the intervention were the possibility to experience an ordinary work life, but also the importance of distraction from their illness. Furthermore, the flexibility of the intervention made it possible for the participants to experience coping,

A non-standardized intervention, as in this study, provides participants with the possibility to do individual choices, and the participants considered flexibility to be an important element in the intervention. On the other hand, results do provide some evidence of different outcomes depending on the intervention content. Participants who more frequently performed challenging and complex work tasks, showed a larger improvement in mental health. Progress in work skills seemed important, possibly connected to increase in coping, which was a factor the participants perceived as important. On this basis, the participants' mastery experience could be essential for improvement in mental health.

Pedersen, I. 2011. Dyreassisterte intervensjoner med husdyr ved klinisk depresjon. Philosophiae Doctor Thesis 2011: 25, Universitetet for miljø- og biovitenskap, Institutt for husdyr- og akvakulturvitenskap

Sammendrag

Depresjon er et omfattende helseproblem og for det enkelte menneske forårsaker den redusert helse og nedsatt livskvalitet. For samfunnet er depresjon forbundet med omfattende kostnader særlig på grunn av redusert arbeidsdeltakelse. I psykisk helsearbeid er det behov for mange ulike behandlingsopplegg og terapeutiske intervensjoner ved depresjon. Grønn omsorg brukes i dag som et samlebegrep for ulike intervensjoner som gjennomføres på ordinære gårdsbruk der det felles formålet er å fremme helse og livskvalitet for deltakerne. Det sosiale samværet på gården er viktig i forhold til opplevelse av sosial støtte, og deltakelse i arbeidsoppgaver legger til rette for opplevelse av mestring. I tillegg til kontakt med dyr er dette faktorer som er vist å være positive for mental helse. Grønn omsorg og dyreassisterte intervensjoner med husdyr kan derfor fungere som en terapeutisk intervensjon og slik være en tilleggstjeneste innen psykisk helsearbeid.

Hovedformålet med studien var å undersøke endring i mental helse av en 12 ukers intervensjon med arbeid og kontakt med husdyr for mennesker med klinisk depresjon. Intervensjonen besto i å delta sammen med gårdbrukeren på ordinære arbeidsoppgaver i forbindelse med fjøsstellet to ganger i uka. Totalt 11 gårdsbruk i 6 ulike fylker deltok. Alle hadde melkeproduksjon som hovednæring. 29 deltakere med klinisk depresjon ble rekruttert til studien, de ble randomisert til intervensjon eller til en ventelistekontrollgruppe som fikk tilbud om intervensjonen seks måneder senere. Deltakerne fylte ut standardiserte skjema som målte depresjon, angst og mestringstro. Dette ble gjort ved rekruttering, ved start, og etter 4 og 8 uker av intervensjonen. Skjemaene ble også utfylt ved avslutning og 3 måneder etter at intervensjonen var avsluttet. Alle deltakere fortsatte sin ordinære behandling mens de deltok i studien.

Et formål med studien var å undersøke sammenhengen mellom tid brukt på ulike arbeidsoppgaver, kontakt med dyr og gårdbruker, og endring i mental helse. Fjorten deltakere ble filmet gjennom et helt fjøsstell en gang til tidlig og en gang sent i løpet av intervensjonen på gården. Tid brukt på de ulike aktivitetene ble korrelert mot endring i angst, depresjon og mestringstro. Åtte deltakere var med på et dybdeintervju i etterkant av intervensjonen.

Formålet med intervjuet var å få innsikt i deltakernes erfaringer med intervensjonen og hva de opplevde som viktige elementer på gården i forhold til egen mental helse.

I intervensjonsgruppen var det en signifikant reduksjon i depresjon fra rekruttering til slutt, det var også en signifikant økning i mestringstro og en tilnærmet signifikant reduksjon i angst. Det var ingen signifikante endringer i kontrollgruppen. Når en sammenlignet de to gruppene var det ingen signifikant forskjeller i endring verken for skåre i depresjon, angst eller mestringstro. Seks deltakere i intervensjonsgruppen og en deltaker i kontrollgruppen viste en klinisk signifikant bedring.

Videostudien viste at det var en signifikant sammenheng mellom det å gjøre mye av arbeidsoppgaver som melking og flytting av dyr og nedgang i depresjon og angst. Det å gjøre arbeidsoppgaver som skraping av båser og pussing av dyr viste ikke den samme positive sammenheng. Intervjuene viste at viktige opplevelser var å være med i en ordinær arbeidssituasjon der en var en vanlig kollega som var verdsatt og nyttig. Samtidig var det viktig for deltakerne at gårdbrukeren viste forståelse for at de kunne ha dårlige dager. Denne tosidigheten ble tatt hensyn til blant annet via fleksibiliteten som var i intervensjonen.

Resultatene i studien indikerer at intervensjonen kan være fordelaktig for undergrupper av deltakere. Det var en sammenheng mellom arbeidsoppgaver som kan defineres som komplekse og utfordrende og en nedgang i depresjon og angst. Dette indikerer at deltakere som gjennom intervensjonen utviklet nye ferdigheter og opplevde mestring hadde størst positiv endring i mental helse. Dette støttes også av intervjuene der mestringsopplevelser var en viktig faktor for deltakerne.

List of papers

I Pedersen, I., Martinsen, E.W., Berget, B. and Braastad, B.O. Farm animal-assisted interventions for persons with clinical depression, a randomized controlled trial. *Revised version submitted.*

II Pedersen, I., Nordaunet, T., Martinsen, E.W., Berget, B. and Braastad, B.O. (in press). Farm animal-assisted intervention: Relationship between work and contact with farm animals and change in depression, anxiety and self-efficacy among persons with clinical depression. *Issues in Mental Health Nursing.*

III Pedersen, I., Ihlebæk, C. and Kirkevold, M. Important elements in farm animal-assisted interventions for persons with clinical depression - a qualitative interview study. *Submitted*

Abbreviations

AAA	Animal-assisted activity
AAI	Animal-assisted interventions
AAT	Animal-assisted therapy
APA	American Psychiatric Association
ART	Attention Restoration Theory
BDI-IA	Beck Depression Inventory-First Amended
CoP FFH	International Community of Practice - Farming for Health
COST	European Cooperation in Science and Technology
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision
ECT	Electroconvulsive Therapy
GP	General Practitioner
GSE	Generalized Self-efficacy
ICD	International Classification of Diseases
LMD	Ministry of Agriculture and Food
M.I.N.I.	Mini International Neuropsychiatric Interview
NAV	Norwegian Labour and Welfare Administration
RCI	Reliable Change Index
RCT	Randomized Controlled Trial
RM-ANOVA	Repeated Measures Analysis of Variance
SD	Standard Deviation
SE	Standard Error
STAI-SS	State-Trait Anxiety Inventory – State Subscale
WHO	World Health Organization

1 Introduction

1.1 Depression - a public health issue

In our part of the world public health issues have changed dramatically during the last century. One hundred years ago preventing tuberculosis, polio and other infectious diseases were in focus, and comprehensive and mandatory vaccination programs together with increased standard of living almost eliminated these diseases. In the modern society of today other major threats to public health increase, like life style related diseases and mental health problems. Depression is one of the most common mental disorders, and in a WHO survey from sixty countries, one-year prevalence for depressive disorder was 3.2 % (Moussavi et al. 2007). This is slightly lower than in a European survey, which estimated one-year prevalence for major depression to be 3.9 % (Alonso et al. 2004). In different surveys lifetime prevalence varies from 8 to 18 % (Alonso et al. 2004; Kringlen et al. 2001, 2006; Ørstavik et al. 2007). However, lifetime prevalence is difficult to estimate and some authors suggest that almost half the population will experience one or more depressive episodes during their lifetime (Andrews et al. 2005).

Despite variations in estimates, depression affects millions of people every year. The consequences are substantial, and depression is estimated to account for 12 % of years lived with disability worldwide (Üstün et al. 2004) and cause poorer health than several other chronic diseases (Moussavi et al. 2007). Another result is an increased mortality rate. In a meta-analysis the overall relative risk of dying was almost twice as high for people with depression compared with the non-depressed (Cuijpers & Smit 2002), and adjusted for known risk factors, the increased mortality in depression still is estimated to be at the same level as for smoking (Mykletun et al. 2009). Social inequalities are recognized and people in low socio-economical groups have higher risk of getting depressed (Fryers et al. 2005). Urban-rural differences are also found in several surveys with higher incidence in urban areas, and this pattern is seen both within countries and between developing and industrialized countries (Kringlen et al. 2001, 2006; Paykel et al. 2005). Gender differences exist, and women are twice as likely to be depressed (Alonso et al. 2004), and for people with other chronic diseases nearly a quarter also had depression (Moussavi et al. 2007). All in all this makes

depression a major public health problem due to high prevalence, high impact on functioning and early age of onset (Alonso et al. 2004; Moussavi et al. 2007).

A diagnosis of depression is based on clinical observation, the patient's own information (anamnesis) and present symptoms according to standardized manuals. Two different diagnostic systems are developed to classify mental disorders, the Diagnostic and Statistical Manual of Mental Disorders (DSM) by the American Psychiatric Association, and International Classification of Diseases (ICD) published by the World Health Organization. Both systems are continually revised and edited due to new clinical experience and research results, and the tenth edition of ICD (ICD-10; WHO 1994) and the fourth edition of DSM (DSM-IV-TR; APA 2000) are at present valid. Both systems are criteria based, and for depression the diagnostic criteria are quite similar; depressed mood, loss of interest and enjoyment, reduced energy, diminished activity, reduced attention and concentration, reduced self-esteem, feeling of guilt, and disturbed sleep and appetite. Dependent on the number of symptoms and severity of each symptom, depression is divided into mild, moderate and severe.

Depression is a major cause for sick leave and work disability (Paykel et al. 2005). Today mental health problems account for almost 25% of new disability pension grants in Norway (Mykletun & Knudsen 2009). For most people, mental health problems are associated with stigmatization, and Alonso et al. (2008) found a twofold increase in perceived stigma when suffering from depression and anxiety compared with no mental disorder. This stigmatization in itself has serious consequences like isolation, loneliness and low self-esteem (Thesen 2001). The consequences for the society are also considerable and a review shows that indirect economical costs, mainly due to sick leave and work disability are twice as high as direct costs (Luppa et al. 2007). In a clinical two-year trial the indirect cost was estimated to be even more substantial, responsible for 87 % of the total cost whereas drug cost was only 4.5 % (von Knorring et al. 2006). Treatment cost for people with chronic medical illness increases by 50 % when co-morbid with depression (Katon 2003). Undiagnosed and untreated depression has also considerable economic consequences mainly due to sick leave and health care visits (Chisholm et al. 2003).

The aetiology of depression is multi factorial. A biological component is recognized (Caspi et al. 2003; Kendler et al. 2005a) and depression is often seen subsequent to stressful life events

(Kendler et al. 1999; Monroe & Reid 2009; Muscatell et al. 2009). A connection to stress responses is also seen during a depressive episode; high depression score is associated with prolonged adrenalin recovery after acute stress (Gold et al. 2004). Change in brain activity associated with cognitive impairment is observed (Ebmeier et al. 2006a), and authors connect this to chronic elevated stress responses (Lee et al. 2002; Sapolsky 2000). The different components work together, and in a review Brown & Harris (2008) highlight that a gene-environment interaction is plausible. This also affects the recurrence of depression, and Monroe & Reid (2009) suggest three different mechanisms; later episodes are triggered from less severe forms of life stress compared to the first episode, it becomes less dependent of life stress (biological factors dominate), and regardless of life stress vulnerable individuals are disposed to recurrent episodes. Even if most time after the first depressive episode is spent as non-depressed (Furukawa et al. 2009), depression tends to recur. In a five year follow-up study by Holma et al. (2008) only one third had no recurrences, and residual symptoms (Kanai et al. 2003) and severity (Holma et al. 2008) predict recurrence. Also low self-efficacy is associated with relapse in depression (Gopinath et al. 2007; Maciejewski et al. 2000). Treatment of depression should therefore focus on recovery from present depression and try to prevent new episodes.

1.2 Treatment and care

Given the large variety of causes, predictors and courses in depression, a wide range of treatments and health care pathways is needed (Butler et al. 2007; Doris et al. 1999; Fletcher et al. 2007; Katon et al. 2001). Combining treatments is common, and the utilization of collaborative care in depression is seen to be more effective than one health care pathway alone (Gilbody et al. 2006). Although well documented, the clinical significance of conventional treatment like medication is sometimes disputed (Kirsch et al. 2008) but mostly viewed as beneficial (Barbui et al. 2007; Ebmeier et al. 2006b). For the most severe cases electroconvulsive therapy (ECT) is most effective (Barbui et al. 2007). However the proportion of non-responders in antidepressant treatment is high and Fava (2003) reported that up to 50-60 % did not achieve adequate response. Another problem is lack of adherence; von Knorring et al. (2006) found that only 40.5 % could be classified as adherent during the 24 first weeks of drug treatment. Different kinds of psychotherapy are effective (Butler et al. 2007) both alone and together with medication, but lack of availability is a problem. The need of adequate treatment is massive, but still a substantial number of people do not receive any

treatment for their illness. A community survey in Europe showed that 30% of people diagnosed with depression did not use any health care service at all, and 80% did not use any psychiatric service (McCracken et al. 2006). In a worldwide mental health survey between one and two thirds did not receive any treatment (Demyttenaere et al. 2004).

Complementary and supplementary treatments are widely used in depression treatment. More than 50 % of people with depression reported using it alone or together with conventional treatment (Kessler et al. 2001). The reasons for this use are several; the side effects of medication are for many people difficult to accept, and a negative view of drug treatment in general could act as an incitement to use complementary treatments. In society, psychotherapy, pharmacotherapy and ECT are sometimes met with prejudice, and fear of stigmatization could be the reason for not attending these treatments. However, efficacy research of complementary and supplementary therapies is limited and only a few systematic reviews are available. In a systematic review Linde et al. (2008) found the herb St. John's wort to be more effective than placebo, to have similar effectiveness and less side effects compared to antidepressants. Another review concluded that physical exercise when compared with no treatment or a control intervention had significant effect on depression (Mead et al. 2009). In a review Smith et al. (2010) did not find enough evidence to recommend acupuncture as treatment for depression, and also for music therapy further research is needed (Maratos et al. 2008). Relaxation techniques were seen to be more effective than no treatment but less effective than psychological treatment (Jorm et al. 2008). Work and work-related activities may contribute positively to mental health (Dunn et al. 2008; Eklund et al. 2004; Mitchell 1998) and contact with pet animals is often seen to be beneficial for mental health and depression (Barker et al. 2003a; Colombo et al. 2006; Hoffmann et al. 2009; Kovacs et al. 2004; Marr et al. 2000; Nathans-Barel et al. 2005; Tower & Nokota 2006; Villalta-Gil et al. 2009). A lot of other interventions are also available, but in general efficacy research on complementary and supplementary therapies in treatment of depression is limited (Ernst et al. 1998). Therefore more research into possible new interventions should be of interest.

1.3 Green care

In the last decades a new supplementary intervention has developed within the agricultural sector. Different expressions like Green care farming, Care farming, Farming for health or

Social farming all describe interventions implemented via normal farming activities at farms all over Europe. All parts of the farm are utilized, creating a diversity of interventions with one common basis; the use of nature and natural environment to promote health and well-being (Sempik et al. 2010). This idea is not new; already in the medieval times natural surroundings and gardens were a part of many hospitals and monasteries taking care of sick people. During the nineteenth century sun light, fresh air, window view, flowers and pet animals were recommended for hospitalized patient (Nightingale 1880). Within mental health care asylums were built in the countryside, providing peaceful surroundings, and farm work was emphasized as healthy and positive (Major 1845; Tuke 1882). Nowadays a range of target groups use the farm for different purposes, and recovery from health problems, mental health rehabilitation and vocational rehabilitation are examples of the use of this concept. The farm is also used for special education purposes for children or adolescents, or for people with mental or physical disabilities. Most farms are ordinary family-based commercial farms, but also farms connected to health institutions and farms as part of therapeutic communities exist within Green care.

Green care farms offer a diversity of work activities connected to livestock management, crop production, forestry, horticultural and greenhouse activities, and repairing machinery or buildings. Preparing meals and dining together is a natural part of the stay at the farm. Nature experiences like hiking and more recreational activities like wood work, herb production and handicraft production are also performed in the farm setting. Caring for animals is a central element at most farms, but one has not reached consensus of a definition of interventions where contacts with farm animals are in focus. Within companion animal research definitions created by the American organization Delta Society (2011) are widely utilized: “Animal-assisted therapy (AAT) is a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process”. The second definition refers to Animal-assisted activity (AAA): “Animal-assisted activity includes pets visiting people and provides opportunities for motivational, educational, recreational, and/or therapeutic benefits”. To be able to use the term AAT the service should be carried out by a professional, whereas AAA is delivered in a variety of milieus by professionals or volunteers. The expression Animal-assisted interventions (AAI) are used as a common term when the character of the intervention is not specified. A farm animal-assisted intervention could be described as an intervention where the participants’ health and wellbeing are in focus, and the content consists of contact and work with farm animals.

1.3.1 Green care in Norway

In the 1990s Vestfold County was a pioneer within Green care in Norway, and the County Governor initiated the first evaluation report on supported work at Green care farms for people with mental health problems (Lærum et al. 2000). Three years after a follow-up study was published (Sørbrøden & Lærum 2003). Both these reports were client oriented, and focused on the clients' satisfaction, health outcome and to what extent participants were able to return to work. A report focusing on the farmers' viewpoint appeared in 2004 (Fjeldavli & Meistad 2004). This was also one of the first attempts to quantify the number of farms with a Green care service in Norway. It illustrated a huge development with a total 325 farms, with the largest percentage in Rogaland and Sør-Trøndelag Counties. In this survey 30 % of the Green care farms had a service for people with mental health problems. In 2006 (Stokke & Paulsen Rye 2007) the number of farms had increased to a 650, and a majority of the 19 Norwegian counties had more than 40 Green care farms. This report also focused on the service providers (farmers), the economical outcome, organization, target groups, working hours and so on. Today the estimated number of Green care farms in Norway is 950 (Logstein & Bleksaune 2010). Due to the positive experience for people with mental illnesses, the Norwegian Labour and Welfare Administration (NAV) made an early initiative to evaluate Green care as work rehabilitation (Meistad & Nyland 2005), and a similar evaluation was conducted two years later (Bjørgen & Johansen 2007) with a client oriented view and under client supervision. Today the Norwegian Labour and Welfare Administration has established work rehabilitation service for people with mental health problems at approximately 60 Green care farms throughout Norway (NAV 2011).

With an increasing number of Green care farms the authorities' need for common national guidelines, quality insurance and outcome research developed. In 2007 The Ministry of Agriculture and Food (LMD) collaborated with Innovation Norway to develop an action plan within Green care comprising five main areas; cooperation between the farmer and the public sector, research and documentation, competence development, network building, and quality standards for the service (LMD 2007). A national advisory board with representatives from governmental agencies, municipality representatives, organizations and researchers within Green care, Farmers Union, and the Research Council of Norway was appointed to implement the action plan. As a result of the action plan a comprehensive report, State of the Art and Research Needs for Green care, was published (Berget & Braastad 2008). A web-page

(www.innpaatonet.no) was already established through collaboration between several Ministries and Innovation Norway. The Royal Norwegian Society operates the web page, which is a vital source for information, net-working and competence development within Green care in Norway. The County Governors in Norway represented by the agricultural department are central coordinators of Green care on county level and are vital information sources at the already mentioned web-page. They are responsible for conducting establisher courses, quality standard courses, and managing local project and regional conferences. They also act as co-organizer of yearly national Green care conferences held in different parts of Norway.

An important part of the national action plan is increase in evidence based knowledge and practice. A pioneer work in this area was the thesis of Berget (2006), based on a randomized controlled trial with farm animal-assisted interventions within Green care conducted at the Norwegian University of Life Sciences in 2003-2006. The research project in the present thesis is a prolongation of the work of Berget. A new research project was initiated at the University in 2008 with adolescence, horse riding and development in self-esteem and social skills in focus. In 2010 two new research projects with somewhat different approach to Green care farms as arenas for work rehabilitation have started. The project at the University College of Hedmark is called, “Mental Health Promotion by Recovery-Oriented Green care Services”. The project at the Norwegian University of Life Sciences is called, “Effects of activities and work on a farm and its natural surroundings on health, social well-being and working ability for people out of work”.

In 2009 the Ministry of Agriculture and Food (LMD 2009) provided a NOK 15 million funding distributed over the next three years for projects aiming to further develop Green care service in Norwegian municipalities. Important focuses were to develop and expand the service, and strengthen local cooperation and net-working. Equally important was to enhance competence and knowledge within the municipality, and to anchor Green care in documents and strategies formulated by local authorities.

1.3.2 Green care in Europe

Together with Norway the Netherlands was a pioneer in development of Green care. A rapid development of Green care farms was seen, from less than one hundred late in the 1990ies to

almost one thousand in 2008 (Haubenhofner et al. 2010). Important success factors were regional associations of care farmers, initiative from care institutions, financing via private insurance companies and development of a national web page which connected facilitators and possible clients. Like in Norway a substantial amount of research is conducted including three different Universities (Wageningen University, Utrecht University and VU University Amsterdam) and in 2009 the first doctoral degree was approved (De Bruin 2009). In the Netherlands a majority of farms are family based commercial farms, but throughout Europe organizing and target groups vary considerably (Hassink & van Dijk 2006). Also number of farms differ; in Austria more than 250 farms provide this service (Wiesinger et al. 2006), and in Italy approximately 350 farms are involved (Di Iacovo et al. 2006), in Germany around 150 (Neuberger et al. 2006), a minimum of 76 in England (Hine et al. 2008), and a few in Sweden and Slovenia (Hassink & van Dijk 2006).

Along with the development of Green care in Europe a growing interest for cooperation between countries was seen. In 2004 an international organization was established, International Community of Practice - Farming for Health (Farming for Health 2011). This was an international group of researchers and practitioners within Green care and the organization include all initiatives and projects related to care in the green. In 2006 on the initiative of this organization the first international conference was held in Stavanger, Norway. Today the organization arranges international conferences and has members from 22 European countries, and also from North-America, Asia and Africa. In the same year, 2006, an international four-year research network was established; COST Action 866 - Green care in agriculture (2010). The action was financed by the European Union (EU). The main aim of the action was to increase the scientific knowledge of relevance to Green care. The network included scientists from a variety of disciplines, and research was an important part of the action's agenda. Three working groups were formed; Health effects of green care, Economics of green care and Policies related to green care. Yearly international conferences were organized (Vienna 2007, Thessaloniki 2008, Antalya 2009) and in 2010 the COST Action's fourth and last conference was held in Germany. Following this conference, final documents from each of the working groups were published (Dessein & Bock 2010; Sempik et al. 2010). The concluding document from the policies work group is at this point not finished.

1.3.3 Studies on Green care and Animal-assisted interventions

To identify relevant research articles related to Green care, a search in major databases (PubMed, ISI Web of science, CINAHL, PsychINFO) for articles from of peer-reviewed journals was conducted with the following key words: green care, care farming, farming for health, farm animal-assisted intervention, and farm animal-assisted therapy. In addition proceedings from conferences and research reports from within Green care were included. Due to the close connection to Animal-assisted intervention with companion animals and the limited amount of papers found within Green care, research conducted within Animal-assisted therapy and Animal-assisted activity were used as basis for our study and this thesis. A similar search was carried out to identify relevant papers within companion Animal-assisted interventions with a wide range of key words: animal-assisted therapy, animal-assisted activity, animal-assisted intervention, pet facilitated therapy and human-animal interaction. To some extent the 'snowball effect' method was used to find relevant literature and also relevant book chapters and conference proceedings were included. Due to the massive amount of research within this field the following limitations were set:

- Publications before 1990 were excluded.
- Interventions including horses were excluded.
- The target group should be adults.
- Outcome measures should include mental health, quality of life or physiological measures related to stress.
- Review and meta-analysis older than five years were excluded

Table 1 and Table 2 present overviews of the literature search for respectively Green care and Animal-assisted intervention with companion animals.

Table 1. Overview of Green care research

	Sample	N	Theory	Intervention	Main findings
RCT-design					
Berget et al. (2008a)	Adults with mental disorders	69		Twelve week farm animal-assisted intervention	Increase in generalized self-efficacy in the intervention group compared to the control group six months after end of interventions
Berget et al. (2011)	Adults with mental disorders	69		Twelve week farm animal-assisted intervention	Decline in state anxiety in the intervention group as compared to the control group six months after end of interventions
Quasi-experimental					
Berget et al. (2007)	Adults with mental disorders	35		Behavioural study connected to a 12 week farm animal-assisted intervention	For persons with affective disorder increased intensity of work correlated to an increase in self-efficacy and decline in anxiety. No association between distance to animals and change in mental health
De Bruin (2009)	Elderly with dementia	55	ART Recreational and physical activities	Participants at Green care farms and day care centre between 2006 and 2008	No differences between groups in cognitive functioning or behavioural symptoms.
De Bruin et al. (2009)	Elderly with dementia	55	ART Recreational and physical activities	Participants at Green care farms and day care centre between 2006 and 2008	Higher level of activity in Green care compared to patients in ordinary day care facilities
De Bruin et al. (2010)	Elderly with dementia	53	ART Recreational and physical activities	Participants at Green care farms and day care centre between 2006 and 2008	Higher level of nutrient intake in Green care compared to patients in ordinary day care facilities
Gonzalez et al. (2009)	Adults with clinical depression	18	ART	Twelve week therapeutic horticulture intervention in a Green care context	Decline in depression and improved attention capacity

	Sample	N	Theory	Intervention	Main findings
Gonzalez et al. (2010)	Adults with clinical depression	28	ART	Twelve week therapeutic horticulture intervention in a Green care context	Decline in depression and improvement in attention capacity were mediated via fascination and being away
Gonzalez et al. (2011)	Adults with clinical depression	46	ART	Twelve week therapeutic horticulture intervention in a Green care context	Significant decline in state anxiety. Positive correlation between change in anxiety and group cohesiveness
Hine et al. (2008)	No specific target group	72		Stay at Green care farm	Increase in self-esteem and decrease in the POMS subscale for depression
Ketelaars et al. (2001)	Adults with mental disorders	41/28		Stay at therapeutic community farm	Higher quality of life and lower mental distress included depression
Scholl et al. (2008)	Multi disabled adults	10		Ten week intervention with work and contact with goats	Increased tactile contact, attentiveness and joy during animal contact. Also decreased retreat and apathy. This changes were not seen in the dining room situation
Qualitative design					
Bjørngen & Johansen (2007)	Adults with mental disorders	15		Stay at Green care farms with work rehabilitation	The social setting and the farmer's commitment and conduct were important
Elings & Hassink (2008)	Adults with mental health issues	21		Stay at Green care farm	Increase in self-confidence, feeling of being useful and the importance of a social setting
Hassink et al. (2010)	Health care professionals	27		Therapists with clients at Green care intervention	The non-care context with normal contact with society and other people via work was central
Hassink et al. (2010)	Adults with mental illnesses	16		Stay at Green care farm	Important: Diversity of activities, work in own pace, useful work, animals are safe

	Sample	N	Theory	Intervention	Main findings
Hine et al. (2008)	No specific target group	72		Stay at Green care farm	The social setting, a feeling of achievement and the environment were enjoyed most
Ketelaars et al. (2001)	Adults with mental disorders	31		Stay at therapeutic community farm	Important with easily adjusted work activities and the possibility to be a part of a community
Mallon (1994)	Adolescent with behavioural and mental problems	80		Residential treatment centre in a farm milieu	Farm visit alleviate difficult feelings via contact and communication with farm animals
Survey					
Berget et al. (2008b)	Health care professionals	60		Therapists with clients at farm animal-assisted interventions	Animal-assisted intervention with farm animals could increase interaction with other people and contribute to better mental health

Table 2. Overview of research within Animal-assisted interventions with companion animals

	Sample	N	Theory	Intervention	Main findings
RCT-design					
Allen et al. (1991)	Adult women	45	Social support	Standard experimental stress tasks with pet present or not	Stress buffering effect when pet present measured as lower blood pressure, pulse rate and skin conductance
Allen et al. (2002)	Married couples	240	Social support	Mental arithmetic or hands in ice water with pet present or not	Lower heart rate and blood pressure levels during a resting baseline, significantly lower increases during the test and faster recovery when pet present
Banks & Banks (2002)	Elderly	45		Six weeks animal-assisted therapy or no treatment	Reduced loneliness with animals in residents of long-term care facilities compared with control
Banks & Banks (2005)	Elderly	33		Six weeks animal-assisted therapy, in group or individually	Higher reduction in loneliness for individuals than group. Socialization was not a mediating factor
Barak et al. (2001)	Elderly schizophrenic patients in closed ward	20		Twelve months animal-assisted therapy (AAT) or no AAT	Enhanced socialization, activity of daily living and general well-being compared to control group
Barker et al. (2003b)	Psychiatric patients	42		Aquarium or not in waiting room before ECT	No differences between conditions on depression, but a trend toward significance was found for self reported anxiety
Barker et al. (2003a)	Psychiatric patients	35		Fifteen minutes with animal-assisted therapy or 15 minutes with a magazine before ECT	Animal-assisted therapy showed effect on fear but not on anxiety and depression compared with control

	Sample	N	Theory	Intervention	Main findings
Chu et al. (2009)	Adults with schizophrenia	30		Eight weeks with animal-assisted activity (AAA) or no treatment	AAA showed improvement in self-esteem, self-determination, and decrease in schizophrenic positive symptoms and emotional symptoms compared with control
Cole et al. (2007)	Adults with heart failure	76	Physiological responses	Twelve minute hospital visit with therapy dog, without dog or care as usual	Significant lower blood pressure, adrenalin, noradrenalin and state anxiety (STAI) in therapy dog group compared to controls
Demello (1999)	Adults	50		Dog absent or dog present without or with tactile contact after mild cognitive stressors	Reduced blood pressure and heart rate after stressor compared to no dog, but only without tactile contact
Folse et al. (1994)	College students with depressive symptoms	44		AAT and psychotherapy/ only AAT and control	Significant lower posttest depression score in AAT group than in control group
Friedmann et al. (2007)	Elderly hypertensive persons	11		Two minutes speech with or without dog present	Significant lower blood pressure with dog present compared to without dog
Hoffmann et al. (2009)	Depressed patients	12		Session with or without AAI	Significant reduced state anxiety (STAI) after dog session compared to control
Johnson et al. (2008)	Adults hospitalized with cancer	30		Twelve visits with or without dog or reading sessions	No differences were found in mood, but patients receiving dog visits viewed their health as improved
Kingwell et al. (2001)	Adults, half of them dog owners	72	Physiological responses	Ten minutes with mild mental stress with or without dog	No difference in pulse and blood pressure between groups, but lowest cardiac autonomic response for dog owners when dog present

	Sample	N	Theory	Intervention	Main findings
Le Roux & Kemp (2009)	Residents in a long-term care facility.	16		Weekly animal-assisted activity for six weeks or control group	No difference between groups but significant decline in depression for the animal-assisted group
Marr et al. (2000)	Psychiatric inpatients	69		Four week AAT in psychiatric rehabilitation group or control group without AAT	Significantly more helpful and interactive with other patients in the AAT group, and scored higher on measures of smiles and pleasure
Miller et al. (2009)	Adult pet owners	10 men and 10 women	Physiological responses	25 minutes interaction with own dog or reading condition	Significant decrease in stress via increases in serum oxytocin levels for women but not men compared to reading
Nathans-Barel et al. (2005)	Patients with schizophrenia	10	Social interaction	10 weekly sessions with psychosocial treatment with or without dog	Significant improvement in the hedonic tone and use of leisure time in the dog group compared with control. A trend towards improvement in motivation
Shiloh et al. (2003)	Non-clinical participants	58		Petting animal, toy or none during stressful laboratory experience	Petting animal reduced state anxiety compared to controls
Villalta-Gil et al. (2009)	Patients with schizophrenia in long-term care units	24		25 sessions with or without therapy dog	Significant increase in social contact and social relationships in dog group, but no differences between groups
Quasi-experimental					
Barker & Dawson (1998)	Hospitalized psychiatric patients	230		One session with Animal-assisted therapy or routine therapeutic recreation session	Animal-assisted therapy reduced state anxiety (STAI) levels, but no difference between groups. Routine therapeutic recreation session reduced anxiety for patients with mood disorders

	Sample	N	Theory	Intervention	Main findings
Barker et al. (2005)	Healthcare professionals	20	Physiological responses	Resting in 20 minutes with a book, and 5 or 20 with a therapy dog	No differences between groups in decline in cortisol, adrenalin and noradrenalin after 20 min. In the dog condition group a reduction in cortisol was seen after 5 minutes
Barker et al. (2010)	Dog owners	10		Stress task followed by 30 minutes interaction with own dog or a unfamiliar therapy dog	No difference between groups in change cortisol, blood pressure, heart rate or anxiety. Correlation between levels of anxiety (STAI) and pet attachment was negative, and between anxiety and cortisol positive
Bernstein et al. (2000)	Geriatric patients	33	Social interaction	Social therapy with or without therapy dog	Residents in therapy dog group were involved in as much or more conversation. They were more likely to start and participate in longer conversation than without dog
Colombo et al. (2006)	Elderly residents	48/43/53		Three months with canary, plant or nothing in the room	Beneficial effect of pet therapy on aspects related to depressive symptoms and perception of quality of life compared to controls
CrowleyRobinson et al. (1996)	Elderly residents	31/32/32		Weekly visits with dog /resident dog/control	Decreased depression in resident dog and control group. Decreased fatigue in the visiting and resident dog groups
Gilbey et al. (2007)	Adults	35/59		Get a new companion animal or not	Companion animal ownership did not alleviate loneliness
Guéguen & Ciccotti (2008)	Adults	40 male/ 40 female	Social interaction	Helping behaviour between strangers with or without dog	Presence of the dog was associated with a higher rate of helping behaviour compared to control
Hall & Malpus (2000)	Long-stay psychiatric population	10	Social interaction	Only dog owner present two weeks, with dog 14 weeks	Increase in verbal and non-verbal social interaction during period with dog visits compared to only dog owner

	Sample	N	Theory	Intervention	Main findings
Holocomb et al. (1997)	Elderly males	38	Social interaction	Two*Two weeks with and 2*2 weeks without aviary in room	No difference in depression with or without aviary, but utilization of the aviary was significantly associated with reduced depression
Jessen et al. (1996)	Elderly residents of long-term care facilities	40		Companion bird or not the 10 first days after admission	Significant decline in depression but none in morale or loneliness for persons with bird compared to control
Kovacs et al. (2004)	In patients with schizophrenia	7		Weekly sessions in nine months for rehabilitation purposes	Significant improvement in domestic and health activities
Kramer et al. (2009)	Elderly residents of long-term care facilities	18	Social interaction	Visitation by a person, a person with live dog, and a person with robotic dog	More social interaction when live dog and robotic dog than person alone. Robotic dog started more conversation than live dog
Odendaal (2000)	Adults	36	Biophilia, Physiological responses	Positive interaction with dog or quite book reading	No significant difference between groups in change in cortisol or dopamine. For oxytocin and endorphin the increase was higher in dog group
Odendaal & Meintjes (2003)	Adults	18	Physiological responses	Positive interaction with dog or quite book reading	Significant higher changes in oxytocin, prolactin and endorphin during contact with dog compared to control
Siegel (1990)	Elderly	938		One year prospective study, pet or no pet	Fewer contacts with medical doctor for pet owners and owing a dog provided a buffer against stressful life events
Straatman et al. (1997)	Students	17/19		Stress task with or without dog present	No significant difference between groups on heart rate, blood pressure or state anxiety during task
Uvnäs-Moberg (2010)	Adult dog owners	20	Physiological responses	Sixty minutes interaction with own dog or no dog	No difference between groups in change in cortisol, oxytocin or insulin. Heart rate decreased in dog owners but not in controls

	Sample	N	Theory	Intervention	Main findings
Wells (2004)	Pedestrians	1800	Social interaction	Contact with strangers with dog, alone, plant or toy	More smiles and verbal responses when with dog compared with controls
Wilson (1991)	Students	92		Reading aloud, reading quietly or interaction with dog	No difference in state anxiety between reading quietly and interacting with dog. Reading aloud differed from both.
Qualitative design					
Kawamura et al. (2009)	Institutionalized elderly women	8		Animal-assisted activity twice monthly for two years	Several themes were found; positive feelings for the dog, confidence, interaction with other residents via the dog and enhanced communication with volunteers
Survey					
Antonacopoulos & Pychyl (2008)	Dog owners	107	Social support		Low levels of social support from other people correlated with high levels of anthropomorphic behaviour and stress
Antonacopoulos & Pychyl (2010)	Cat and dog owners	132	Social support		Low levels of human social support combined with high attachment to pets predicted significantly higher scores on loneliness and depression
McNicholas & Collis (2006)	Recently widowed people	61 pet owners/ 106 non-owners	Social support	Three months after bereavement	No difference in psychological symptoms, but fewer physical symptoms like physical complaints, and disturbance to sleep and appetite in pet owner group
Pachana et al. (2005)	Community living older adults	6404		Pet owners and non-pet owners	Companion animal status was not associated with differences in mental health scores
Parslow et al. (2005)	Elderly	2551		Pet owners and non-pet owners	Worse mental and physical health was seen among pet owners. They also use more pain relief medication

	Sample	N	Theory	Intervention	Main findings
Straede & Gates (1993)	Adults	162		Cat owner or non-pet owner	No significant differences were found for depression or anxiety, but better general psychological health for cat owners
Tower & Nokota (2006)	Adults	2291		Internet questioner about depression	Unmarried women who live with a pet had fewest depressive symptoms, and unmarried men who live with a pet have the most.
Winefield, et al. (2008)	Community living older adults	314		Pet owners	Neither pet ownership nor pet attachment explained variance in health and well-being
Zasloff & Kidd (1994)	Adult female students	59 pet owners 89 non-pet		Living with or without pet and other people	No difference in loneliness between pet owners and non-owners. Women living entirely alone were significantly lonelier than those living with pets only or pet and people
Zimolag & Krupa (2009)	Mentally ill living in the community	60		Pet owners and non-pet owners	Significant more engagement in meaningful activities for pet owners, and better integrated in the community
Reviews and meta-analysis					
Barker & Wolen (2008)	Review on benefits for pet owners and interaction via AAA	110 papers			Some evidence of effect on stress reactivity in general. For psychiatric disorders are enhanced social behaviour and improved mood seen
Friedmann & Son (2009)	Review on benefits for human-health and well-being	98 papers			Growing evidence for AAA reduces stress, and ownership is beneficial. More research concerning subgroups is necessary

	Sample	N	Theory	Intervention	Main findings	
	Giaquinto & Valentini (2009)	Review on benefits for pet owners	26 papers			Physical (cardiovascular) benefits quite clear while psychological is controversial
	Nimer & Lundahl (2007)	Meta-analysis on efficacy of AAT	49 papers			Moderate effect sizes in improving emotional well-being and behavioural problems
	Rossetti & King (2010)	Review on benefits for psychiatric patients	17 papers			Animal-assisted therapy can improve socialization and may have psychological benefits for psychiatric patients
	Souter & Miller (2007)	Meta-analysis on efficacy on depressive symptoms	5 papers			AAA and AAT are associated with fewer depressive symptoms
	Virues-Ortega & Buela-Casal (2006)	Review on the psycho-physiological effects	36 papers	Social support and classical conditioning		Long-term relationships with animals may moderate physiological variables, particularly blood pressure
	Walsh (2009)	Review on benefits for pet owners and interaction via AAI	77 papers			Positive effect on physiological measures, increasing evidence that companion animals provide psychological and relational benefits
	Wells (2009)	Review on benefits for human-health and well-being	150 papers	Social support and attachment		Mixed results on depression and self-esteem

Table 1 illustrates the limited number of studies addressing the potential of Green care and farm animal-assisted interventions. Another striking feature is the variation in methods and heterogeneous groups of participants, exceptions are studies by Gonzalez et al. (2009, 2010, 2011) and De Bruin (2009). These are also the only ones which provide a theoretical foundation. Nevertheless, Green care studies do show beneficial associations from taking part in the programs with reduced depression and anxiety, and increased self-efficacy or self-esteem. From the qualitative studies, useful work, animal contact, the social contact and support from the farmer are emphasized as important by the participants.

As illustrated in the introduction, many studies do conclude that contact with companion or pet animals could be beneficial for mental health and depression. However, this result is not consistent. In Table 2 the results from randomized controlled trials show positive effects in depression and anxiety in some studies and no significant effect in others. It is important to emphasize that no study has shown increase in symptoms. In several RCT studies reduced loneliness and increased social interaction are observed. Physiological effect could be summarized as a quite clear with regard to heart rate and blood pressure, and several studies showed effect on cortisol and other stress related hormones. But as for mental health, some studies show no effect. The quasi-experimental studies show similar outcome as the randomized controlled trials; a majority of trials show beneficial outcome for depression, they are quite consistent for blood pressure and heart rate, but vary regarding change in hormones. Positive connections to enhanced social interaction were seen. From surveys with pet owners; positive connections to mental health are not consistent. As for Green care studies results from companion animals emerged from a variety of interventions with different target groups and duration, the shortest intervention lasted for 15 minutes and the longest for twelve months. Few studies have conducted follow up assessments.

From both tables combined; many studies do show beneficial outcome in depression, anxiety and self-efficacy or self-esteem. A majority of Animal-assisted interventions with companion animals show a possible stress reducing effect, via change in hormones, blood pressure and heart rate.

1.4 Theoretical framework

In Sempik et al. (2010) many different possible mechanisms working within Green care are suggested, and psychological, social and physiological mechanisms behind observed beneficial effects are proposed. These include the Biophilia hypothesis, Attention restoration theory, Salutogenic theory, The Recovery model and Self-efficacy theory. Animal-assisted interventions with companion animals also suggest a variety of mechanisms behind observed effects (Kruger & Serpell 2006), and the authors emphasize that the theoretical foundations are poorly understood and still to be confirmed. Common mechanisms reported from both Green care and companion animal-assisted interventions include The Biophilia hypothesis, which is used as an umbrella theory for nature experiences and as a possible explanation for physiological responses seen in contact with animals. Social support theory and Self-efficacy theory are extensively examined in relation to beneficial effects in depression. Therefore in our study with farm animal-assisted interventions, utilization of these three mechanisms could be a useful approach.

1.4.1 The Biophilia hypothesis

This hypothesis was first forwarded by Edward O. Wilson in his book *Biophilia* (1984), and he defined biophilia as humans' natural tendency to focus on life and lifelike processes. This is not single instinct but complex learning rules which could form a range of emotions like attraction and peacefulness, but also aversion and anxiety (Wilson 1993). This tendency gave distinctive advantages in human evolution, and therefore there is partly a genetic basis for this positive responsiveness to nature (Kellert 1993). In a review of a more than 50 studies the authors conclude that a link between the Biophilia hypothesis and observed beneficial outcome of nature experiences are likely (Grinde & Patil 2009). Ulrich (1993) divided this biological based response into; liking or approach responses, restoration or stress recovery responses and enhanced cognitive functioning. The stress reducing effect of outdoor recreation and natural settings are extensively investigated and Ulrich (1993) emphasizes a probable relationship between nature, reduced stress and health. This stress recovery response is also much used as a potential mechanism of the observed health effects in companion animal research. A decline in blood pressure and heart rate are seen in several studies when people interact and have physical contact with a pet animal (Allen et al. 2002; Allen et al.

1991; Friedmann et al. 2007; Kingwell et al. 2001; Nagengast et al. 1997; Odendaal & Meintjes 2003; Uvnäs-Moberg 2010), and a decrease is also observed in levels of stress hormones (cortisol, adrenalin and noradrenalin; Barker et al. 2005; Cole et al. 2007; Odendaal 2000). At the same time is a connection between change in physiological measures and reduced state anxiety proposed and examined (Barker & Dawson 1998; Barker et al. 2003a; Cole et al. 2007; Hoffmann et al. 2009). Also an increase in the beneficial hormone oxytocin is observed when humans interact with pet animals (Miller et al. 2009; Odendaal & Meintjes 2003). Whether these results are valid also for interaction with farm animals have never been examined, but Mallon (1994) and Bokkers (2006) expect effects of contact with farm animals to be similar to those found for pet animals.

1.4.2 Social support theory

Cobb (1976) was one of the first to define social support. He expressed it as the individual belief that one is esteemed and valued, and that someone cares for and loves you. Belonging to a network of communication and mutual obligations is also a part of perceived social support. Stressful life events, for example some form of loss, are often emphasized as a vital cause for onset of depression (Kendler et al. 1999; Muscatell et al. 2009), and social support is recognized as a moderator of life stress by two different mechanisms called direct effect and buffer effect (Cohen & Syme 1985). The direct effect mechanism enhances health irrespectively of stress level, and results in overall positive affect and elevated self-esteem. The buffer effect is active when a stressful life event occurs where social support hinders a stress response by preventing the appraisal of the situation as stressful. A possible reduction in physiological stress responses will also diminish the pathological outcome. Social support is an important part of mental health interventions as it could preserve feeling of self-esteem and sense of mastery (Milne 1999). International surveys do demonstrate a significant relationship between perceived social support and depression. In a survey among 8.832 participants from six countries in Europe an increase in percentage of depressed people (Beck Depression Inventory score > 19) were found with decreasing social support after a negative life event (Dalgard et al. 2006). For men the numbers increased from 5.5 to 12.8 %, for women the increase in incidence of depression was even more substantial from 5.1 to 22.4 % with decreasing social support. For both genders the increase were statistical significant. Kendler et al. (2005b) found 25% reduced risk of depression with each standard deviation increase in social support among 1057 twin pairs. A connection to positive emotions are also

demonstrated, Lethinen et al. (2005) found social support as the determinant factor for positive emotions among 10.878 inhabitants in eleven European countries.

Social support is frequently presented as a potential mechanism in companion animal research, and several studies show that a close and long-term relationship with a companion animal could contribute to enhanced mental health (McNicholas & Collis, 2006; Tower & Nokota, 2006; Zimolag & Krupa, 2009). In a farm animal-assisted intervention it could be expected that both the farmer and the farm animals may offer an experience of social support, and Ender-Slegers (2008) describes the relationship to the farmer as a therapeutic ‘tool’ within Green care. House (1981) divided social support into four different categories: emotional, appraisal, informational, and instrumental support. Informational support, consisting of giving advice, information and instructions, is a natural part of farm animal-assisted interventions. Emotional support, comprising concern, listening to and trust from farmers or other participants would possibly be a component, and the participants could also interpret close contact with farm animals as emotional support. Appraisal support, with affirmation and feedback, is also likely to be a part of the contact between the farmer and the participant.

1.4.3 Self-efficacy theory

Self-efficacy is defined as a person’s belief that one can successfully achieve the desired outcome (Bandura 1977). Perceived self-efficacy is a major determinant of motivation for and choice of activity. It also affects how much effort a person will spend and for how long in order to cope in a situation or with a task. Low generalized self-efficacy is correlated to both depression and anxiety (Schwarzer 1993), and in a study Dalgard (2008) found low self-efficacy and powerlessness as important explanatory factors for the social gradient seen in mental health. Maciejewski, Prigerson and Mazure (2000) showed that high self-efficacy at baseline predicted less depression at follow up. For people with previous depression 40 % of the probability of relapse was mediated by negative change in self-efficacy. Bandura (1997a) suggests a multiple explanation for this connection between depression and self-efficacy; to be unable to reject depressive thoughts and rumination increases the risk for recurrence, defeat of one’s hope results in low mood thereby creating a downward circle, and last but not least people with low self-efficacy often lack adequate social relationships, which increases the impact of stressful life events. According to self-efficacy theory several sources are basis

for a persons' belief in own efficacy. Both information from a person's milieu, own cognitions and physiological state act as sources for self-efficacy belief. However, the most influential source to improved self-efficacy is when a person completes a task or copes in a situation (Bandura 1997b). Farm animal-assisted interventions provide a range of work tasks easily adjusted to each person's requirement, and may therefore be suitable arenas for coping experiences and enhanced self-efficacy.

1.4.4 Aims of the thesis

The overall research aim of the present thesis was to investigate changes in mental health of persons with clinical depression participating in a farm animal-assisted intervention. This was implemented via three different part objectives:

1. Investigate the effects on mental health following the intervention compared to a waiting list control group.
2. Examine associations between various behaviours among participants during the intervention and change in mental health.
3. Examine the participants' experience with the intervention and what they perceived as important factors related to their mental health.

2 Material and methods

2.1 Recruitment and participants

A power analysis was conducted as part of the research protocol with regard to minimum number of participants needed. This power analysis ($SD_{(BDI)} = 7.0$, $p = 0.05$) estimated a total of 50 participants finishing the study to detect possible difference between groups with a probability equal 0.80. In an attempt to achieve this number a comprehensive recruitment process was conducted throughout nine counties in Eastern, Western and Middle parts of Norway, where a total of 26 farmers were recruited in different districts. In each district advertisements in main newspapers were used to recruit participants and in addition approximately 1550 invitation letters were sent to persons registered with depression diagnosis in the database at Norwegian Labour and Welfare Administration. Also between 40

and 50 persons in the health care system were used to recruit participants. This included GPs, mental health workers in the municipalities and personnel in the specialist health service. Despite all efforts only forty-five participants were recruited. Ten of these did never deliver recruitment data and are therefore not been described as participants in this study. All participants received an information letter, and signed a written consent before being included in the study.

2.2 Classification

All potential participants filled in the Beck Depression Inventory-First Amended (BDI-IA; Beck & Steer 1987). The sum scores of BDI-IA ranges from 0-63. An easy way of classification of depression is to use the BDI-IA sum score, where 0-9 represents the normal range, 10-19 mild depression, 20-29 moderate depression and 30-39 severe depression. We chose a cut-off of 14 which is in the middle of mild depression. Potential participants earlier diagnosed with severe personality disorders, schizophrenia, eating disorders or substance abuse or dependence out of control for the last six months were excluded. To increase the precision of diagnoses, 60 percent of the participants completed a diagnostic interview; Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al. 1998), providing DSM-IV diagnoses (APA 1994). Those who were recruited in autumn 2007 and in 2008 were interviewed. This time frame was based on the possibility to use students at Akershus University College. These were attending post-graduate studies to become psychiatric nurses, and were trained by Professor Egil W. Martinsen to conduct interviews. All who were interviewed, except one, met the DSM-IV criteria for major depression and were included. Due to the considerable distance between the participants' home places, we were not able to interview all the participants. The remaining participants were therefore included on the basis of the BDI score at time of recruitment. We chose the concept clinical depression. This is not a diagnostic entity, but it covers patients with symptoms of depression of clinical significance, who most probably meet the criteria for a diagnosis of depression.

In all 34 persons were included. Five participants dropped out before the intervention started and therefore a total of 29 participants recruited from spring 2007 to spring 2009 comprised the final sample in the study.

2.3 Research setting and intervention

Eleven dairy farms from six different counties (Akershus, Buskerud, Hedmark, Oppland, Vestfold and Rogaland) in Norway were used in the project. The housing systems for animals were free range stall or tie-stall. Both female (5) and male farmers (6) had the main responsibility for the participants during the intervention. All farms had dairy cattle as their main production, and the mean number of dairy cows was 25 (range 14-60). Most farms also had companion animals like horses, cats, dogs or rabbits. The intervention consisted of work and interaction with farm animals twice a week for twelve weeks. Due to differences in farm size, degree of mechanization, and amount of work each time the session varied between 1.5 and 3.0 hours. A first visit was used by the participants to get familiar with the farm and the farmer. When they returned the next time the participants worked together with the farmer, performing on their own choice ordinary work tasks in the cowshed, like grooming, mucking, feeding, taking care of the calves and milking. They could also choose to spend their time in physical contact with the farm animals. The study was open for two participants at the same time at the farm, but with a few exceptions there was only one participant at the farm during the intervention. The start of intervention period was distributed throughout most of the year. Seven participants started in the autumn (September, October and November), two during the winter (December and January) and seven in March or April. Due to holiday seasons some participants had a pause which caused extension of the intervention. The minimum attendance in the intervention was set to 50 %. Mean attendance was approximately 80 %, but accurate numbers for all participants were not registered.

2.4 Design and research methods

Triangulation or mixed-methods are defined as the use of multiple methods or perspectives in the same study (Olsen 2004). The purpose of triangulation is to overcome bias that occurs when data are obtained from a single method. This may improve understanding of a phenomenon, because it blends the structured, quantitative information with descriptive data obtained from in-depth interviews. To apply both quantitative and qualitative methods for collection and interpretation of data have both benefits and problems. The possibility of multiple viewpoints into a complex reality and to access different facets of a phenomenon is a clear advantage. Also the combination of broad, general views in quantitative methods' and a

deeper, subjective insight in qualitative methods broadens our knowledge of the issue (Foss & Ellefsen 2002). On the other hand triangulation rises a possible epistemological problem; the chasm between an empiricist and a constructivist view on knowledge, and Olsen (2004) stated that triangulation is only consistent with a pluralist theoretical viewpoint. A possible solution is to choose the pragmatic approach; use a relevant research method to answer your research question (Silverman 2005). Contradictory outcome may be another problem if it leads to argument about validity instead of acknowledging it as an important outcome in itself. True triangulation appears only when different methods are integrated and given equal weight. In our study this means to accept that neither symptoms assessments, nor thematic interviews or behaviour analysis on its own could capture the whole and complex reality in farm animal-assisted interventions. Therefore triangulation will enhance the understanding of this phenomenon. This is also supported by Levinson (1962) the 'founder' of animal-assisted therapy, who recommended a mixed method approach to explore the human-animal relationship.

2.4.1 Randomized controlled trial

In the randomized controlled trial the participants were randomly assigned to the intervention or the control group after recruitment data were obtained. The initial plan was that the control group should receive treatment as usual from the health care system, and the only contact with the project should be in relation to the assessments. We had a challenging recruitment process, where potential participants were reluctant to take part because they did not want the risk of ending in the control group. We therefore changed the control group to a waiting list control group, and all participants in the control group were offered the possibility to attend the intervention at the farm after the control period.

The randomization was conducted by a computer program in Excel 7.0 (Microsoft[®]). There were long distances between the farms, and for each participant only one farm was within reach. Participants therefore were randomly assigned to intervention or control group at each farm separately. Only two participants could attend the same farm at the same time, as a consequence maximum number of participants recruited at the same time was four. In this case, and in cases with two participants the chance to be drawn to the intervention group was set to 0.50. In cases with one or three participants the chance to be drawn to the intervention group was set to 0.65, due to higher dropout in this group in an earlier study (Berget et al.

2008a). The randomization was conducted by a researcher blind to farm and participants. The flowchart (Figure 1) shows drop out before, during and after the intervention period. Drop outs after randomization but before the intervention started were not included in the statistical analyses (Fergusson et al. 2002). Drop outs during the intervention were due to a variety of reasons; offer of paid work and vocational rehabilitation, allergic reactions, and one participant completed the intervention, but did not fill in the questionnaires at the end.

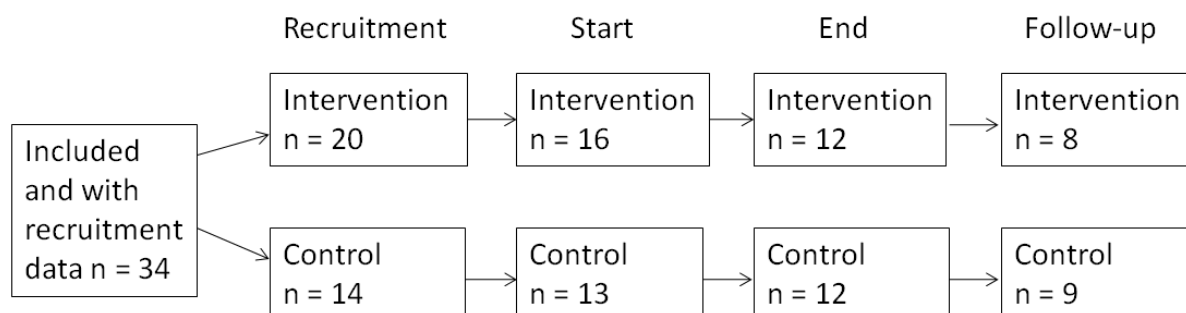


Figure 1. Drop out before, during and after the intervention period.

The background variables for the 29 participants at start are assembled in Table 3.

Table 3. Background variables for intervention group (n=16) and control group (n=13)

Variable	Intervention group	Control group
Males/Females	5/11	1/12
Mean age (SD)	40.5 (10.7)	34.0 (6.6)
Medication:		
Yes/No	10/4	6/4
No information	2	3
Psychotherapy:		
Yes/No	9/3	10/0
No information	4	3
Highest education:		
Primary school	5	7
Junior college	7	4
College/University	4	0
No information	0	2
Work situation:		
Out of work	1	2
Sick leave	2	0
Medical rehabilitation	7	4
Disability pension	6	5
No information	0	2
Pet ownership:		
Yes/No	11/5	7/4
No information	0	2

2.4.2 Video recordings and behaviour analyses

All participants completing the project in the intervention group (n =12) participated in the behavioural study. Two participants from the control group, who took part in the intervention after the control period, were included in order to increase the total number of participants. The final sample comprised fourteen. Each participant was video recorded for one whole session early (during the two first weeks) and late (during the two last weeks) of the intervention. The mean (SD) recording time was 97.8 (\pm 26.5) minutes early, and 98.0 (\pm 25.0) minutes late in the intervention. Different work tasks conducted in the cowshed, and all animal contact and dialogue with the farmer were classified into different behavioural categories (Table 4).

Table 4. The various behavioural categories and their definition

Activity	Definition
Milking	All work tasks connected directly to the milking procedure
Feeding	All work tasks connected directly to feeding, including cleaning the feed bunk
Fetching feed	Fetching all kind of feed, including milk to calves
Cleaning	Cleaning all kinds of equipment and washing the milking parlor
Moving animals	Moving animals within the barn, or from the pasture to the barn
Milk-feeding calves	All work tasks directly connected to milk-feeding calves
Hand-feeding animals	Offering feed to animals from the hand
Technical preparation before milking	All work tasks connected to technical preparation before milking
Grooming animals	Brush and clean the coat of the animals with a suitable equipment
Mucking	Remove manure and other dirt from the tie-stall or free range area, also litter the animals
Physical contact with animals	Patting, stroking and all kinds of physical contact which are not work related
Observing animals	Attention towards animals but without physical contact
Inactivity	No work activity and no attention directed towards animals
Other activity	All other behaviours, also walking between work tasks in different barns
Dialogue with the farmer	All vocalization directed towards and from farmer, including instructions received and small talk
Talking to animals	Vocalization from the participant directed towards an animal

The complete recordings were coded by continuous time sampling using The Observer 7.0 software (Noldus 2007), and analyzed according to the different behavioural categories in Table 4. The various behaviours were expressed as time spent in percent of total recording time early and late in the intervention, and as the mean of these.

2.4.3 Thematic interviews

A qualitative study, inspired by a phenomenological-hermeneutical perspective was conducted based on individual thematic interviews. A purposive sample of ten persons who had completed the twelve-week farm animal-assisted intervention in 2008 or 2009 was recruited through a letter of invitation. Two did not want to attend the study, but seven women and one man between 25 and 54 years of age accepted the invitation. The qualitative data were obtained by accomplishing individual thematic interviews that were audiotaped. The interviews, lasting between 16 and 51 min, were conducted by the candidate, and all the participants were interviewed in their homes in the period between May 2009 and July 2009, between 0-14 months after the intervention ended.

The interview guide was developed on the basis of earlier qualitative research within this area, the theoretical frameworks developed within animal-assisted interventions with companion animals, and earlier informal conversations between the PhD candidate and the participants. The interview questions addressed relevant themes connected to the participants' experiences with farm animal-assisted intervention, like their relationship to the farmer, the different work tasks, and the animal contact. The transcripts were analyzed according to a modified version of systematic text condensation by Malterud (2001, 2003). Quotes from the interviews used in the results were translated from Norwegian to English by the PhD candidate, and the participants' number in the study was added in brackets at the end of each quote.

2.5 Outcome measures and measurement points

Questionnaires measuring different aspects of mental health were filled in by the participants. Change of depression was the main outcome in our study, and Beck Depression Inventory-First Amended (BDI-IA) a widely used and well validated questionnaire with sound psychometric properties ($\alpha = 0.88$) was chosen (Beck et al. 1988). Anxiety is a common symptom among depressed. In several studies with companion animal state anxiety has been

assessed as an indicator of stress level, it was therefore included in our study. State-Trait Anxiety Inventory (STAI-SS) was chosen, as it is a widely used questionnaire with sound psychometric properties ($\alpha = 0.83-0.94$) (Spielberger et al. 1983). Self-efficacy was one of the proposed mechanisms behind the potential effects on mental health in our study, and the Generalized Self-efficacy (GSE) questionnaire is well validated ($\alpha = 0.84-0.93$) and implemented in mental health intervention all over the world (Luszczynska et al. 2005; Scholz et al. 2002; Schwarzer 1993). This questionnaire is developed on basis of Albert Banduras' self-efficacy theory and considered to be suitable to measure change in self-efficacy. All three questionnaires were used in the previous farm animal-assisted intervention study by Berget (2006). The possibility to compare the two studies was an important reason for the final choice of assessments. The questionnaires were sent by post or delivered by health personnel to the participants, with information about how and when to fill in, and the participants were identified via a number written on each questionnaire. A return envelope with written return address and a stamp was provided.

2.5.1 Beck Depression Inventory

Beck Depression Inventory-First Amended (BDI-IA; Beck & Steer 1987) was used to assess the level of depressive symptoms. This questionnaire consists of 21 items which are scored on a 0-3 scale, where 0 indicates no symptoms and 3 indicates severe symptoms. Sum scores range between 0-63. BDI is widely used in research and in clinical practice, and it discriminates well between varying degrees of depression severity (Richter et al. 1998). In our study Chronbach's α was 0.85 at the start of intervention. The normal range of the sum score of BDI-IA is 0-9, 10-19 is considered mild depression, and we chose a sum score in the middle of this (14) as inclusion criterion. BDI-IA was also used to estimate if a reliable change and a clinically significant change occurred during the intervention. Reliable change index (RCI) ≥ 1.96 (Jacobson & Truax 1991) is often used as an indicator for improvement in mental health research, and is calculated from the pretest standard deviation from the study in question and the internal consistency of the outcome measure in question. The formula as presented by Jacobsen & Truax (1991):

$$RCI = \frac{(\text{pretreatment}) - (\text{posttreatment})}{S_{(\text{diff})}} \quad S_{(\text{diff})} = \sqrt{2S_E^2} \quad S_E = SD \sqrt{1-r_{xx}}$$

With an internal consistency $r_{xx} = 0.86$ for BDI (Beck et al. 1988), a reliable change in our study would correspond to a decline in $BDI \geq 9$ points. A clinically significant change has a twofold criterion; a drop in score to below a cutoff score and a reliable change index (RCI) ≥ 1.96 . Seggar, Lambert and Hansen (2002) has estimated a cut-off score for BDI to be 14 between a community sample and a clinically symptomatic sample. A clinically significant change in our study would therefore occur when BDI score drop below 14 together with a decrease in $BDI \geq 9$.

2.5.2 State-Trait Anxiety Inventory

State-Trait Anxiety Inventory – State Subscale (STAI-SS; Spielberger et al. 1983) was used to measure state anxiety. The instrument consists of 20 items, each describing an anxiety symptom, and the participants scored how they felt at the present on a 1 (not at all) to 4 (a great deal) scale. This creates a total score ranging from 20 to a maximum of 80. This assessment is widely used to explore current anxiety and has high construct validity. In the present research Chronbach's α was 0.88 at the start of intervention.

2.5.3 Generalized Self-Efficacy Scale

Perceived self-efficacy was measured by Generalized Self-Efficacy Scale (GSE; Schwarzer & Jerusalem 1995). This inventory consists of 10 statements connected to the participant's perceived ability to cope with a variety of difficult demands. The answer options were ranging from 1 (absolutely wrong) to 4 (absolutely right), which creates a maximum score of 40, demonstrating the highest level of generalized self-efficacy. In our study Chronbach's α was 0.89 at the start of intervention.

2.5.4 Measurement points

The first measurement points for all questionnaires were after recruitment and inclusion, and then again at start of the intervention. Two of the questionnaires (BDI-IA and GSE) were filled in after 4 and 8 weeks of the intervention period. After end of intervention all questionnaires were filled in. The last point of time was three months after end of intervention. Participants in the intervention group and the control group received the questionnaires simultaneously. Originally we planned to include six and twelve months

follow-up registrations, but we excluded these due to the high dropout rate after end of the intervention.

2.6 Statistical analyses

Missing single items of an instrument were handled by the following method: A mean value was calculated for the registered items and the closest integer value above this was given to the missing item. When more than three items were missing, the whole questionnaire was regarded as absent, and was replaced by the last observation carried forward. The intention to treat method with last observation carried forward (Hamer & Simpson 2009; Hollis & Campbell 1999; Montori & Guyatt 2001) was also used to replace missing data and data from participants who dropped out during the intervention period. The same procedure was used for the participants who completed the intervention, but dropped out at the 3-month follow-up.

Matched-paired t-tests were performed to examine changes in mental health between two measurement points within the intervention group and the control group. The first time point was recruitment and end of intervention was the last. A repeated-measures analysis of variance (RM-ANOVA) was used to examine the difference between groups. This analysis can be used when there are repeated measurements for the same subjects on the same variable for a minimum of three measurement points (Field 2009). In our study two of the questionnaires (BDI-IA and GSE) were administered at six measurement points while the remaining questionnaire (STAI-SS) was used four times. The sphericity assumption for repeated measures was not met, and a Greenhouse-Geisser correction was used.

A power analysis was conducted on the data from the randomized controlled trial. This was done in order to estimate minimum number of participants needed if we should obtained a significant difference in change between groups in BDI-IA from recruitment to end of intervention.

Bivariate correlations between time spent with different work tasks, dialogue with farmer and animal contact, and change in depression, anxiety and self-efficacy from start to end of intervention, were calculated as Spearman's rho. This non-parametric test is used when raw

data violate basic assumptions such as non-normality distribution of data. In our study this was seen for the behavioural measures.

All analyses were conducted by using the statistical software JMP 8.0 (JMP 2008) and the significance level used for all tests included the power analysis was $p < 0.05$.

2.7 Ethical considerations

The research protocol, the interview guide, the information letter and the data handling procedures were approved by the Regional Committee for Medical Research Ethics and the Privacy Ombudsman for Research. All participants gave a written consent prior to the inclusion in this study, and all were allowed to drop out at any time without giving any reasons for this.

3 Summary of results from individual papers

Paper I: Farm animal-assisted intervention for persons with clinical depression, a randomized controlled trial

The main aim of this paper was to examine the effects of a twelve-week farm animal-assisted intervention on depression, state anxiety and self-efficacy, compared to a waiting list control group.

Figure 2 and 3 show development in scores of depression, state anxiety and generalized self-efficacy in the intervention and control group at the different measurement points from recruitment to follow-up (mean and SE).

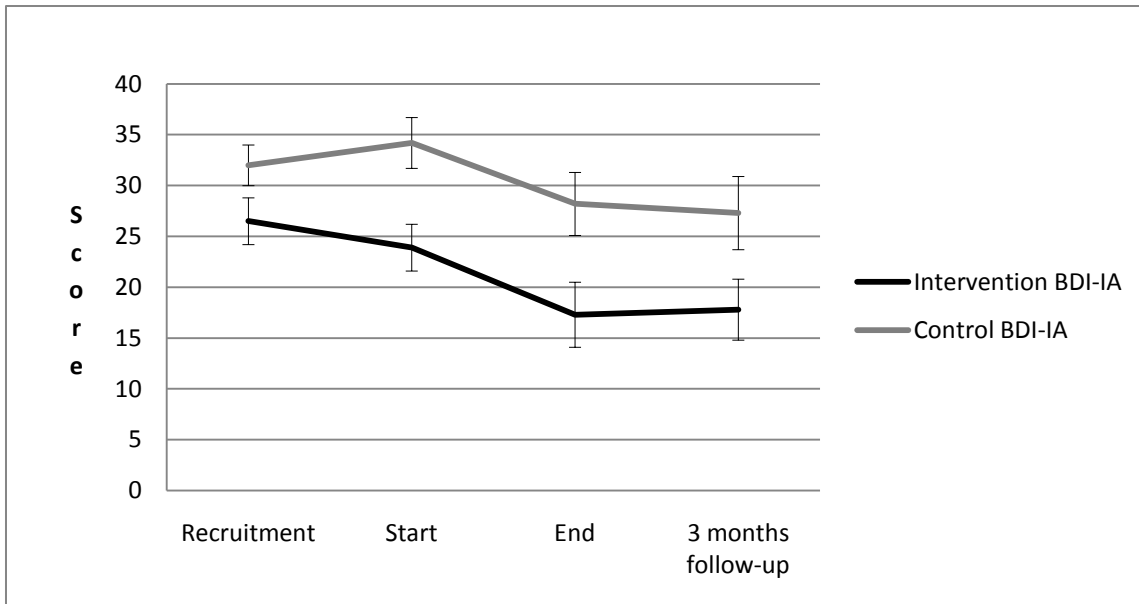


Figure 2. Development in scores of depression (BDI-IA) in the intervention and control group at different measurement points from recruitment to follow-up (mean and SE)

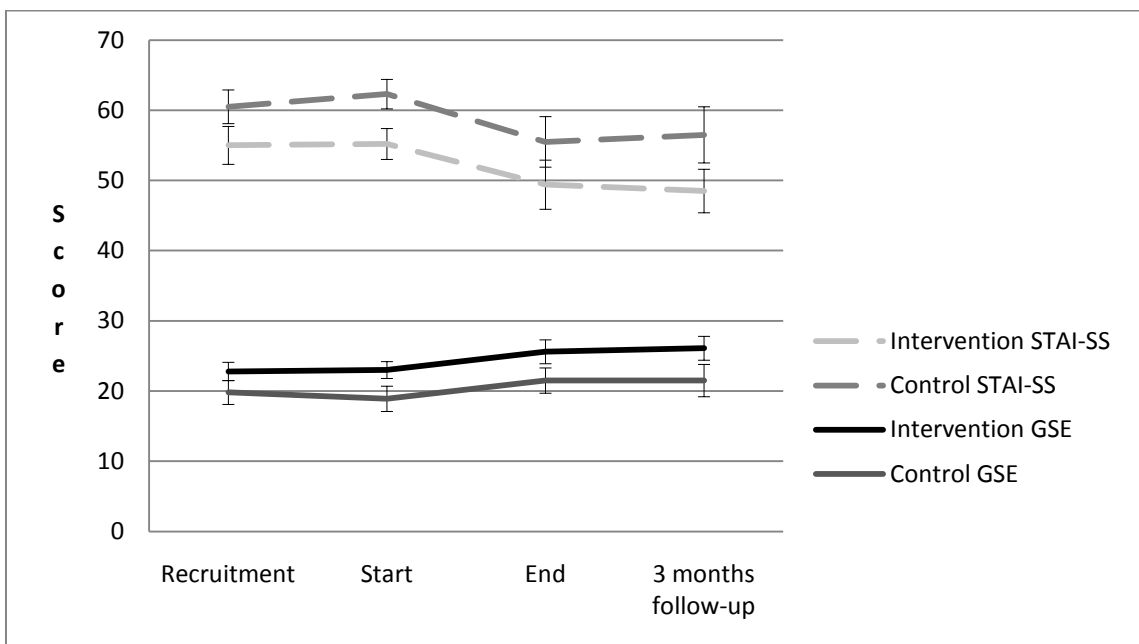


Figure 3. Development in scores of state anxiety (STAI-SS) and generalized self-efficacy (GSE) in the intervention and control groups at different measurement points from recruitment to follow-up (mean and SE)

For the intervention group, the matched-paired t-tests revealed a significant decline in depression between recruitment and end of intervention. It was a close to significant decrease in state anxiety between recruitment and end of intervention. A significant increase in self-efficacy was found between recruitment and end of intervention. Participants kept their gains

during the three-month follow-up period. For the control group no significant changes were found. The repeated-measures analysis of variance did not reveal any significant difference between groups at any time point for none of the instruments. Result from the power analysis showed that a minimum of 50 participants were needed to obtain significant results. With regard to the reliable change index, 9 of 16 participants in the intervention group and 3 of 13 participants in the control group met this criterion and could be classified as improved. Clinically significant changes were achieved by 6 of 16 participants in the intervention group and only one participant in the control group, and these persons could be regarded as returned to the normal range.

Paper II: Farm animal-assisted intervention: Relationship between work and contact with farm animals and change in depression, anxiety and self-efficacy among persons with clinical depression.

The main aim of this study was to examine the relationships between various elements in a farm animal-assisted intervention, and changes in depression, anxiety and self-efficacy for persons with clinical depression. The specific hypotheses were:

- There will be a favourable association between high levels of performed work tasks and a decline in depression and state anxiety symptoms, and increase in self-efficacy.
- There will be a favourable association between high levels of animal contact, and a decline in state anxiety and depression symptoms.
- There will be a favourable association between high levels of dialogue with the farmer, and a decline in state anxiety and depression symptoms.

Figure 4 illustrates the time spent doing various work tasks, animal contact and dialogue with the farmer early and late in the intervention in percent of total time used in the cowshed for the 14 video recorded participants. Figure 5 shows the participants' (n=14) development in mean scores (SE) of depression, anxiety and generalized self-efficacy from recruitment to the end of the intervention.

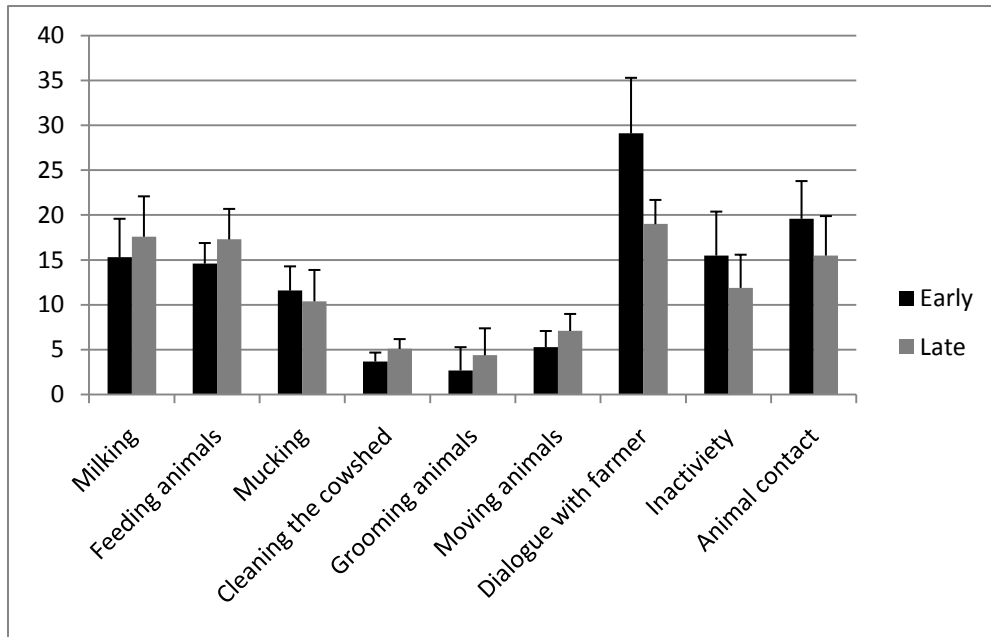


Figure 4. Time spent doing various work tasks, animal contact and dialogue with the farmer early and late in the intervention in percent of total time in the cowshed (mean and SE)

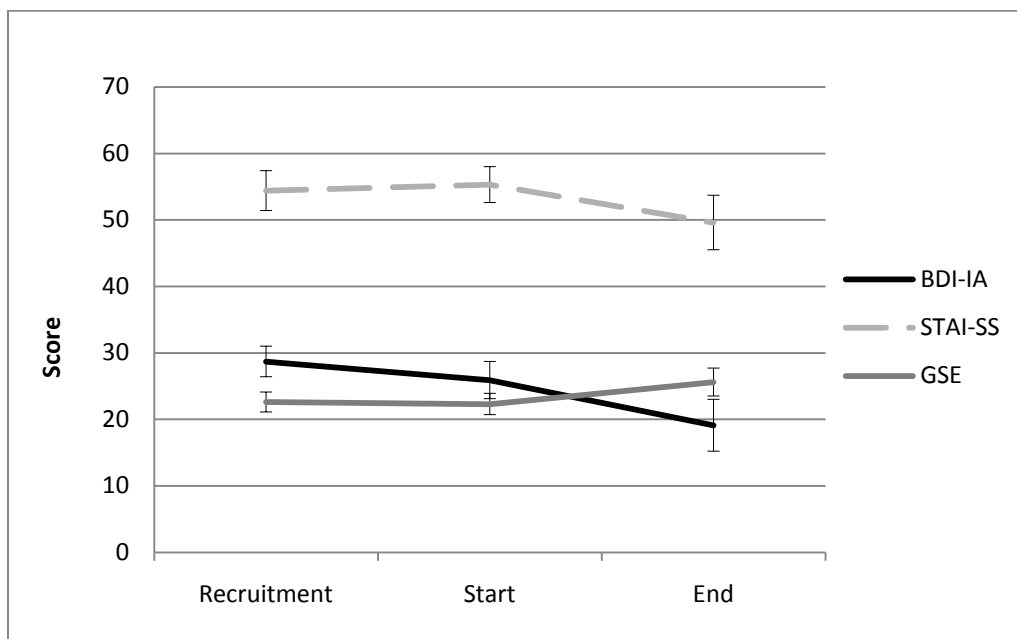


Figure 5. Change in scores of depression (BDI-IA), state anxiety (STAI-SS) and generalized self-efficacy (GSE) (mean and SE)

Bivariate correlations between average time spent in various behavioural categories and changes in depression, anxiety and self-efficacy were calculated. Time spent with milking procedures (milking and technical preparations) were significantly negatively correlated with change in both depression and anxiety; illustrating that the greatest decline in symptoms were

associated with high levels of this work task. Similar relationships were found for other work tasks; cleaning, feeding, moving animals, and dialogue with the farmer. The correlations between moving animals and reduction in depression and anxiety were also significant. High levels of dialogue with the farmer were significantly correlated with the greatest decline in anxiety. For the behaviours mucking, grooming, inactivity, and pure animal contact (physical contact, observing and talking to animals), the relationships with depression and state anxiety were in the opposite direction. The results indicate an unfavourable association between these behaviours and change in symptoms of depression and anxiety. Significant correlations were only found between state anxiety and grooming, and close to significance between depression and animal contact. There was only one significant correlation between generalized self-efficacy and the registered behaviours, mucking was unfavourable associated with self-efficacy. However, there was a trend towards a significant favourable relationship between generalized self-efficacy and milking procedures.

Paper III: Important elements in farm animal-assisted interventions for persons with clinical depression – a qualitative interview study

The main objective of this study was to obtain the participants' own experiences of a farm animal- assisted intervention, and what they perceived as important elements in relation to their mental health. This was done via thematic interviews, and the text analytic process resulted in four main themes: 'Ordinary life', 'Being sick', 'Flexibility', and 'Coping'. Within 'Ordinary life' and 'Being sick' different subthemes emerged from the text, and these were assembled into these two themes.

Within the main theme 'Ordinary life' a majority of the participants expressed that it was very important to them that the intervention gave them a possibility to experience ordinary working life. As one participant said,

"It is an ordinary setting, and you get this...you experience yourself as a person again, you feel like a human being again". (7)

To be considered as an ordinary co-worker gave them a contrast to their illness, which they appreciated, and the experience of being useful was important and very positive. The different elements concerning ordinary life consisted of the subthemes 'ordinary work', 'being

appreciated', and 'being a colleague'. The participants expressed that it was important and positive that the farm work was experienced as 'ordinary work'. This was related to the fact that they felt they accomplished something useful and that their illness was not relevant or in focus. One of the topics mentioned most frequently by the participants, was the feeling of 'being appreciated'. They emphasized that this experience was both due to the farm animals' behaviour and statements from the farmer,

" They said that I helped them a lot, because when we were two milking we could share the work between us". (5)

The experience of 'being a colleague' arose from the participant's view of themselves as a part of workforce at the farm, included and respected as an ordinary worker. They also appreciated the conversation as between colleagues; not focused on treatment or illness, but concentrated on the work tasks and everyday life at the farm.

Within the main theme 'Being sick' the participants emphasized the importance that the farmers knew their condition and situation. In addition they experienced that the intervention served as a distraction from their illness, and created some distance to their problems. This was expressed in different ways by the participants and the subthemes were named; 'Considerate relations', 'Closeness, warmth and calmness', 'Forget my difficulties' and 'Kept me going'. In 'Considerate relations' the possibility to be open about their condition was expressed as important from several of the participants. As one participant said,

"I felt I could tell him and talk with him about....almost everything, actually". (8)

They felt the farmer understood their situation and that they could easily express how they felt. The farmer was also sensitive with regard to the participant's daily state. All participants in different manners expressed the importance of physical contact with the animals. These contacts were achieved through cuddling and stroking animals, or just sit or stand close to them. Statements concerning these experiences were assembled into the sub theme 'Closeness, warmth and calmness'. As one said,

“It is a special tranquillity when you are in the milk parlour milking; it is.....a sort of harmony”. (7)

The main theme ‘Flexibility’ was related to the intervention’s opportunity to adjust the work in relation to the participants’ daily condition. ‘Flexibility’ made it possible for the participants to alternate between being sick and an ordinary life, not only from day to day, but also during one session. This was done both by alternating between work tasks, and by the opportunity to adjust the total work load. Also the adapted instruction given by the farmer during the training process was essential, and the participants felt no pressure during the intervention regarding how fast they completed the work. The farm animals was also an important part of the experienced flexibility,

“You can still have a bad day when you are in contact with animals, because the cows don’t care if you are in a bad mood or if you haven’t put your make up on. So you knew you could go anyway”. (4)

A majority of the participants experienced ‘Coping’ as a central aspect at the farm. This was mainly connected to be able to accomplish work tasks, which also led to a diversity of other positive experiences described as self-confidence, independence, achieving goals and learning new skills. The participants felt they were given tasks they could manage, and this gave a positive feeling of accomplishment,

“My self-confidence has increased after I started at the farm, because I understand that I manage things. I have been allowed to do a lot of things, and I felt I could manage them”. (7)

During the final step in the analytic process a connections between the four main themes and their subordinate subthemes were observed, and a model (Figure 6) was created to visualize this. In the figure, the subthemes related to ‘Being sick’ and ‘Ordinary life’ are placed according to whether they were identified by the participants as a contrast to their illness or as consideration, comfort and distraction from their illness. The themes ‘Flexibility’ and ‘Coping’ are described more as general qualities of the intervention by the participants.

'Flexibility' made it possible for the participants to alternate between being sick and an ordinary life. In the model 'Flexibility' also has a horizontal direction, making it possible to vary between contacts with animals, performing work tasks, and interact and communicate with the farmer. The experience of coping could occur at all "levels" in the intervention, from managing to show up at the farm, to an experience of being an ordinary worker in an ordinary work setting. As for 'Flexibility', 'Coping' also has a horizontal direction; the participants experienced coping in all the three areas, work tasks, contact with animals and with other people. The interview guide was originally structured into the different elements which the intervention could possibly consist of. As these elements were all confirmed by the participants to be essential aspects of the intervention, this division is kept in the model, creating three vertical two headed arrows; personal relationship, performing work tasks, and animal contact.

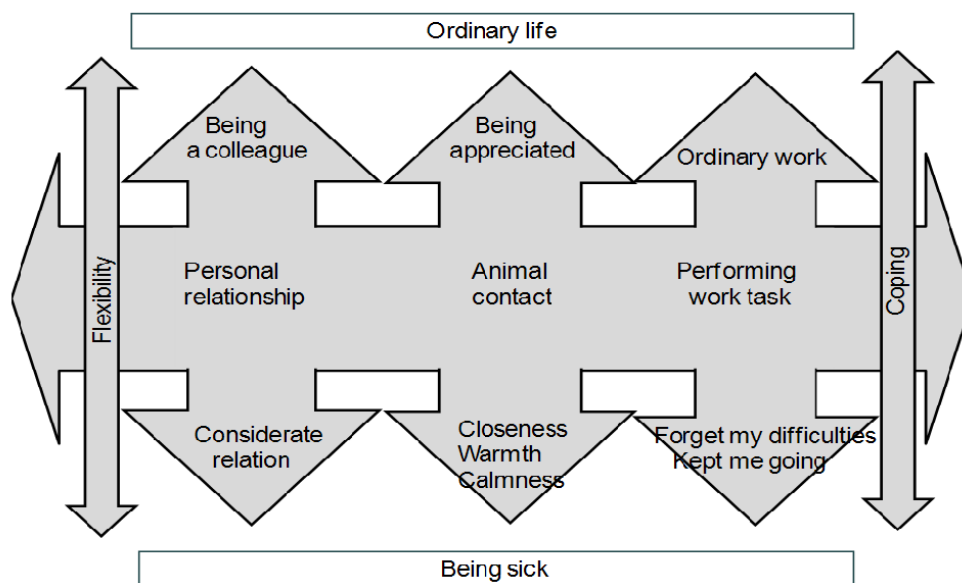


Figure 6. The four main themes as interacting elements in a farm animal-assisted intervention

4 Discussion

The overall research aim of the present thesis was to investigate change in mental health of persons with clinical depression participating in a farm animal-assisted intervention. The discussion is divided into three parts, one for each of the three mental health outcome measures. A discussion around the part objectives; the effects of the intervention on mental

health, the associations between various elements of the intervention and change in mental health, and the participants' own experience with the intervention are incorporated where it naturally belongs. Furthermore, a possible link to and relevance of the theoretical framework presented in the introduction is considered. Finally methodological issues are discussed and the limitations and strengths of the study emphasized.

Participants in the intervention group experienced a significant decline in depression and improved self-efficacy and a close to significant reduction in state anxiety from recruitment to the end of the intervention. Participants kept their gains during the three-month follow-up period. In the control group no significant changes were obtained. However, when the two groups were compared, none of the changes were statistically significant between the groups. Clinical significant change in depression was achieved by 6 of 16 participants in the intervention group and only one participant in the control group. Change in mental health scores were favorably correlated to time spent with milking procedures, feeding, cleaning, moving animals and dialog with farmer, and unfavorably correlated with mucking, grooming, sole animal contact and inactivity. Important elements in the intervention were the possibility to experience an ordinary work life, but also the importance of a distraction from the illness. Furthermore, the intervention's flexibility made it possible for the participants to experience coping and was thereby a key element.

4.1 Change in depression

The participants in this study were clinically depressed persons and, as a natural consequence, change in depression symptoms was a central outcome. From recruitment to end of intervention a significant decline in depression was seen in the intervention group (Paper I). However, when change in depression during the intervention period was compared between the intervention and control groups no significant difference was found (Paper I). Other studies on Green care farming without a control group show a significant decline in depression (Hine et al. 2008; Ketelaars et al. 2001). In two studies without control groups by Gonzalez et al. (2009, 2010) significant declines in depression were seen for persons with clinical depression during a twelve-week therapeutic horticultural intervention in a Green care context. However, Berget et al. (2011) found no significant decline in depression within the intervention group during a twelve-week farm animal-assisted intervention for a group of 41 participants with various psychiatric diagnoses. This may partly be related to the fact that the

patients in the study of Berget et al. had a lower level of depression (mean value of BDI=20.4) before the intervention than in our study (BDI=26.5). In line with our results (Paper I), Berget et al. (2011) found no significant difference between intervention and control groups in depression neither during the intervention nor at six-month follow up. Also in animal-assisted interventions with companion animals a decline in depression is seen in several studies with a control group (Colombo et al. 2006; CrowleyRobinson et al. 1996; Folse et al. 1994; Jessen et al. 1996; Le Roux & Kemp 2009) while others show no change (Barker et al. 2003a; Barker et al. 2003b; Holocomb et al. 1997). Both for Green care studies and animal-assisted interventions with companion animals the intervention sample (diagnoses) and the intervention duration and content are highly dissimilar, making precise comparisons difficult.

The non-standardized intervention content is one of the challenges in Green care research, and results from our study (Paper II) show the variety in intervention content and time spent within each behaviour. At the same time individualization and variety is described as necessary and vital in mental health care and rehabilitation (Ebmeier et al. 2006b; Liberman 2008; Robdale 2008). Results from our study support this description; 'Flexibility' was a main theme emerging from interviews conducted (Paper III), and the possibility to adapt the intervention content to their daily condition was important for the participant. Adjusted demands are claimed as important in Green care studies where work with farm animals was a part of the service (Hassink et al. 2010; Ketelaars et al. 2001). In Paper II the variation in intervention content was investigated and linked to change in depressive symptoms. Time spent in several work tasks was favourably associated with change in depression. For two work tasks, which could be defined as challenging and complex (milking and moving animals), the correlations were significant.

For other behaviours (grooming, mucking and inactivity) the relationship with depression was in the opposite direction, indicating unfavourable associations between time spent with these behaviours and change in symptoms of depression. Since all these behaviours could be classified as a part of beginners' actions, some evidence is provided that a progress in work skills is important as basis for improvement in depression. Diminished self-worth and self-esteem are symptoms of depression, and Bandura (1997b) emphasizes masterful experiences as a basis for alleviating depression. A link between progress in work skills and coping experiences are likely, and results in Paper III support this interpretation. Coping is a main

theme in the thematic interviews. But this was expressed as a general quality of the intervention and not connected to any particular work task. However, the qualitative results (Paper III) were not connected to time spent in each work task as it is in Paper II. This could imply that coping was experienced in a variety of behaviours, but a decline in depression was largest for participants who spent more time in complex and challenging work tasks.

The association between change in depression and time spent in animal contact was unfavourable and close to significant (Paper II). In a study by Berget et al. (2007) no association was found between average distance kept to the animal and change in depression. These results are in contrast to earlier mentioned studies with companion animals where animal contact was beneficial for change in depression (Colombo et al. 2006; CrowleyRobinson et al. 1996; Folse et al. 1994; Jessen et al. 1996; Le Roux & Kemp 2009), and also in Paper III within the main theme 'Being sick' the participants describe the result of contact with animals in positive terms, as calmness, warmth and closeness. But even if animals are important to the participants, there is not necessarily a linear relationship between magnitude of contact and magnitude of improvement in depression. In our study a possible explanation is that it is sufficient that animals are present in the room and that tactile contact is made in connection to work tasks. Animal contact beyond this seems to have negative consequences for a change in depression, possibly because it acts as an obstacle in the development of new work skills.

The main theme 'Being sick' in paper III also includes other important but more unspecific benefits of the intervention described as distraction and distance. Inactivity, withdrawal and behavioural avoidance are common consequences of depression, and the intervention could counteract this. Physical activity is beneficial in depression (Martinsen 2008; Mead et al. 2009), and participation in work tasks could lead to increased physical activity. This is seen in a study by De Bruin et al. (2009) who found higher activity level during a Green care intervention compared to participants in a day care centre. Behavioural activation also act as positive reinforcement and training of social skills (Cuijpers et al. 2007; Kanter et al. 2010) and together with engagement in pleasant activities could this alleviate depression (Bylsma et al. 2011; Harmon et al. 1980; Lewinsohn & Graf 1973). Having an appointment and absorption in activities could protect against rumination and disturbing thoughts and lead to less depressive symptoms (Ehring et al. 2008; Lo et al. 2010).

To our knowledge no other Green care study has examined the association between intervention content and change in mental health measures (Paper II). It is improbable that the same intervention content fits all participants and a non-standardized intervention as ours could fulfil the requirement of individualization. Several studies advocate identifying subgroups and support the usefulness of this approach in mental health interventions when identifying factors contributing to outcome variation (Kraemer et al. 2002; Macias et al. 2008; Razzano et al. 2005; Rubin & Panzano 2002). Within companion animal interventions and pet ownership, identifying underlying or confounding factors are stressed as important (Antonacopoulos & Pychyl 2010; Holocomb et al. 1997; Tower & Nokota 2006; Zasloff & Kidd 1994). Among contributing factors are pet attachment, animal species and frequency of animal contact, demographical factors and social support from humans seen as possible reasons for the observed divergence in results. The analysis of clinically significant change in depression (Paper I) supports the idea of a beneficial outcome for subgroups; a greater part of the intervention group (six of sixteen) than the control group (one of thirteen) achieved this and could be classified as returned to normal functioning. This is in accordance with results from the thematic interviews (Paper III) where three out of 8 interviewed participants saw the intervention as a turning point in their mental illness history and a start of the recovering from depression.

4.2 Change in anxiety

The within-group analysis for the intervention group revealed a tendency towards significant reduction in state anxiety from recruitment to end of intervention (Paper I). No significant group differences were found at any time point. Few other studies within Green care farming have addressed change in anxiety as an outcome, but in a twelve-week therapeutic horticultural intervention in a Green care context for 46 participants with clinical depression a significant decline in state anxiety was observed (Gonzalez et al. 2011). By contrast, Berget et al. (2011) found no significant decline in state anxiety during a twelve-week farm animal-assisted intervention for a group of 41 participants with various psychiatric diagnoses. However, at six-months follow up Berget et al. (2011) found a significant reduction in state anxiety compared with a control group. This latter finding was not seen in our study by three-month follow up (Paper I). It could be speculated if these conflicting results are due to a postponed long-term effect which needs six months after end of intervention before being measurable. On the other hand the intention to treat approach in our data analysis makes it

difficult to find changes because frequency of dropouts increased during the follow-up period. Several studies on animal-assisted interventions with companion animals use anxiety as an outcome. In some studies with a control group improvement in anxiety is observed when in contact with companion animals (Barker & Dawson 1998; Barker et al. 2003b; Cole et al. 2007; Hoffmann et al. 2009; Shiloh et al. 2003), while others report no difference (Barker et al. 2010; Straatman et al. 1997; Wilson 1991). In our study an unfavourable association was seen between time spent in animal contact and state anxiety (Paper II). A similar interpretation as given for depression could be suitable, animal contact beyond the contact connected to work tasks showed no beneficial effect.

Change in state anxiety was associated with time spent in several categories of work tasks and in dialogue with the farmer (Paper II). Beginners' activities like mucking, grooming and inactivity showed an unfavourable association, indicating less decrease in anxiety symptoms with high frequencies of these behaviours. Like for the change in depression, complex and challenging work tasks showed a favourable and significant association with the level of anxiety. This is in accordance with the study of Berget et al. (2007), in the subgroup of persons with affective disorders increase in intensity and exactness in performed work tasks were significantly correlated to decrease in state anxiety. A link to self-efficacy could be possible since coping is closely related to reduced arousal during performance of new tasks (Bandura 1982; Bandura et al. 1988; Schwarzer 1993). Other studies confirm this, showing a significant negative relationship between self-efficacy and state anxiety (Mystakidou et al. 2010; Wiedenfeld et al. 1990).

A relatively high fraction of time spent in dialogue with the farmer was significantly correlated with a decline in anxiety (Paper II) and the farmer was regarded by the participants as both a co-worker and a considerate relation (Paper III). Both these findings could probably be connected to several classes within social support, like emotional, informational and appraisal support (House 1981). Results similar to our findings were seen in the study by Gonzalez et al. (2011) where group cohesiveness correlated positively with change in anxiety measures, and several studies within Green care highlight the group, the social setting and the farmer as essential (Berget et al. 2008b; Bjørgen & Johansen 2007; Elings & Hassink 2008; Ketelaars et al. 2001). Many studies on animal-assisted interventions with companion animals show enhanced social interaction possibly due to the animal serving as a social catalyst (Barak et al. 2001; Bernstein et al. 2000; Gilbey et al. 2006; Guéguen & Ciccotti 2008; Hall &

Malpus 2000; Kawamura et al. 2009; Kramer et al. 2009; Marr et al. 2000; Nathans-Barel et al. 2005; Villalta-Gil et al. 2009). Social interaction is another aspect connected to social support (Cobb 1976), and this was seen in the only farm animal-assisted intervention which measured social interaction (Scholl et al. 2008). It is not possible to conclude if this is valid in our study since no analysis of dialogue content was carried out, but farm animals as attractive and safe subjects for conversation should be considered. Social support is referred to as vital within mental health rehabilitation (Milne 1999) and authors refer to social support, social contact and development of social skills as fundamental for a successful process towards recovery of mental illness (Hansson 2006; Kuehner & Buerger 2005; Ruesch et al. 2004).

Dealing with stressful situations is an issue in mental health rehabilitation and vocational activities for persons with mental illnesses (Blank et al. 2008; Eriksson et al. 2010; Koletsi et al. 2009; Rossler 2006). In many studies with stress inducing tasks a possible calming effect of companion animals were investigated (Allen et al. 2002; Allen et al. 1991; Barker et al. 2010; Demello 1999; Friedmann et al. 2007; Kingwell et al. 2001; Odendaal & Meintjes 2003; Odendaal 2000; Straatman et al. 1997; Wilson 1991). Decline in heart rate, blood pressure and hormones connected to reduced stress (oxytocin, cortisol, adrenalin, and noradrenalin) were seen in a majority of the studies, and the social support theory and the biophilia hypothesis are suggested as possible mechanisms behind the observed physiological changes. In Paper III, calmness, warmth and closeness were some of the descriptions the participants provided about animal contact, and physiological changes could be a reason for this perception. This could ease stress inducing incidents during the intervention. In the analysis of the thematic interviews (Paper III) this comforting relation was placed within the theme 'Being sick' as a distraction from the illness for the participants. This could serve as an explanation for the somewhat conflicting results with Paper II. The unfavourable association between animal contact and change in anxiety could be the result of using animals to endure a hard period. This is shown in the study by Mallon (1994) where animal contact was used to ease difficult feelings.

4.3 Change in generalized self-efficacy

In our study a significant increase in generalized self-efficacy was seen in the intervention group between recruitment and end of intervention (Paper I). In contrast to the many studies with regard to change in depression and anxiety in animal-assisted intervention with

companion animals, only a few previous studies have reported results related to self-efficacy. Chu et al. (2009) found improvement in self-determination and self-esteem during an 8-week animal-assisted intervention with a control group. A similar finding was seen during a Green care intervention without a control group (Hine et al. 2008) while Berget et al. (2008) found no significant increase within the intervention group in generalized self-efficacy during a twelve-week farm animal-assisted intervention. However, the latter authors found significant increase in self-efficacy at six-month follow-up compared to a control group. This was not seen in our study where the change in self-efficacy in the intervention group was not significantly different from the control group (Paper I). It could just be speculated if an extended follow-up period in our study could have made a difference, but the high dropout rate during follow-up and intention to treat analysis makes this more unlikely.

Regardless of a non-significant difference at group level, change in self-efficacy during the intervention showed positive association with time spent in some work tasks and negative associations with others (Paper II). There was only one significant correlation between generalized self-efficacy and the registered behaviours; mucking was unfavourably associated with self-efficacy. This could indicate a negative connection between much time spent with beginners' activity and development in self-efficacy. As for depression and anxiety, challenging and complex work tasks like milking and moving animals had favourable associations with change in self-efficacy (Paper II). A similar result was seen in the study by Berget et al. (2007), where increase in intensity and exactness in performed work tasks was significantly correlated to increase in self-efficacy for persons with affective disorders. The same authors found an increase in milking procedures during the intervention which was linked to an increase in working skills. These findings are supported by conclusions done by Hassink et al. (2010), where Green care interventions are described as empowerment and coping oriented. The importance of coping experiences is highlighted in several studies within work and mental health rehabilitation (Casper & Fishbein 2002; Dunn et al. 2008; Faragher et al. 2005; Mitchell 1998). The possibility to experience coping was important for the participants (Paper III). Even though the theme was not connected to specific work tasks it supports the interpretation about coping as a central mechanism. The theme 'Coping' was linked to a diversity of other positive experiences described as self-confidence, independence, accomplishment, achieving goals and learning new skills. This is in agreement with other qualitative studies describing increase in self-confidence and feeling of achievement as a result of Green care interventions (Elings & Hassink 2008; Hine et al. 2008).

Another main theme in Paper III, 'Ordinary Life' could possibly be linked to the utilization of the farm also as vocational activities, and Liberman (2008) lists a whole range of positive "side effects" of participation in an ordinary work context. It provides purpose and function in daily life, possibility to interact with co-workers, self-esteem, empowerment and hope. In other studies daily activities and social contact are described as important needs (Wiersma 2006) for persons with severe mental illness, and Hillborg et al. (2010) found several important themes during the participants work rehabilitation; to be appreciated, distraction from illness, support and understanding. Similar results are seen in the study by Sundsteigen et al. (2009) where daily occupation is connected to themes like belonging, meaningful occupation and to manage. All these studies do in some way describe contact between co-workers as an important part of the process and this is also a sub-theme within 'Ordinary Life' (Paper III). Social support is already mentioned before in this section as an important part of the intervention, and according to Milne (1999) support influences the feeling of self-esteem and sense of mastery during rehabilitation. In a study by Dunn et al. (2008) the participants described many positive factors in a work situation contributing to a recovery from their mental illness. Work has personal meaning, they felt needed and appreciated, and it was a source to enhanced self-esteem. Statements about being useful and appreciated were frequently mentioned in our study (Paper III), and other studies have also shown ordinary work and the opportunity to feel useful as important within Green care (Elings & Hassink 2008; Hassink et al. 2010; Ketelaars et al. 2001). The possibility to perform meaningful tasks and thereby increase the experience of one's personal value is essential in difficult life situations, and Rappe (2007) emphasizes that coping experiences within Green care lead to personal empowerment. On the other hand coping is dependent on a flexible approach in a work situation and the need for individually adapted challenges is important to avoid too demanding and stressful experiences (Sundsteigen et al. 2009).

Other studies refer to stress as an important barrier during rehabilitation in an ordinary work setting (Blank et al. 2008; Koletsi et al. 2009), but this is not mentioned as a problem in our study (Paper III). The main theme 'Flexibility' in Paper III could be a reason for this, which was connected to both the farmers' conduct and the farm animals. Liberman (2008) emphasizes the need for individualization and the author refers to a study by Fuller et al. (2000) with farming and livestock management as an example of best practice for adjusted

work. This supports the impression our study provides, that farm animal-assisted interventions could be suitable for rehabilitation and recovery from depression (Papers I, II and III).

4.4 Methodological issues

The intervention described in chapter 2.0 was carried out to examine the main aim in this thesis; change in mental health for persons with clinical depression. Throughout the whole process from recruitment to data analysis a whole range of threats to the validity of results could arise. Different methodological issues are discussed in Shadish et al. (2002), which is used as a frame of reference in this section.

4.4.1 Statistical conclusion validity

According to Shadish et al. (2002) relevant threats to statistical conclusion validity include low statistical power, non-standardized intervention, violation of statistical assumptions and increased error rate with multiple tests. The power analysis conducted as described in section 2.1 estimated the necessary number of participants to fifty. During the recruitment process this was impossible to achieve. As a consequence low statistical power is an issue in this project, possibly making it difficult to reject the null hypothesis even if difference in the population should exist. In addition to statistically significant changes, clinical significance is of interest. In our study the proportion of participants achieving a clinically significant change with substantial improvement in depression score are dissimilar in the two groups, indicating a greater potential for improvement in the intervention group. In a clinical trial like ours with a large range of options in intervention content, lack of standardization is natural. Shadish et al. (2002) therefore recommend exploring how different components relate to change in outcome, and this was done in Paper II.

With regard to meet statistical assumptions, check for normal distribution and equal variance was conducted and appropriate corrections and analyses were done. During analysis of Pair-wise t-tests and RM-ANOVA, even though estimated values were used for dropouts no adjustment in degrees of freedom was done. This could possibly cause too low estimates of p-values. On the other hand, the method of last data carried forward is a conservative estimate of end data, with the initial values used and thereby implying no treatment effect. Several

pair-wise correlations were conducted in Paper II, but no correction for multiple tests was applied. This could lead to overestimation of number of significant associations.

4.4.2 Internal validity

Whether a causal relationship between treatment and outcome could be claimed is referred to as a study's internal validity (Shadish et al. 2002). Several factors could contribute to make conclusions about this relationship incorrect; selection, history, maturation, regression towards mean, skewed dropout rate, and last but not least the question about cause preceding effect. A majority of these treats are quite well handled by the randomization process, like selection, history (events occurring during the intervention) and maturation (the naturally occurrence of change over time). However, in such a small study differences between groups in background variables (Table 3) could be confounding factors. Missing data made it impossible to use this information as covariates in analyses, and this is a weakness in the study. None of the mental health scores at recruitment were significantly different between groups, but the mean scores in the control group are numerically larger and could cause a difference in regression to the mean between groups. A randomized controlled trial also protects against the effect before cause possibility. Causal conclusions are however not possible in the video study with bivariate correlations (Paper II).

Attrition is a problem also in randomized controlled trials and is often systematically biased, for example that participants with the most severe symptoms tend to drop out (Shadish et al. 2002). In our study four out of five dropouts during the intervention came from the intervention group. Due to ethical considerations the reasons for dropping out were not mandatory to report, but several of the participants gave an oral or written explanation (Paper I). None of them expressed that reasons were related to the intervention or the symptom level. The skewed dropout rate during the intervention was dealt with to a certain extent using last data carried forward during data analysis.

4.4.3 Construct validity

Shadish et al. (2002) refer to construct validity as the match between study operations and the constructs used to describe them. Common threats are inadequate clarification of construct, reactivity to experimental situation, and experimenter expectancies. We used the concept

clinical depression. We defined this as minimum level of Beck Depression Inventory (BDI-IA) score of 14, implying mild depression. A subsample of 60 % completed the Mini International Neuropsychiatric Interview (M.I.N.I.), a structured clinical interview which is considered reliable and valid (Sheehan et al. 1998). Only one participant did not meet the criteria for major depression. This supports the used of the BDI score as inclusion criteria. Clinical depression is the central construct in our project. If all participants had completed M.I.N.I. interview and given DSM-IV diagnoses this would have strengthen our study. Beck Depression Inventory is considered valid and suitable for research purposes, with a normal range of sum score of 0-9. Most of our participants had a BDI-IA score at recruitment within the range of moderate depression (20-29), and despite some concerns the clarification of construct should be considered adequate.

Reactivity to the experimental situation and experimenter expectancies are threats to validity in our project. Due to ethical guidelines it was an imperative to inform the participants about the research aims before they signed the consent, and the convenience sample of people motivated for this kind of intervention easily includes expectation about a beneficial outcome. Studies of this kind cannot be performed blind, and placebo effects cannot be excluded. In addition a numeric change in opposite direction between the two groups was observed from recruitment to start with improvement in scores for the intervention group. This may be explained by the participants' expectation from the intervention. Then the intervention will "start" when the results of randomization are announced. As a result, recruitment data were used as start point in our data analysis to avoid any influence from participants' expectations on treatment outcome. A possible desire to please the researcher was also a threat against construct validity, and relevant in self-reported measures and video-recordings.

4.4.4 External validity

According to Shadish et al. (2002) questions related to external validity concerns the possibility that the findings in the study are valid for other individuals, in other situations and at other times. The participants in our study were not a result of random sampling, and this makes it difficult to generalize our results to all people with depression. The sample could be described as a convenience sample of persons interested in and motivated for this kind of intervention. Another question is whether recruitment is depending on depression level. Persons with severe depression, even motivated for the intervention, could find it too

demanding. A limitation to persons with mild and moderate depression could be realistic. Another question is the research setting. We were not able to analyze potential interactions between the separate farms and health outcomes, because there were too few participants at each farm. But the diversity in size, mechanisation and farmers of both genders imply a possibility to generalize our findings to most ordinary farms with dairy production. In addition intervention periods were carried out throughout most of the year for more than two years. Any positive findings could possibly be repeated regardless of season. Work and contact with farm animals are together with farmer contact important elements in Green care interventions and our findings should be relevant for most Green care services.

4.4.5 Validity issues in qualitative research

In the present research validity in qualitative research is discussed in relation to three specific challenges stated by Malterud (2001) and Stige et al. (2009); reflexivity, analysis and interpretation of data, and transferability. Reflexivity relates to the researcher's background and position and must be addressed to secure valid findings. The candidate had a preconception of important elements in a farm animal-assisted intervention, developed on the basis of earlier qualitative research within this area, the theoretical frameworks developed within animal-assisted interventions with companion animals, and earlier informal conversations with participants. The interview questions addressed these elements connected to the participants' experiences, like their relationship to the farmer, the different work tasks, and the animal contact. Both the candidate presumptions and the interview guide could bias the participants' response. But it was emphasized from the start of the interview that the elements mentioned were only examples and that all possible themes were welcome. Also a verbal summary was done in the end of each interview to ensure a common understanding, and to help the participant to recall any forgotten aspects.

Presumptions could also affect analysis and interpretation of data, which could be avoided by a transparent and systematic data analysis. Systematic text condensation used in this study meets this demand and during the analysis units of meaning in the text were independently identified by the researchers to ensure openness and prevent premature closure with regard to themes and subthemes to pursue. The preliminary understanding of important elements in the intervention could create a bias in the result, although this was limited through the variation between the researchers regarding closeness and experiences with animal-assisted

interventions, as well as different disciplinary perspectives. During the next stage of the text analysis, the interpretations were done in a group setting to avoid one researcher's personal view to unduly affect the result. Throughout the analysis, the researchers returned to the interview texts to check that the evolving themes and subthemes reflected the meanings conveyed.

Transferability describes the external validity in qualitative research, and range and limitation for application of the findings. One limitation is purposeful sampling of participants, and in this study all participants had finished the intervention. This could create a bias regarding positive experiences, and affect the results towards more positive attitudes to such an intervention. However, there were no new themes or topics emerging from the interviews as the eight interviews took place and saturation of the topics seemed to be achieved. This supports the aim to obtain information that could be applied beyond the study setting. On this basis the main themes presented in this thesis could be applicable to participants finishing a farm animal-assisted intervention.

5 Conclusions

5.1 Main findings

Significant beneficial changes in mental health were observed in the intervention group, and remarkably more participants were improved and experienced clinically significant change in depression, compared to the control group. Thus our study offers some support to claim that a farm animal-assisted intervention could be a beneficial supplementary intervention for people with depression, even though no significant differences between groups were obtained.

Differences in outcomes seems to some degree depended on the intervention content. Progress in work skills seems important, possibly connected to increase in coping. Examining the participants' experience with the intervention was another objective in this study. The intervention's flexibility was a key element, and the basis for coping experiences which was perceived as important. On this basis, the participants' mastery experience could be essential for improvement in mental health.

Participants with the most frequent animal contact showed the least improvement, or even deterioration, in mental health. At the same time the participants' experiences provide some evidence of a stress reducing effect of animal contact. Nevertheless, interaction with farm animals via work tasks may offer a greater potential for improved mental health than sole animal contact.

Participants who spent much time in dialogue with the farmer showed larger decline in anxiety. A close relationship to the farmer could be an important element in the intervention because it provides social support and anxiety relief in a potentially stressful situation. This may also influence positively on participants' progress into new work skills.

5.2 Theoretical implications

To our knowledge this is the first farm animal-assisted intervention study with an explicit theoretical framework. Farm animal-assisted interventions are complex with unspecific intervention content and several theories could be relevant for explaining the results. In this study three theories were elaborated in order to explain why farm animal-assisted intervention may be beneficial in clinical depression. Our findings represent only indications of possible mechanisms involved. Farm animals, like companion animals, may provide a stress reducing milieu. A possible link to the biophilia hypothesis should be considered. Some evidence is provided for social support as a vital mechanism with the farmer as main source, and a connection to several of the classes within social support could be relevant. Like for companion animals, contact with the animals may catalyze such social effects. Our study supports the idea that change in self-efficacy could be a mechanism behind alleviation of depression, but further exploration of this relation is necessary.

5.3 Implications for further research

The comprehensive and rather unsuccessful recruitment process suggests further investigations about how to motivate and recruit persons in the most successful way. Symptoms related to depression, anxiety level and degree of contact with health personnel could be factors which potentially affected the recruitment process. A more successful recruitment process is essential to achieve enough power to detect possible differences between groups and should be an important aim in projects in the future. An extended follow-

up period should be of interest, and relevant actions to avoid dropout in this period should be investigated. Another question is to what extent patients with mental disorders find this kind of intervention meaningful or relevant. Maybe it would have been easier to recruit patients to a project involving a variety of farm animals.

Essential factors for a successful intervention could be enhanced self-efficacy and social support, and this should be further investigated and identified. Change in generalized self-efficacy was only to a certain extent linked to intervention content in our study. Self-efficacy measures more directly connected to the intervention content could capture if change in self-efficacy is related to some work task more than others. Enhanced self-efficacy could act as a mediating factor in change in depression. This was not examined in this project, but could be an interesting perspective in further research. Self-efficacy is shown to protect against relapse in depression (Gopinath et al. 2007; Maciejewski et al. 2000), and during an extended follow-up this possible connection could be interesting to observe in future research. Social support was addressed via participants' experience with the intervention and time used in dialogue with the farmer. An alternative could be a more direct outcome measures on perceived social support. Also a potential influence of dialogue content on progress into new work skills could be interesting to examine, with respect to instructions, affirmation, advice and suggestions from the farmer. In the future, interventions with increasing duration could help to clarify if a twelve-week intervention is sufficient time to detect differences.

Several elements and possible mechanisms involved in the intervention point in the direction to a positive influence on stress. Perceived stress as outcome measure could be an option in further research. Another alternative is to examine change in physiological measures linked to stress. This could be blood pressure, heart rate or hormones connected to stress like cortisol, adrenalin or oxytocin. Our results indicate an influence of intervention content on outcome possibly creating subgroups; however the connection between intervention content and outcome should be further investigated. Farm animal-assisted interventions could also be applied for groups diagnosed with other mental health disorders in order to investigate to whom it may be beneficial. A number of theoretical hypotheses are suggested in farm animal-assisted interventions and Green care, but the research into plausible mechanisms is limited. In the future this research field needs theoretical development to be able to offer evidence-based interventions as supplementary treatment to different target groups. The number of

studies with adequate scientific level still is few, and there is a need for qualitative as well as quantitative studies.

5.4 Clinical implications

The participants' experiences highlight the importance of preparing interventions which create a realistic working community with ordinary work tasks. Flexibility is an essential element and a diversity of work tasks should be provided. The farmer offered the participants both an experience of being an ordinary co-worker and a considerate relation, and the farmer's attitude and commitment should be stressed as essential when planning interventions for clients with clinical depression. Support from the farmer could also be important for the progress into new working skills, which probably is central for achieving reduced symptoms of depression and anxiety. Our results show that farm animals add a significant value by offering closeness, warmth and calmness. Livestock management also provides a variety of work tasks in a non-demanding and flexible way. This is difficult to replace by other means, and farm animals should be included in Green care interventions. Because this milieu already exists in many small scale farms, it should be feasible to implement farm animal-assisted interventions as a supplement in mental health care and mental health rehabilitation. Planning and implementing this kind of intervention involves different occupational groups and our model developed from the thematic interviews could be used to facilitate a common understanding in an interdisciplinary field.

6 References

- Allen, K., Blascovich, J. & Mendes, W. B. (2002). Cardiovascular reactivity and the presence of pets, friends, and spouses: the truth about cats and dogs. *Psychosomatic medicine*, 64(5), 727-739.
- Allen, M. K., Blascovich, J., Tomaka, J. & Kelsey, R. M. (1991). Presence of human friends and pet dogs as moderators of autonomic responses to stress in women. *Journal of Personality and Social Psychology*, 61(4), 582-589.
- Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., Bryson, H., de Girolamo, G., Graaf, R., Demyttenaere, K., Gasquet, I., Haro, J. M., Katz, S. J., Kessler, R. C., Kovess, V., Lepine, J. P., Ormel, J., Polidori, G., Russo, L. J., Vilagut, G., Almansa, J., Arbabzadeh-Bouchez, S., Autonell, J., Bernal, M., Buist-Bouwman, M. A., Codony, M., Domingo-Salvany, A., Ferrer, M., Joo, S. S., Martinez-Alonso, M., Matschinger, H., Mazzi, F., Morgan, Z., Morosini, P., Palacin, C., Romera, B., Taub, N. & Vollebergh, W. A. (2004). Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta psychiatrica Scandinavica, Supplementum*(420), 21-27.
- Alonso, J., Buron, A., Bruffaerts, R., He, Y., Posada-Villa, J., Lepine, J. P., Angermeyer, M. C., Levinson, D., de Girolamo, G., Tachimori, H., Mneimneh, Z. N., Medina-Mora, M. E., Ormel, J., Scott, K. M., Gureje, O., Haro, J. M., Gluzman, S., Lee, S., Vilagut, G., Kessler, R. C. & Von Korff, M. (2008). Association of perceived stigma and mood and anxiety disorders: results from the World Mental Health Surveys. *Acta psychiatrica Scandinavica*, 118(4), 305-314.
- Andrews, G., Poulton, R. & Skoog, I. (2005). Lifetime risk of depression: restricted to a minority or waiting for most? *British Journal of Psychiatry*, 187, 495-496.
- Antonacopoulos, N. M. D. & Pychyl, T. A. (2008). An examination of the relations between social support, anthropomorphism and stress among dog owners. *Anthrozoös*, 21(2), 139-152.
- Antonacopoulos, N. M. D. & Pychyl, T. A. (2010). An Examination of the Potential Role of Pet Ownership, Human Social Support and Pet Attachment in the Psychological Health of Individuals Living Alone. *Anthrozoös*, 23(1), 37-54.
- APA. (1994). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* Washington D.C.: American Psychiatric Association.
- APA. (2000) *Diagnostic and Statistical manual of Mental Disorders (DSM-IV-TR)*. Washington D.C.: American Psychiatric Association
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191-215.
- Bandura, A. (1982). Self-efficacy Mechanism in Human Agency. *American Psychologist*, 37(2), 122-147.
- Bandura, A. (1997a). Self-efficacy. *Harvard Mental Letter*, 13(9).
- Bandura, A. (1997b). *Self-efficacy : The Exercise of Control*. New York: W.H. Freeman and Company, 604 p.
- Bandura, A., Cioffi, D., Taylor, C. B. & Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. *Journal of personality and social psychology*, 55(3), 479-488.
- Banks, M. R. & Banks, W. A. (2002). The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. *Journals of Gerontology Series A-Biological Sciences and Medical Sciences*, 57(7), 428-432.

- Banks, M. R. & Banks, W. A. (2005). The effects of group and individual animal-assisted therapy on loneliness in residents of long-term care facilities. *Anthrozoös*, 18(4), 396-408.
- Barak, Y., Savorai, O., Mavashev, S. & Beni, A. (2001). Animal-Assisted Therapy for Elderly Schizophrenic Patients. A One-Year Controlled Trial. *American Journal of Geriatric Psychiatry*, 9(4), 439-442.
- Barbui, C., Butler, R., Cipriani, A., Geddes, J. & Hatcher, S. (2007). Depression in adults: drug and physical treatments. *Clinical Evidence*, 1003. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2943802/?tool=pubmed>
- Barker, S. B. & Dawson, K. S. (1998). The effects of animal-assisted therapy on anxiety ratings of hospitalized psychiatric patients. *Psychiatric Services*, 49(6), 797-801.
- Barker, S. B., Knisely, J. S., McCain, N. L. & Best, A. L. (2005). Measuring stress and immune response in healthcare professionals following interaction with a therapy dog: a pilot study. *Psychological Reports*, 98, 713-729.
- Barker, S. B., Knisely, J. S., McCain, N. L., Schubert, C. M. & Pandurangi, A. K. (2010). Exploratory Study of StressBuffering Response Patterns from Interaction with a Therapy Dog. *Anthrozoös*, 23(1), 79-91.
- Barker, S. B., Pandurangi, A. K. & Best, A. M. (2003a). Effects of animal-assisted therapy on patients' anxiety, fear, and depression before ECT. *Journal of ECT*, 19(1), 38-44.
- Barker, S. B., Rasmussen, K. G. & Best, A. M. (2003b). Effect of aquariums on electroconvulsive therapy patients. *Anthrozoös*, 16(3), 229-240.
- Barker, S. B. & Wolen, A. R. (2008). The Benefits of Human-Companion Animal Interaction: A Review. [Proceedings Paper]. *Journal of Veterinary Medical Education*, 35(4), 487-495.
- Beck, A. & Steer, R. A. (1987). *Manual for the Beck Depression Inventory*. San Antonio, TX: The Psychological Corporation.
- Beck, A., Steer, R. A. & Carbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical psychology review*, 8(1), 77-100.
- Berget, B. (2006). *Animal-assisted therapy: effects on persons with psychiatric disorders working with farm animals*. Philosophiae Doctor Thesis 2006:20, UMB, Ås. ISBN:82-575-0724-5.
- Berget, B. & Braastad, B. O. (2008). Kunnskapsstatus og forskningsbehov for Inn på tunet: Helse UMB – Universitetet for miljø- og biovitenskap. Institutt for husdyr- og akvakulturvitenskap.
- Berget, B., Ekeberg, O. & Braastad, B. O. (2008a). Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on self-efficacy, coping ability and quality of life, a randomized controlled trial. *Clinical practice and epidemiology in mental health*, 4. Retrieved from <http://www.cpementalhealth.com/content/4/1/9>
- Berget, B., Ekeberg, O. & Braastad, B. O. (2008b). Attitudes to animal-assisted therapy with farm animals among health staff and farmers. *Journal of Psychiatric and Mental Health Nursing*, 15(7), 576-581.
- Berget, B., Ekeberg, Ø., Pedersen, I. & Braastad, B. O. (2011). Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on anxiety and depression. A randomized controlled trial. *Occupational Therapy in Mental Health*, 27(2), 50-64.
- Berget, B., Skarsaune, I., Ekeberg, Ø. & Braastad, B. O. (2007). Humans with Mental Disorders Working with Farm Animals: A Behavioral Study. *Occupational Therapy in Mental Health*, 23(2), 101-117.

- Bernstein, P. L., Friedmann, E. & Malaspina, A. (2000). Animal-assisted therapy enhances resident social interaction and initiation in long-term care facilities. *Anthrozoös*, 13(4), 213-224.
- Bjørger, D. & Johansen, K. J. (2007). Bruker spør bruker, evaluering av Inn på tunet. Brukerevaluering av tilbud til mennesker med psykiske vansker i tre kommuner i Sør-Trøndelag: Mental helse i Sør- Trøndelag. Prosjektrapport I/2007.
- Blank, L., Peters, J., Pickvance, S., Wilford, J. & Macdonald, E. (2008). A systematic review of the factors which predict return to work for people suffering episodes of poor mental health. *Journal of occupational rehabilitation*, 18(1), 27-34.
- Bokkers, E. A. M. (2006). Effects of interactions between humans and domesticated animals. In J. Hassink & M. van Dijk (Eds.), *Farming for Health. Green-Care Farming Across Europe and the United States of America* (Vol. 13, pp. 31-41). Dordrecht: Wageningen UR Frontis Series.
- Brown, G. W. & Harris, T. O. (2008). Depression and the serotonin transporter 5-HTTLPR polymorphism: A review and a hypothesis concerning gene-environment interaction. *Journal of affective disorders*, 111(1), 1-12.
- Butler, R., Hatcher, S., Price, J. & Von Korff, M. (2007). Depression in adults: psychological treatments and care pathways. *Clinical Evidence*, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2943776/?tool=pubmed>
- Bylsma, L. M., Taylor-Clift, A. & Rottenberg, J. (2011). Emotional Reactivity to Daily Events in Major and Minor Depression. *Journal of Abnormal Psychology*, 120(1), 155-167.
- Casper, E. S. & Fishbein, S. (2002). Job satisfaction and job success as moderators of the self-esteem of people with mental illnesses. *Psychiatric rehabilitation journal*, 26(1), 33-42.
- Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., McClay, J., Mill, J., Martin, J., Braithwaite, A. & Poulton, R. (2003). Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science*, 301(5631), 386-389.
- Chisholm, D., Diehr, P., Knapp, M., Patrick, D., Treglia, M. & Simon, G. (2003). Depression status, medical comorbidity and resource costs. Evidence from an international study of major depression in primary care (LIDO). *The British journal of psychiatry*, 183, 121-131.
- Chu, C. I., Liu, C. Y., Sun, C. T. & Lin, J. (2009). The Effect of Animal-Assisted Activity on Inpatients with Schizophrenia. *Journal of Psychosocial Nursing and Mental Health Services*, 47(12), 42-48.
- Cobb, S. (1976). Social support as Moderator of Life Stress. *Psychosomatic Medicine*, 38(5), 300-314.
- Cohen, S. & Syme, S. L. (1985). *Social support and health*. Orlando, Fla.: Academic Press, 390 p.
- Cole, K. M., Gawlinski, A., Steers, N. & Kotlerman, J. (2007). Animal-assisted therapy in patients hospitalized with heart failure. *American Journal of Critical Care*, 16(6), 575-585.
- Colombo, G., lo Buono, M., Smania, K., Raviola, R. & De Leo, D. (2006). Pet therapy and institutionalized elderly: A study on 144 cognitively unimpaired subjects. *Archives of Gerontology and Geriatrics*, 42(2), 207-216.
- COST. (2010). Action 866: Green care in agriculture Retrieved 10th of April 2011, from http://w3.cost.esf.org/index.php?id=181&action_number=866

- CrowleyRobinson, P., Fenwick, D. C. & Blackshaw, J. K. (1996). A long-term study of elderly people in nursing homes with visiting and resident dogs. *Applied Animal Behaviour Science*, 47(1-2), 137-148.
- Cuijpers, P. & Smit, F. (2002). Excess mortality in depression: a meta-analysis of community studies. *Journal of affective disorders*, 72(3), 227-236.
- Cuijpers, P., van Straten, A. & Warmerdam, L. (2007). Behavioral activation treatments of depression: A meta-analysis. [Review]. *Clinical psychology review*, 27(3), 318-326.
- Dalgard, O. S. (2008). Social inequalities in mental health in Norway: possible explanatory factors. *International Journal for Equity in Health*, 7(27). Retrieved from <http://www.equityhealthj.com/content/pdf/1475-9276-7-27.pdf>
- Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson, G., Ayuso-Mateos, J. L., Page, H. & Dunn, G. (2006). Negative life events, social support and gender difference in depression - A multinational community survey with data from the ODIN study. *Social Psychiatry and Psychiatric Epidemiology*, 41(6), 444-451.
- De Bruin, S. R. (2009). *Sowing in the autumn season - Exploring benefits of green care farms for dementia patients*. PhD Thesis, Wageningen University, Wageningen, NL. ISBN: 978-90-8585-509-5.
- De Bruin, S. R., Oosting, S. J., Tobi, H., Blauw, Y. H., Schols, J. & De Groot, C. (2010). Day care at green care farms: A novel way to stimulate dietary intake of community-dwelling older people with dementia? *Journal of Nutrition, Health & Aging*, 14(5), 352-357.
- De Bruin, S. R., Oosting, S. J., Y., K., Hoefnagels, E. C. M., Blauw, Y. H., De Groot, C. P. M. G. & Schols, J. M. G. A. (2009). Green care farms promote activity among elderly people with dementia. *Journal of Housing for the Elderly*, 23(4), 368-389.
- Delta Society. (07th of April 2011). Delta Society. The Human-Animal Health Connection. Retrieved from www.deltasociety.org
- Demello, L. R. (1999). The effect of the presence of a companion-animal on physiological changes following the termination of cognitive stressors. *Psychology & Health*, 14(5), 859-868.
- Demyttenaere, K., Bruffaerts, R., Posada-Villa, J., Gasquet, I., Kovess, V., Lepine, J. P., Angermeyer, M. C., Bernert, S., de Girolamo, G., Morosini, P., Polidori, G., Kikkawa, T., Kawakami, N., Ono, Y., Takeshima, T., Uda, H., Karam, E. G., Fayyad, J. A., Karam, A. N., Mneimneh, Z. N., Medina-Mora, M. E., Borges, G., Lara, C., de Graaf, R., Ormel, J., Gureje, O., Shen, Y., Huang, Y., Zhang, M., Alonso, J., Haro, J. M., Vilagut, G., Bromet, E. J., Gluzman, S., Webb, C., Kessler, R. C., Merikangas, K. R., Anthony, J. C., Von Korff, M. R., Wang, P. S., Brugha, T. S., Aguilar-Gaxiola, S., Lee, S., Heeringa, S., Pennell, B. E., Zaslavsky, A. M., Ustun, T. B. & Chatterji, S. (2004). Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *JAMA*, 291(21), 2581-2590.
- Dessein, J. & Bock, B. B. (Eds.). (2010). *The Economics of Green Care in Agriculture. COST Action 866, Green Care in Agriculture*. Loughborough: Loughborough University.
- Di Iacovo, F., Senni, S. & De Knecht, J. (2006). Farming for Health in Italy. In J. Hassink & M. van Dijk (Eds.), *Farming for Health. Green-Care Farming Across Europe and the United States of America* (Vol. 13, pp. 289-308). Dordrech: Wageningen UR Frontis Series.
- Doris, A., Ebmeier, K. & Shajahan, P. (1999). Depressive illness. *Lancet*, 354(9187), 1369-1375.

- Dunn, E. C., Wewiorski, N. J. & Rogers, E. S. (2008). The meaning and importance of employment to people in recovery from serious mental illness: results of a qualitative study. *Psychiatric rehabilitation journal*, 32(1), 59-62.
- Ebmeier, K., Rose, E. & Steele, D. (2006a). Cognitive impairment and fMRI in major depression. *Neurotoxicity Research*, 10(2), 87-92.
- Ebmeier, K. P., Donaghey, C. & Steele, J. D. (2006b). Recent developments and current controversies in depression. *Lancet*, 367(9505), 153-167.
- Ehring, T., Frank, S. & Ehlers, A. (2008). The role of rumination and reduced concreteness in the maintenance of posttraumatic stress disorder and depression following trauma. *Cognitive Therapy and Research*, 32(4), 488-506.
- Eklund, M., Hansson, L. & Ahlqvist, C. (2004). The importance of work as compared to other forms of daily occupations for wellbeing and functioning among persons with long-term mental illness. *Community mental health journal*, 40(5), 465-477.
- Elings, M. & Hassink, J. (2008). Green Care Farms, A Safe Community Between Illness or Addiction and the Wider Society. *International journal of therapeutic communities*, 29(3), 310-322.
- Enders-Slegers, M. J. (2008). Therapeutic farming or therapy on a farm. In J. Dessein (Ed.), *Farming for health. Proceedings of the Community of Practice Farming for Health, 6-9 November 2007* (pp. 37-44). Ghent: Merelbeke, Belgium: ILVO.
- Eriksson, T., Karlstrom, E., Jonsson, H. & Tham, K. (2010). An exploratory study of the rehabilitation process of people with stress-related disorders. *Scandinavian Journal of Occupational Therapy*, 17(1), 29-39.
- Ernst, E., Rand, J. I. & Stevinson, C. (1998). Complementary therapies for depression: an overview. *Archives of general psychiatry*, 55(11), 1026-1032.
- Faragher, E. B., Cass, M. & Cooper, C. L. (2005). The relationship between job satisfaction and health: a meta-analysis. *Occupational and Environmental Medicine*, 62(2), 105-112.
- Farming for Health. (2011) Retrieved 10th of April 2011, from <http://www.farmingforhealth.org>
- Fava, M. (2003). Diagnosis and definition of treatment-resistant depression. *Biological Psychiatry*, 53(8), 649-659.
- Fergusson, D., Aaron, S. D., Guyatt, G. & Hebert, P. (2002). Post-randomisation exclusions: the intention to treat principle and excluding patients from analysis. *British Medical Journal*, 325(7365), 652-654.
- Field, A. (2009). *Discovering statistics using SPSS* (3 ed.). London: SAGE Publications Ltd, 809 p.
- Fjeldavli, E. & Meistad, T. (2004). Green Care - report of frequencies from a survey among Norwegian farmers (Vol. 2/2004, pp. 0-50): Centre for Rural Research, NTNU.
- Fletcher, J., Bower, P. J., Gilbody, S., Lovell, K., Richards, D. & Gask, L. (2007). Collaborative care for depression and anxiety problems in primary care. *Cochrane Database of Systematic Reviews, Intervention Protocol*. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD006525/frame.html>
- Folse, E. B., Minder, C. C., Aycock, M. J. & Santana, R. T. (1994). Animal-Assisted Therapy and Depression in Adult College-Students. *Anthrozoös*, 7(3), 188-194.
- Foss, C. & Ellefsen, B. (2002). The value of combining qualitative and quantitative approaches in nursing research by means of method triangulation. *Journal of Advanced Nursing*, 40(2), 242-248.
- Friedmann, E. & Son, H. (2009). The Human-Companion Animal Bond: How Humans Benefit. *Veterinary Clinics of North America-Small Animal Practice*, 39(2), 293-+.

- Friedmann, E., Thomas, S. A., Cook, L. K., Tsai, C. C. & Picot, S. J. (2007). A friendly dog as potential moderator of cardiovascular response to speech in older hypertensives. *Anthrozoös*, 20(1), 51-63.
- Fryers, T., Melzer, D., Jenkins, R. & Brugha, T. (2005). The distribution of the common mental disorders: social inequalities in Europe. *Clinical practice and epidemiology in mental health*, 1, 14.
- Fuller, T. R., Oka, M., Otsuka, K., Yokoyama, N., Liberman, R. P. & Niwa, S. I. (2000). A hybrid supported employment program for persons with schizophrenia in Japan. *Psychiatric Services*, 51(7), 864-866.
- Furukawa, T. A., Yoshimura, R., Harai, H., Imaizumi, T., Takeuchi, H., Kitamura, T. & Takahashi, K. (2009). How many well vs. unwell days can you expect over 10 years, once you become depressed? *Acta psychiatrica Scandinavica*, 119(4), 290-297.
- Giaquinto, S. & Valentini, F. (2009). Is there a scientific basis for pet therapy? *Disability and Rehabilitation*, 31(7), 595-598.
- Gilbey, A., McNicholas, J. & Collis, G. M. (2006). Companion animal separation and loneliness. *Anthrozoös*, 19(3), 257-264.
- Gilbey, A., McNicholas, J. & Collis, G. M. (2007). A longitudinal test of the belief that companion animal ownership can help reduce loneliness. *Anthrozoös*, 20(4), 345-353.
- Gilbody, S., Bower, P., Fletcher, J., Richards, D. & Sutton, A. J. (2006). Collaborative care for depression: a cumulative meta-analysis and review of longer-term outcomes. *Archives of internal medicine*, 166(21), 2314-2321.
- Gold, S. M., Zakowski, S. G., Valdimarsdottir, H. B. & Bovbjerg, D. H. (2004). Higher Beck depression scores predict delayed epinephrine recovery after acute psychological stress independent of baseline levels of stress and mood. *Biological psychology*, 67(3), 261-273.
- Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. & Kirkevold, M. (2009). Therapeutic horticulture in clinical depression: a prospective study. *Research and theory for nursing practice*, 23(4), 312-328.
- Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. & Kirkevold, M. (2010). Therapeutic horticulture in clinical depression: a prospective study of active components. *Journal of Advanced Nursing*, 66(9), 2002-2013.
- Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. & Kirkevold, M. (2011). A prospective study of group cohesiveness in therapeutic horticulture for clinical depression. *International Journal of Mental Health Nursing*, 20, 119-129.
- Gopinath, S., Katon, W. J., Russo, J. E. & Ludman, E. J. (2007). Clinical factors associated with relapse in primary care patients with chronic or recurrent depression. *Journal of affective disorders*, 101(1-3), 57-63.
- Grinde, B. & Patil, G. G. (2009). Biophilia: does visual contact with nature impact on health and well-being? *International journal of environmental research and public health*, 6(9), 2332-2343.
- Guéguen, N. & Ciccotti, S. (2008). Domestic Dogs as Facilitators in Social Interaction: An Evaluation of Helping and Courtship Behaviors. *Anthrozoös*, 21(4), 339-349.
- Hall, P. L. & Malpus, Z. (2000). Pets as therapy: effects on social interaction in long-stay psychiatry. *British Journal of Nursing*, 9(21), 2220-2225.
- Hamer, R. M. & Simpson, P. M. (2009). Last observation carried forward versus mixed models in the analysis of psychiatric clinical trials. *The American journal of psychiatry*, 166(6), 639-641.
- Hansson, L. (2006). Determinants of quality of life in people with severe mental illness. *Acta psychiatrica Scandinavica. Supplementum*(429), 46-50.

- Harmon, T. M., Nelson, R. O. & Hayes, S. C. (1980). Self-Monitoring of Mood Versus Activity by Depressed Clients. *Journal of Consulting and Clinical Psychology*, 48(1), 30-38.
- Hassink, J., Elings, M., Zweekhorst, M., van den Nieuwenhuizen, N. & Smit, A. (2010). Care farms in the Netherlands: attractive empowerment-oriented and strengths-based practices in the community. *Health & Place*, 16(3), 423-430.
- Hassink, J. & van Dijk, M. (Eds.). (2006). *Farming for health. Green-Care Farming Across Europe and the United States of America* (Vol. 13). Dordrecht: Springer.
- Haubenhofner, D. K., Elings, M., Hassink, J. & Hine, R. E. (2010). The Development of Green Care in Western European Countries. *Explore-the Journal of Science and Healing*, 6(2), 106-111.
- Hillborg, H., Svensson, T. & Danermark, B. (2010). Towards a working life? Experiences in a rehabilitation process for people with psychiatric disabilities. *Scandinavian Journal of Occupational Therapy*, 17(2), 149-161.
- Hine, R., Peacock, J. & Pretty, J. (2008). Care Farming in the UK: Contexts, Benefits and Links with Therapeutic Communities. *International journal of therapeutic communities*, 29(3), 245-260.
- Hoffmann, A. O. M., Lee, A. H., Wertenaue, F., Ricken, R., Jansen, J. J., Gallinat, J. & Lang, U. E. (2009). Dog-assisted intervention significantly reduces anxiety in hospitalized patients with major depression. *European Journal of Integrative Medicine*, 1(3), 145-148.
- Hollis, S. & Campbell, F. (1999). What is meant by intention to treat analysis? Survey of published randomised controlled trials. *British Medical Journal*, 319(7211), 670-674.
- Holma, K. M., Holma, I. A., Melartin, T. K., Rytysala, H. J. & Isometsa, E. T. (2008). Long-term outcome of major depressive disorder in psychiatric patients is variable. *The Journal of Clinical Psychiatry*, 69(2), 196-205.
- Holocomb, R., Jendro, C., Weber, B. & Nahan, U. (1997). Use of an aviary to relieve depression in elderly males. *Anthrozoös*, 10, 32-36.
- House, J. S. (1981). *Work stress and social support*. Reading, Mass.: Addison-Wesley, 156 p.
- Jacobson, N. S. & Truax, P. (1991). Clinical-Significance - a Statistical Approach to Defining Meaningful Change in Psychotherapy-Research. *Journal of Consulting and Clinical Psychology*, 59(1), 12-19.
- Jessen, J., Cardiello, F. & Baun, M. M. (1996). Avian companionship in alleviation of depression, loneliness, and low morale of older adults in skilled rehabilitation units. *Psychological reports*, 78(1), 339-348.
- JMP. (2008). JMP users guide (Version 8). Cary, NC, USA: SAS Institute Inc.
- Johnson, R., Meadows, R., Haubner, J. & Sevedge, K. (2008). Animal-Assisted Activity Among Patients With Cancer: Effects on Mood, Fatigue, Self-Perceived Health, and Sense of Coherence. *Oncology Nursing Forum*, 35(2), 225-232.
- Jorm, A. F., Morgan, A. J. & Hetrick, S. E. (2008). Relaxation for depression. *Cochrane Database of Systematic Reviews*, 4. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD007142/frame.html>
- Kanai, T., Takeuchi, H., Furukawa, T. A., Yoshimura, R., Imaizumi, T., Kitamura, T. & Takahashi, K. (2003). Time to recurrence after recovery from major depressive episodes and its predictors. *Psychological medicine*, 33(5), 839-845.
- Kanter, J. W., Manos, R. C., Bower, W. M., Baruch, D. E., Busch, A. M. & Rusch, L. C. (2010). What is behavioral activation?: A review of the empirical literature. *Clinical psychology review*, 30(6), 608-620.

- Katon, Rutter, C., Ludman, E. J., Von Korff, M., Lin, E., Simon, G., Bush, T., Walker, E. & Unutzer, J. (2001). A randomized trial of relapse prevention of depression in primary care. *Archives of General Psychiatry*, 58(3), 241-247.
- Katon, W. J. (2003). Clinical and health services relationships between major depression, depressive symptoms, and general medical illness. *Biological psychiatry*, 54(3), 216-226.
- Kawamura, N., Niiyama, M. & Niiyama, H. (2009). Animal-Assisted Activity: Experiences of Institutionalized Japanese Older Adults. *Journal of Psychosocial Nursing and Mental Health Services*, 47(1), 41-47.
- Kellert, S. R. (1993). The Biological Basis for Human Values of Nature. In S.R. Kellert & E.O. Wilson (Eds.), *The Biophilia hypothesis* (pp. 42-66). Washington, D.C.: Island Press.
- Kendler, K. S., Karkowski, L. M. & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *The American journal of psychiatry*, 156(6), 837-841.
- Kendler, K. S., Kuhn, J. W., Vittum, J., Prescott, C. A. & Riley, B. (2005a). The interaction of stressful life events and a serotonin transporter polymorphism in the prediction of episodes of major depression - A replication. *Archives of General Psychiatry*, 62(5), 529-535.
- Kendler, K. S., Myers, J. & Prescott, C. A. (2005b). Sex differences in the relationship between social support and risk for major depression: A longitudinal study of opposite-sex twin pairs. *American Journal of Psychiatry*, 162(2), 250-256.
- Kessler, R. C., Soukup, J., Davis, R. B., Foster, D. F., Wilkey, S. A., Van Rompay, M. I. & Eisenberg, D. M. (2001). The use of complementary and alternative therapies to treat anxiety and depression in the United States. *The American journal of psychiatry*, 158(2), 289-294.
- Ketelaars, D., Baars, E. & Kroon, H. (2001). *Healing trough working. A study of Therapeutic Communities for persons with Psychiatric Problems*. New York, USA: Mercury Press, 206 p.
- Kingwell, B. A., Lomdahl, A. & Anderson, W. P. (2001). Presence of a pet dog and human cardiovascular responses to mild mental stress. *Clinical Autonomic Research*, 11(5), 313-317.
- Kirsch, I., Deacon, B. J., Huedo-Medina, T. B., Scoboria, A., Moore, T. J. & Johnson, B. T. (2008). Initial severity and antidepressant benefits: a meta-analysis of data submitted to the Food and Drug Administration. *PLoS Medicine*, 5(2), e45.
- Koletsis, M., Niersman, A., van Busschbach, J. T., Catty, J., Becker, T., Burns, T., Fioritti, A., Kalkan, R., Lauber, C., Rossler, W., Tomov, T. & Wiersma, D. (2009). Working with mental health problems: clients' experiences of IPS, vocational rehabilitation and employment. *Social psychiatry and psychiatric epidemiology*, 44(11), 961-970.
- Kovacs, Z., Kis, R., Rozsa, S. & Rozsa, L. (2004). Animal-assisted therapy for middle-aged schizophrenic patients living in a social institution. A pilot study. *Clinical Rehabilitation*, 18(5), 483-486.
- Kraemer, H. C., Wilson, G. T., Fairburn, C. G. & Agras, W. S. (2002). Mediators and moderators of treatment effects in randomized clinical trials. *Archives of general psychiatry*, 59(10), 877-883.
- Kramer, S. C., Friedmann, E. & Bernstein, P. L. (2009). Comparison of the Effect of Human Interaction, Animal-Assisted Therapy, and AIBO-Assisted Therapy on Long-Term Care Residents with Dementia. *Anthrozoös*, 22(1), 43-57.
- Kringlen, E., Torgersen, S. & Cramer, V. (2001). A Norwegian psychiatric epidemiological study. *The American journal of psychiatry*, 158(7), 1091-1098.

- Kringlen, E., Torgersen, S. & Cramer, V. (2006). Mental illness in a rural area: a Norwegian psychiatric epidemiological study. *Social psychiatry and psychiatric epidemiology*, 41(9), 713-719.
- Kruger, K. A. & Serpell, J. A. (2006). Animal-Assisted Interventions in Mental Health: Definitions and Theoretical Foundations. In A. Fine (Ed.), *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice*. (2 ed., pp. 21-38). San Diego: Academic press, Elsevier Inc.
- Kuehner, C. & Bueger, C. (2005). Determinants of subjective quality of life in depressed patients: the role of self-esteem, response styles, and social support. *Journal of affective disorders*, 86(2-3), 205-213.
- Le Roux, M. C. & Kemp, R. (2009). Effect of a companion dog on depression and anxiety levels of elderly residents in a long-term care facility. *Psychogeriatrics*, 9(1), 23-26.
- Lee, A. L., Ogle, W. O. & Sapolsky, R. M. (2002). Stress and depression: possible links to neuron death in the hippocampus. *Bipolar Disorders*, 4(2), 117-128.
- Lehtinen, V., Sohlman, B. & Kovess-Masfety, V. (2005). Level of positive mental health in the European Union: results from the Eurobarometer 2002 survey. *Clinical practice and epidemiology in mental health*, 1(9). Retrieved from <http://www.cpementalhealth.com/content/1/1/9>
- Levinson, B. M. (1962). The dog as a "co-therapist". *Mental Hygiene*, 46, 59-65.
- Lewinsohn, P. M. & Graf, M. (1973). Pleasant Activities and Depression. *Journal of Consulting and Clinical Psychology*, 41(2), 261-268.
- Lieberman, R. P. (2008). *Recovery from disability: manual of psychiatric rehabilitation*. Washington, D.C.: American Psychiatric Publ., 588 p.
- Linde, K., Berner, M. M. & Kriston, L. (2008). St John's wort for major depression. *Cochrane Database of Systematic Reviews*, 4. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD000448/frame.html>
- LMD. (2007). *Handlingsplan for Inn på tunet. Landbruks- og matdepartementet*. Oslo: Departementenes servicesenter.
- LMD. (2009). Inn på tunet løftet Retrieved 10th of April, 2011, from <http://www.regjeringen.no/nb/dep/lmd/aktuelt/nyheter/2009/okt-09/inn-pa-tunet-et-politisk-loft.html?id=582800>
- Lo, C. S., Ho, S. M. & Hollon, S. D. (2010). The Effects of Rumination and Depressive Symptoms on the Prediction of Negative Attributional Style Among College Students. *Cognitive therapy and research*, 34(2), 116-123.
- Logstein, B. & Bleksaune, A. (2010). *Trender i Norsk Landbruk*. Hedmark (Vol. 8/10). Trondheim: Norsk senter for bygdeforskning.
- Luppa, M., Heinrich, S., Angermeyer, M. C., König, H.-H. & Riedel-Heller, S. G. (2007). Cost-of-illness studies of depression: A systematic review. *Journal of affective disorders*, 98(1-2), 29-43.
- Luszczynska, A., Scholz, U. & Schwarzer, R. (2005). The general self-efficacy scale: multicultural validation studies. *The Journal of Psychology*, 139(5), 439-457.
- Lærum, K. T., Lærum, E. & Sørbrøden, Ø. (2000). *Grønn omsorg i Vestfold. Tilrettelagt sysselsetting for menesker med psykiske lidelser*. Drammen: Fylkesmannen i Vestfold.
- Macias, C., Jones, D. R., Hargreaves, W. A., Wang, Q., Rodican, C. F., Barreira, P. J. & Gold, P. B. (2008). When programs benefit some people more than others: tests of differential service effectiveness. *Administration and policy in mental health*, 35(4), 283-294.
- Maciejewski, P. K., Prigerson, H. G. & Mazure, C. M. (2000). Self-efficacy as a mediator between stressful life events and depressive symptoms. Differences based on history of prior depression. *The British journal of psychiatry*, 176, 373-378.

- Major, H. W. (1845). Forslag til et Sindsyge-Asyl for Norge. *Ugeskrift for Medicin og Pharmacie*(7/8), 49-73.
- Mallon, G. P. (1994). Cow as Co-Therapist: Utilization of Farm Animals as Therapeutic Aides with Children in Residential Treatment. *Child and Adolescent Social Work Journal*, 11(6), 455-474.
- Malterud, K. (2001). Qualitative research: standards, challenges, and guidelines. *Lancet*, 358(9280), 483-488.
- Malterud, K. (2003). *Kvalitative metoder i medisinsk forskning - en innføring* (2 ed.). Oslo: Universitetsforlaget, 240 p.
- Maratos, A., Gold, C., Wang, X. & Crawford, M. (2008). Music therapy for depression. 1. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD004517/frame.html>
- Marr, C. A., French, L., Thompson, D., Drum, L., Greening, G., Mormon, J., Henderson, I. & Hughes, C. W. (2000). Animal-assisted therapy in psychiatric rehabilitation. *Anthrozoös*, 13(1), 43-47.
- Martinsen, E. W. (2008). Physical activity in the prevention and treatment of anxiety and depression. *Nordic journal of psychiatry*, 62 Suppl 47, 25-29.
- McCracken, C., Dalgard, O. S., Ayuso-Mateos, J. L., Casey, P., Wilkinson, G., Lehtinen, V. & Dowrick, C. (2006). Health service use by adults with depression: community survey in five European countries - Evidence from the ODIN study. *British Journal of Psychiatry*, 189, 161-167.
- McNicholas, J. & Collis, G. M. (2006). Animals as Social Supports: Insights for Understanding Animal-Assisted Therapy. In A. Fine (Ed.), *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice* (2 ed., pp. 49-72). San Diego: Academic press, Elsevier Inc.
- Mead, G. E., Morley, W., Campbell, P., Greig, C. A., McMurdo, M. & Lawlor, D. A. (2009). Exercise for depression. *Cochrane Database of Systematic Reviews*, 3. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD004366/frame.html>
- Meistad, T. & Nyland, R. (2005). Du må så før du høster – om arbeidsmarkedstiltak på gård for mennesker med psykiske lidelser. (Vol. 2/05): Senter for bygdeforskning ISSN 1503-2035.
- Miller, S. C., Kennedy, C., Devoe, D., Hickey, M., Nelson, T. & Kogan, L. (2009). An Examination of Changes in Oxytocin Levels in Men and Women Before and After Interaction with a Bonded Dog. *Anthrozoös*, 22(1), 31-42.
- Milne, D. L. (1999). *Social Therapy: A Guide to Social Support Interventions for Mental Health Practitioners*. Chichester: John Wiley, 267 p.
- Mitchell, D. (1998). Promoting enjoyment and self-belief through work rehabilitation. *Archives of psychiatric nursing*, 12(6), 344-350.
- Monroe, S. M. & Reid, M. W. (2009). Life Stress and Major Depression. *Current Directions in Psychological Science*, 18(2), 68-72.
- Montori, V. M. & Guyatt, G. H. (2001). Intention-to-treat principle. *CMAJ*, 165(10), 1339-1341.
- Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V. & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet*, 370(9590), 851-858.
- Muscatell, K. A., Slavich, G. M., Monroe, S. M. & Gotlib, I. H. (2009). Stressful life events, chronic difficulties, and the symptoms of clinical depression. *The Journal of nervous and mental disease*, 197(3), 154-160.

- Mykletun, A., Bjerkeset, O., Overland, S., Prince, M., Dewey, M. & Stewart, R. (2009). Levels of anxiety and depression as predictors of mortality: the HUNT study. *The British journal of psychiatry*, 195(2), 118-125.
- Mykletun, A. & Knudsen, A. K. (2009). Tapte arbeidsår ved uførepensjonering for psykiske lidelser (Vol. 4). Oslo: Nasjonalt folkehelseinstitutt.
- Mystakidou, K., Tsilika, E., Parpa, E., Gogou, P., Theodorakis, P. & Vlahos, L. (2010). Self-efficacy beliefs and levels of anxiety in advanced cancer patients. *European Journal of Cancer Care*, 19(2), 205-211.
- Nagengast, S. L., Baun, M. M., Megel, M. & Leibowitz, J. M. (1997). The effects of the presence of a companion animal on physiological arousal and behavioral distress in children during a physical examination. *Journal of Pediatric Nursing*, 12(6), 323-330.
- Nathans-Barel, I., Feldman, P., Berger, B., Modai, I. & Silver, H. (2005). Animal-assisted therapy ameliorates anhedonia in schizophrenia patients - A controlled pilot study. *Psychotherapy and Psychosomatics*, 74(1), 31-35.
- NAV. (2011). Green Work. Retrieved 10th of April 2011, from <http://www.nav.no/Helse/Arbeid+og+psykisk+helse/Gr%C3%B8nt+arbeid.805366715.cms>
- Neuberger, K., Stephan, I., Hermanowski, R., Flake, A., Post, F.-J. & van Elsen, T. (2006). Farming for Health: Aspects from Germany. In J. Hassink & M. van Dijk (Eds.), *Farming for Health. Green-Care Farming Across Europe and the United States of America* (Vol. 13, pp. 193-211). Dordrecht: Wageningen UR Frontis Series.
- Nightingale, F. (1880). *Notes on nursing, What it is, and What it is not*. New York: D. Appelton and Company.
- Nimer, J. & Lundahl, B. (2007). Animal-assisted therapy: A meta-analysis. *Anthrozoös*, 20(3), 225-238.
- Noldus. (2007). The Observer XT (Version 7.0). The Netherlands: Noldus Information Technology bv.
- Odendaal, J. S. & Meintjes, R. A. (2003). Neurophysiological correlates of affiliative behaviour between humans and dogs. *Veterinary journal*, 165(3), 296-301.
- Odendaal, J. S. J. (2000). Animal-assisted therapy - magic or medicine? *Journal of Psychosomatic Research*, 49(4), 275-280.
- Olsen, W. (2004). Triangulation in Social Research: Qualitative and Quantitative Methods can Really be Mixed. In M. Holborn (Ed.), *Developments in Sociology*. Ormskirk: Causeway Press.
- Pachana, N. A., Ford, J. H., Andrew, B. & Dobson, A. J. (2005). Relations between companion animals and self-reported health in older women: cause, effect or artifact? *International journal of behavioral medicine*, 12(2), 103-110.
- Parslow, R., Jorm, A., Christensen, H., Rodgers, B. & Jacomb, P. (2005). Pet Ownership and Health in Older Adults: Findings from a Survey of 2,551 Community-Based Australians Aged 60-64. *Gerontology*, 51(1), 40.
- Paykel, E. S., Brugha, T. & Fryers, T. (2005). Size and burden of depressive disorders in Europe. *European neuropsychopharmacology*, 15(4), 411-423.
- Rappe, E. (2007). *Green Care in the framework of health promotion*. Paper presented at the 1st European COST Action 866 conference. Green Care in Agriculture: Health effects, Economics and Policies, Vienna, Austria.
- Razzano, L. A., Cook, J. A., Burke-Miller, J. K., Mueser, K. T., Pickett-Schenk, S. A., Grey, D. D., Goldberg, R. W., Blyler, C. R., Gold, P. B., Leff, H. S., Lehman, A. F., Shafer, M. S., Blankertz, L. E., McFarlane, W. R., Toprac, M. G. & Ann Carey, M. (2005). Clinical factors associated with employment among people with severe mental illness:

- findings from the employment intervention demonstration program. *The Journal of nervous and mental disease*, 193(11), 705-713.
- Richter, P., Werner, J., Heerlein, A., Kraus, A. & Sauer, H. (1998). On the validity of the Beck Depression Inventory - A review. *Psychopathology*, 31(3), 160-168.
- Robdale, N. (2008). Vocational rehabilitation: variety is the key to success. *Mental Health Today*, 24-27.
- Rossetti, J. & King, C. (2010). Use of Animal-Assisted Therapy with Psychiatric Patients :A Literature Review. *Journal of Psychosocial Nursing & Mental Health Services*, 48(11), 44-48.
- Rosler, W. (2006). Psychiatric rehabilitation today: an overview. *World Psychiatry*, 5(3), 151-157.
- Rubin, W. V. & Panzano, P. C. (2002). Identifying meaningful subgroups of adults with severe mental illness. *Psychiatric Services*, 53(4), 452-457.
- Ruesch, P., Graf, J., Meyer, P. C., Rosler, W. & Hell, D. (2004). Occupation, social support and quality of life in persons with schizophrenic or affective disorders. *Social psychiatry and psychiatric epidemiology*, 39(9), 686-694.
- Sapolsky, R. M. (2000). Stress hormones: good and bad. *Neurobiology of disease*, 7(5), 540-542.
- Scholl, S., Grall, G., Petzl, V., Röthler, M., Slotta-Bachmayr, L. & Kotrschal, K. (2008). Behavioural Effects of Goats on Disabled Persons. *International journal of therapeutic communities*, 29(3), 297-309.
- Scholz, U., Dona, B. G., Sud, S. & Schwarzer, R. (2002). Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment*, 18(3), 242-251.
- Schwarzer, R. (1993). *Measurement of perceived self-efficacy. Psychometric scales for cross-cultural research*. Berlin: Freien Universität.
- Schwarzer, R. & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor: NFER-NELSON.
- Seggar, L. B., Lambert, M. J. & Hansen, N. B. (2002). Assessing clinical significance: Application to the beck depression inventory. *Behavior Therapy*, 33(2), 253-269.
- Sempik, J., Hine, R. & Wilcox, D. (Eds.). (2010). *Green Care: A Conceptual Framework. A Report of the Working Group on the Health Benefits of Green Care. COST 866, Green Care in Agriculture*. Loughborough: Loughborough University.
- Shadish, W. R., Cook, T. D. & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin, 623 p.
- Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J. & Weiler, E. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Norwegian version. *Journal of Clinical Psychiatry*, 59 (Suppl.), 22-33.
- Shiloh, S., Sorek, G. & Terkel, J. (2003). Reduction of state-anxiety by petting animals in a controlled laboratory experiment. *Anxiety Stress and Coping*, 16(4), 387-395.
- Siegel, J. M. (1990). Stressful Life Events and Use of Physician Services among the Elderly: The Moderating Role of Pet Ownership. *Journal of Personality and Social Psychology*, 58(6), 1081.
- Silverman, D. (2005). *Doing Qualitative Research* (2 ed.). London: SAGE Publications Ltd, 395 p.
- Smith, C. A., Hay, P. P. J. & MacPherson, H. (2010). Acupuncture for depression. *Cochrane Database of Systematic Reviews*, 1. Retrieved from <http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD004046/frame.html>

- Souter, M. A. & Miller, M. D. (2007). Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoös*, 20(2), 167-180.
- Spielberger, C. D., Gorsuch, R. I. & Lushene, R. E. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, Ca: Consulting Psychologists Press.
- Stige, B., Malterud, K. & Midtgarden, T. (2009). Toward an agenda for evaluation of qualitative research. *Qualitative health research*, 19(10), 1504-1516.
- Stokke, K. & Paulsen Rye, S. K. (2007). Inn på tunet. Nasjonal og regional organisering. Gårdbrukerens økonomi og erfaringer (pp. 50). Oslo: Norsk institutt for landbruksøkonomisk forskning.
- Straede, C. M. & Gates, G. R. (1993). Psychological Health in A Population of Australian Cat Owners. *Anthrozoös*, 6(1), 30-42.
- Straatman, I., Hanson, E., Endenburg, N. & Mol, J. (1997). The Influence of a Dog on Male Students During a Stressor. *Anthrozoös*, 10(4), 191-197.
- Sundsteigen, B., Eklund, K. & Dahlin-Ivanoff, S. (2009). Patients' experience of groups in outpatient mental health services and its significance for daily occupations. *Scandinavian Journal of Occupational Therapy*, 16(3), 172-180.
- Sørbrøden, Ø. & Lærum, K. T. (2003). Grønn omsorg i Vestfold. Tilrettelagt sysselsetting for menesker med psykiske lidelser. Evaluering med vekt på langsiktige virkninger for brukerne. Drammen: SND.
- Thesen, J. (2001). Being a psychiatric patient in the community--reclassified as the stigmatized "other". *Scandinavian journal of public health*, 29(4), 248-255.
- Tower, R. B. & Nokota, M. (2006). Pet companionship and depression: results from a United States Internet sample. *Anthrozoös*, 19(1), 50-64.
- Tuke, D. H. (1882). *Chapters in the History of the Insane in the British Isles*. London: Keagan Paul, Trench & Co.
- Ulrich, R. S. (1993). Biophilia, Biophobia and natural landscapes. In S.R. Kellert & E.O. Wilson (Eds.), *The Biophilia hypothesis* (pp. 73-137). Washington, D.C.: Island Press.
- Uvnäs-Moberg, K. (2010). *Short-term interaction between dogs and their owners - effects on oxytocin, cortisol, insulin and heart rate*. Paper presented at the 12th International IAHAIO Conference People & Animals - For Life, Stockholm, Sweden, July 1-4.
- Villalta-Gil, V., Roca, M., Gonzalez, N., Domenec, E., Cuca, Escanilla, A., Asensio, M. R., Esteban, M. E., Ochoa, S. & Haro, J. M. (2009). Dog-Assisted Therapy in the Treatment of Chronic Schizophrenia Inpatients. *Anthrozoös*, 22(2), 149-159.
- Virues-Ortega, J. & Buela-Casal, G. (2006). Psychophysiological effects of human-animal interaction: theoretical issues and long-term interaction effects. *The Journal of nervous and mental disease*, 194(1), 52-57.
- von Knorring, L., Akerblad, A. C., Bengtsson, F., Carlsson, A. & Ekselius, L. (2006). Cost of depression: effect of adherence and treatment response. *European Psychiatry*, 21(6), 349-354.
- Walsh, F. (2009). Human-Animal Bonds I: The Relational Significance of Companion Animals. *Family Process*, 48(4), 462-480.
- Wells, D. L. (2004). The facilitation of social interactions by domestic dogs. *Anthrozoös*, 17(4), 340-352.
- Wells, D. L. (2009). The Effects of Animals on Human Health and Well-Being. [Review]. *Journal of Social Issues*, 65(3), 523-543.
- WHO. (1994). *The ICD-10 Classification of Mental and Behavioural Disorders. Clinical Description and Diagnostic Guidelines*. Geneva: World Health Organization.
- Wiedenfeld, S. A., O'Leary, A., Bandura, A., Brown, S., Levine, S. & Raska, K. (1990). Impact of perceived self-efficacy in coping with stressors on components of the immune system. *Journal of personality and social psychology*, 59(5), 1082-1094.

- Wiersma, D. (2006). Needs of people with severe mental illness. *Acta psychiatrica Scandinavica. Supplementum*(429), 115-119.
- Wiesinger, G., Neuhauser, F. & Putz, M. (2006). Farming for health in Austria. Farms, horticultural therapy, animal-assisted therapy. In J. Hassink & M. van Dijk (Eds.), *Farming for Health. Green-Care Farming Across Europe and the United States of America* (Vol. 13, pp. 233-248). Dordrecht: Wageningen UR Frontis Series.
- Wilson, C. C. (1991). The Pet as an Anxiolytic Intervention. *Journal of Nervous and Mental Disease*, 179(8), 482-489.
- Wilson, E. O. (1984). *Biophilia*. Cambridge: Harvard University Press, 180 p.
- Wilson, E. O. (1993). Biophilia and the Conservation Ethic. In S.R. Kellert & E.O. Wilson (Eds.), *The Biophilia hypothesis* (pp. 31-67). Washington, D.C.: Island Press.
- Winefield, H. R., Black, A. & Chur-Hansen, A. (2008). Health Effects of Ownership of and Attachment to Companion Animals in an Older Population. *International Journal of Behavioral Medicine*, 15(4), 303-310.
- Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C. & Murray, C. J. (2004). Global burden of depressive disorders in the year 2000. *The British journal of psychiatry*, 184, 386-392.
- Zasloff, R. L. & Kidd, A. H. (1994). Loneliness and pet ownership among single women. *Psychological reports*, 75(2), 747-752.
- Zimolag, U. & Krupa, T. (2009). Pet Ownership as a Meaningful Community Occupation for People With Serious Mental Illness. *American Journal of Occupational Therapy*, 63(2), 126-137.
- Ørstavik, R. E., Kendler, K. S., Czajkowski, N., Tambs, K. & Reichborn-Kjennerud, T. (2007). Genetic and environmental contributions to depressive personality disorder in a population-based sample of Norwegian twins. *Journal of affective disorders*, 99(1-3), 181-189.

Paper I

1 **Farm Animal-Assisted Intervention for Persons with Clinical Depression, a**
2 **Randomized Controlled Trial**

3

4 Ingeborg Pedersen¹, Egil W. Martinsen^{2,3}, Bente Berget¹ and Bjarne O. Braastad¹

5

6 ¹Norwegian University of Life Sciences, Ås, Norway

7 ²Oslo University Hospital, Norway

8 ³University of Oslo, Norway

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24 **ABSTRACT**

25

26 The concept of Green care includes a diversity of interventions at farms, where the common
27 basis is use of nature and the natural environment to improve or promote health and well-
28 being. Farm animals are a natural part of this service and farm animal-assisted interventions
29 may act as a complementary intervention within mental health care. The main aim of this
30 study was to examine the effect of a twelve-week farm animal-assisted intervention on the
31 levels of depression (BDI-IA), state anxiety (STAI-SS) and self-efficacy (GSE) for people
32 with clinical depression. Twenty-nine persons (23 women and 6 men, mean age 37.8, range
33 23-58) were randomly assigned to the intervention (n=16) or a waiting-list control group
34 (n=13). In the intervention group the participants worked twice a week in company with the
35 farmer in the cowshed. They interacted on their own choice with dairy cattle via work tasks
36 and physical contact. A significant decline in depression ($t_{(15)} = -3.53$, $p = 0.003$) and a
37 significant increase in self-efficacy ($t_{(15)} = 2.18$, $p = 0.045$) were seen in the intervention
38 group between recruitment and end of intervention. In the control group no significant
39 changes were found. No significant differences were found when comparing change in
40 mental health measures in the intervention and control groups. However, more subjects in the
41 intervention group (6) than in the control group (1) had clinical significant change, indicating
42 that animal-assisted intervention in Green care could be beneficial for subgroups of clients
43 and act as a useful supplement within mental health care.

44

45 Key words: Animal-assisted intervention, clinical depression, farm animals, Green care,
46 complementary intervention

47

48

49 **Introduction**

50 Depression is a serious health issue which affects 3.2 - 3.9 % of the world's population each
51 year and leads to high costs for society and for the individual suffering from it (Alonso et al.
52 2004; Üstün et al. 2004; Luppá et al. 2007; Moussavi et al. 2007). Conventional treatment of
53 depression, like medication and psychotherapy, are effective both separately and combined
54 (Ebmeier, Donaghey and Steele 2006; Barbui et al. 2007; Butler et al. 2007). However, non-
55 responders and lack of adherence is problematic in antidepressant treatment (Fava 2003; von
56 Knorring et al. 2006), and psychotherapy is only available for a minority of those in need of
57 it. Complementary treatment is widely used, and more than 50 % of people with depression
58 reported making use of it alone or alongside conventional treatment (Kessler et al. 2001).
59 However, scientific evidence for these methods is often limited (Ernst, Rand and Stevinson
60 1998).

61 A new service has developed within the agricultural sector. Green care or Care
62 farming is an inclusive term for many complex interventions. What links this diverse set of
63 interventions is their use of nature and the natural environment to improve or promote health
64 and well-being (Sempik, Hine and Wilcox 2010). Today approximately 650 farms in Norway
65 offer Green care services (Stokke and Paulsen Rye 2007), and other European countries have
66 similar figures (Hassink and van Dijk 2006; Haubenhofner et al. 2010). Also in the U.S.A.
67 many institutions facilitate this service (Relf 2006), and Green Chimneys is one example of
68 using a farm milieu in health care (Mallon 1994; Mallon et al. 2006). Farm animals are an
69 important part of the Green care milieu at most of the farms, and during the last decades a
70 new interest in the potential mental health benefits following contact with animals has
71 emerged. In several studies contact with companion animals is seen to be beneficial for
72 mental health and depression (Marr et al. 2000; Barker, Pandurangi and Best 2003; Kovacs et
73 al. 2004; Nathans-Barel et al. 2005; Colombo et al. 2006; Tower and Nokota 2006; Hoffmann

74 et al. 2009; Villalta-Gil et al. 2009). Many anecdotal stories illustrate the possibility to use
75 farm animals as pets. When farm animals get familiar with people, a close interaction could
76 occur, and contact via strokes, cuddling, grooming and talking to the animals could result in
77 similar effects as those found for pet animals (Bokkers 2006). Farm animal-assisted
78 interventions may act as a complementary intervention within mental health care, but this is
79 scarcely examined.

80 Self-efficacy is described as a person's belief that one can successfully produce the
81 desired outcome (Bandura 1997), and a main source for increase in self-efficacy is a person's
82 own accomplishment of a task or coping in a situation. Work and work-related activities are
83 seen to help people to recover from mental health problems due to enhanced self-efficacy and
84 coping (Mitchell 1998; Eklund, Hansson and Ahlqvist 2004; Dunn, Wewiorski and Rogers
85 2008; Koletsi et al. 2009), and coping and improved self-esteem are essential aspects in
86 Green care studies (Hine, Peacock and Pretty 2008; Hassink et al. 2010; Pedersen, Ihlebæk
87 and Kirkevold 2010). Farm animal-assisted interventions could be an excellent arena for
88 coping and enhanced self-efficacy, as they provide a variety of work tasks easily adjusted to
89 each person's needs.

90 Social support is central in mental health rehabilitation (Milne 1999; Ruesch et al.
91 2004), and is described as a person's individual belief that one is cared for, esteemed and
92 valued, and belongs to a group with mutual obligations (Cobb 1976). Social support is
93 associated with lower levels of depression and better mental health (Lehtinen, Sohlman and
94 Kovess-Masfety 2005; Dalgard et al. 2006), and several studies on Green care do emphasize
95 the social setting and network building as important aspects of what the intervention offers
96 (Bjørngen and Johansen 2007; Elings and Hassink 2008; Hassink et al. 2010). Contact with
97 farm animals could also be perceived as social support, as seen in research on companion
98 animals (McNicholas and Collis 2006; Tower and Nokota 2006; Zimolag and Krupa 2009).

99 Social support could therefore be an important mechanism in farm animal-assisted
100 interventions.

101 As far as we know, only one randomized controlled study within Green care is
102 completed (Berget, Ekeberg and Braastad 2008; Berget et al. 2011). This study included
103 persons with a variety of mental disorders. The intervention included work with farm
104 animals, mainly dairy cows, while the control group attended treatment as usual. No
105 significant differences in outcome were found between groups during the intervention, but at
106 six-months follow-up significant changes in favor of the intervention group were found for
107 state anxiety and generalized self-efficacy (Berget, Ekeberg and Braastad 2008; Berget et al.
108 2011). Among the various diagnoses, the largest effects were seen among persons with
109 affective disorders, warranting further studies with farm animal-assisted interventions for
110 people with depression.

111

112 **Study aim**

113 In this study we wanted to examine potential changes in mental health in people with clinical
114 depression, while working with farm animals as the only task on the farm. The main aim was
115 to compare effects of a twelve-week farm animal-assisted intervention on depression, state
116 anxiety and self-efficacy with a waiting-list control group that continued their initial
117 treatment.

118

119 **Material and methods**

120

121 **Study population**

122 Thirty-five participants were recruited through advertisements, invitation letters from
123 Norwegian Labour and Welfare Service, and contact with health personnel. Potential

124 participants received an information letter where the intervention was described, and the
125 possibility to be drawn to either a control or an intervention group were stated. All who
126 wanted to attend signed a written consent before being included in the study. The potential
127 participants filled in the Beck Depression Inventory (BDI-IA; Beck and Steer 1987), and
128 those with a score of 14 and above were included. Due to practical reasons only a subset of
129 the sample (60 %) conducted a diagnostic interview; The Mini International Neuropsychiatric
130 Interview (Sheehan et al. 1998). All except one who were interviewed met the DSM-IV
131 (American Psychiatric Association 1994) criteria for major depression and were included. In
132 the following the term clinical depression will be used. After recruitment data were obtained,
133 the participants were randomly assigned by a computer randomization program (in Excel 7.0)
134 to the intervention or a waiting-list control group. Due to considerable distance between
135 farms the randomization process was done within the group of participants being offered
136 intervention on a particular farm. As only two participants could attend the same farm at the
137 same time, the maximum number of participants recruited was four. In this case, and in cases
138 with two participants the chance to be drawn to the intervention group was set to 0.50. In
139 cases with one or three participants, the chance to be drawn to the intervention group was set
140 to 0.65, due to the higher dropout rate in the intervention group found in a previous study
141 (Berget, Ekeberg and Braastad 2008). In the total sample, 14 persons were drawn to the
142 control group and 20 to the intervention group. The randomization was conducted by a
143 researcher blinded to farm and participants.

144 All participants continued their initial treatment and participants in the waiting-list
145 control group were not offered anything extra before they could attend the farm animal-
146 assisted intervention after the end of the six-month control period. Five participants, one in
147 the control and four in the intervention group, dropped out after randomization, but before the
148 intervention started. In addition, four in the intervention group (3 men and 1 woman) and one

149 woman in the control group dropped out during the intervention. There were various reasons
150 for the dropouts; offer of paid work, vocational rehabilitation and allergic reactions. One
151 participant completed the intervention, but did not fill in the questionnaires at the end. Those
152 who dropped out before the study started were excluded, while those dropping out during the
153 intervention were included in the statistical analyses (Fergusson et al. 2002). The background
154 variables for the final sample are seen in Table1. Current treatment for mental disorders,
155 medication and/or psychotherapy, is also reported. In this study psychotherapy comprises
156 both individually and group therapy.

157

158 *(Insert Table 1 here)*

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174 *Table 1. Background variables for the intervention group (n=16) and the control group*
 175 *(n=13).*

Variable	Intervention group	Control group
Male/Female	5/11	1/12
Mean age (SD)	40.5 (10.7)	34.0 (6.6)
Medication:		
Yes/No	10/4	6/4
No information	2	3
Psychotherapy:		
Yes/No	9/3	10/0
No information	4	3
Years in treatment:		
Less than one year	3	1
One to five years	5	3
More than five years	1	3
No information	7	6
Education:		
Primary school	5	7
Junior college	7	4
College/University	4	0
No information	0	2
Work situation:		
Out of work	1	2
Sick leave	2	0
Medical rehabilitation	7	4
Disability pension	6	5
No information	0	2
Pet ownership:		
Yes/No	11/5	7/4
No information	0	2

176

177

178 **Farms and farmers**

179 Eleven dairy farms from six different counties in Norway were recruited to the project. The
180 housing system for animals was free range stall or tie-stall. Both female (5) and male farmers
181 (6) had the main responsibility for the participants during the intervention. All farms had
182 dairy cattle as their main production, and the average number of dairy cows was 25 (range
183 14-60). Most farms also had companion animals like horses, cats, dogs or rabbits.

184

185 **Intervention**

186 The intervention consisted of work and interaction with farm animals twice a week for twelve
187 weeks. Due to differences in farm size, degree of mechanization and amount of work each
188 time, the time spent on the farm per day varied from 1.5 to 3.0 hours. A first visit was used by
189 the participants to get familiar with the farm and the farmer. When they returned the next
190 time the participants worked together with the farmer, performing on their own choice
191 ordinary work tasks in the cowshed, like grooming, mucking, feeding, taking care of the
192 calves and milking. They could also choose to spend their time in physical contact with the
193 animals. The participants did not take part in any other work at the farm.

194 The study was open for maximum two participants at the same time at one farm, but
195 with a few exceptions there was only one participant at the farm during the intervention. All
196 participants stayed at the same farm for the whole intervention. Start of intervention periods
197 were distributed throughout the year. Seven participants started in the autumn (September,
198 October and November), two during the winter (December and January), and seven during
199 the early spring time (March and April). The minimum attendance to the intervention was set
200 to 50 %, i.e. showing up on at least half of the intervention days. The mean attendance was
201 estimated to approximately 80 %.

202

203 **Mental health assessments**

204 Questionnaires measuring different aspects of mental health were filled in by the participants
205 several times. The Beck Depression Inventory (BDI-IA; Beck and Steer 1987) was used to
206 assess the level of depressive symptoms. Beck Depression Inventory consists of 21 items
207 which are scored on 0 (no symptoms) to 3 (severe symptoms) scale, giving a range of 0-63 in
208 sum scores. The normal range of the sum score of BDI-IA is 0-9, 10-19 is considered mild
209 depression, and we chose a sum score in the middle of this (14) as inclusion criterion. This
210 inventory is widely used and well validated with sound psychometric properties ($\alpha=0.86$;
211 Beck, Steer and Carbin 1988). In our study the Chronbach's α was 0.85 at the start of the
212 intervention.

213 State-Trait Anxiety Inventory - State Subscale (STAI-SS; Spielberger, Gorsuch and
214 Lushene 1983) is a widely used and a validated questionnaire ($\alpha = 0.83-0.94$) measuring state
215 anxiety. In the present study Chronbach's α was 0.88 at the start of the intervention. The
216 instrument consists of 20 items, each describing an anxiety symptom, and the participants
217 scored how they felt at the present moment on a 1(not at all) to 4 (a great deal) scale. This
218 creates a total score ranging from 20 to 80.

219 Generalized Self-Efficacy Scale (GSE; Schwarzer and Jerusalem 1995) is validated (α
220 = 0.84-0.93) and implemented in mental health interventions all over the world (Scholz et al.
221 2002; Luszczynska, Scholz and Schwarzer 2005). In the present study the Chronbach's α was
222 0.89 at the start of the intervention. This inventory consists of 10 statements connected to the
223 participant's perceived ability to cope with a variety of difficult demands. The answer options
224 were ranging from 1 (absolutely wrong) to 4 (absolutely right), which creates a maximum
225 score of 40, demonstrating the highest level of generalized self-efficacy.

226 All inventories were filled in at inclusion and at start of the intervention for both the
227 intervention and control group. BDI-IA and GSE were filled in after 4 and 8 weeks of the

228 intervention period, and all the inventories were filled in after the end of the intervention and
229 at 3-month follow-up.

230

231 **Statistical analyses**

232 Missing single items of an instrument were handled by the following method; a mean value
233 was calculated for the registered items and the closest integer value above this was given to
234 the missing item. When more than three items were missing, the whole questionnaire was
235 regarded as missing, and was replaced by the last observation carried forward (intention to
236 treat method; Hollis and Campbell 1999; Montori and Guyatt 2001; Hamer and Simpson
237 2009). This procedure was used to replace missing data from the five participants who
238 dropped out during the intervention period and the seven who dropped out in the follow-up
239 period. Those who dropped out before the start of the intervention were excluded from the
240 analyses.

241 Matched-paired t-tests were performed to examine changes in mental health within
242 each group. Recruitment was used as first measure point and the end of intervention as last. A
243 repeated-measures analysis of variance was used to examine the difference between groups
244 from recruitment, during intervention, and at follow up for all the questionnaires (BDI-IA,
245 STAI-SS and GSE). The sphericity assumption for repeated measures was not met, and a
246 Greenhouse-Geisser correction was used. For BDI-IA a power analysis between groups in
247 change from recruitment to the end of the intervention was performed ($p=0.05$). All analyses
248 were conducted by using the statistical software JMP 8.0 (JMP 2008).

249

250 **Ethical approval**

251 The project was approved by the Regional Committee for Medical Research Ethics and the
252 Privacy Ombudsman for Research.

253

254 **Results**

255 Table 2 presents scores of depression, state anxiety and generalized self-efficacy in the
256 intervention and control groups at the various measurement points from recruitment to
257 follow-up, with the last observation carried forward method.

258

259 *(Table 2 insert here)*

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276 *Table 2. Depression (BDI-IA), State anxiety (STAI-SS,) and Self-efficacy (GSE) at different*
 277 *time points for the intervention (n=16) and control groups (n=13).The values are presented*
 278 *as mean and (SD).*

Group	Instrument	Recruitment	Start	4-weeks	8-weeks	12-weeks	3-month follow-up
Intervention	BDI-IA	26.5 (9.2)	23.9 (9.3)	21.1 (10.2)	20.3 (12.4)	17.3* (12.6)	17.8 (12.0)
Control	BDI-IA	32.0 (7.2)	34.2 (8.8)	32.2 (9.0)	30.8 (9.1)	28.2 (11.0)	27.3 (13.0)
Intervention	STAI-SS	55.0 (10.6)	55.2 (8.7)	--	--	49.4 (13.9)	48.5 (12.4)
Control	STAI-SS	60.5 (8.6)	62.3 (7.5)	--	--	55.5 (13.1)	56.5 (14.3)
Intervention	GSE	22.8 (5.3)	23.0 (4.9)	23.8 (5.5)	23.8 (7.2)	25.6* (6.7)	26.1 (6.9)
Control	GSE	19.8 (6.2)	18.9 (6.4)	18.4 (7.7)	20.7 (6.3)	21.5 (6.6)	21.5 (8.3)

279 * Significant change within group from recruitment to this time point, p<0.05

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294 **Analyses within groups**

295 For the intervention group, the matched-paired t-tests revealed a significant decline in
296 depression between recruitment and end of intervention ($t_{(15)} = -3.53, p = 0.003$). It was a
297 close to significant decrease in state anxiety between recruitment and end of intervention ($t_{(15)}$
298 $= -2.05, p = 0.059$). A significant increase in self-efficacy was found between recruitment and
299 end of intervention ($t_{(15)} = 2.18, p = 0.045$). For the eight intervention participants that
300 completed follow-up questionnaires, scores at follow-up were at the same level as at the end
301 of the intervention (BDI-IA: 1.0 points increase; STAI-SS: 1.9 points decrease; GSE: 1.0
302 points increase). Participants in the control group also experiences positive developments in
303 all assessments, but the changes on all assessments were larger in the intervention group. No
304 significant changes were found in the control group.

305

306 **Analyses between groups**

307 The repeated-measures analysis of variance did not reveal any significant group difference at
308 any time point for any of the instruments (BDI-IA ($F_{(2,9/80,9)} = 0.66, p = 0.58$), STAI-SS
309 ($F_{(1,9/52,4)} = 0.12, p = 0.88$), GSE ($F_{(3,2/86,0)} = 0.38, p = 0.78$)). A power analysis for change in
310 depression score (BDI-IA) showed that the difference between the groups would be
311 statistically significant on a 0.05 level with 25 participants in each group.

312

313 **Analyses of clinically significant change**

314 Reliable change index (RCI) ≥ 1.96 (Jacobson and Truax 1991) is often used as an indicator
315 for improvement in mental health research. With an internal consistency for BDI on 0.86
316 (Beck, Steer and Carbin 1988), a reliable change in our study would correspond to a decline
317 in BDI ≥ 9 points. Nine of 16 participants in the intervention group and 3 of 13 participants in
318 the control group met this criterion and could be classified as improved. A clinically

319 significant change has a twofold criterion; a drop in score to below a cutoff score and a
320 reliable change index (RCI) ≥ 1.96 . Seggar, Lambert and Hansen (2002) has estimated a
321 cutoff score for BDI to be 14 between a community sample and a clinically symptomatic
322 sample. A clinically significant change in our study would therefore occur when depression
323 score (BDI-IA) dropped below 14 together with a decrease in BDI-IA ≥ 9 . Six of 16
324 participants in the intervention group and one participant in the control group met these
325 criteria and could be regarded as returned to normal range.

326

327 **Discussion**

328 The intervention group experienced significant reduction in depression and increase in self-
329 efficacy scores at the end of the intervention, and the participants kept their gains at three-
330 month follow-up. In the control group no significant changes were observed. However,
331 change in scores in the intervention group was not significantly different from those in the
332 control group. In the intervention group more people achieved reliable and clinically
333 significant change.

334 The main outcome of the present study is the decline in depressive symptoms in the
335 intervention group. This is in accordance with an English study where Profile of Mood State
336 questionnaire (POMS) showed a significant decline in the depression subscale in a group of
337 72 participants within Care farming (Hine, Peacock and Pretty 2008). A similar result was
338 obtained in two interventions with therapeutic horticulture in a Green care context for
339 clinically depressed subjects (n= 28 and n =18), utilizing the BDI. In both studies significant
340 declines in depression were seen (Gonzalez et al. 2009, 2010). None of these studies,
341 however, had control groups. The same questionnaire was used by Berget et al. (2011) where
342 a group of 41 participants with different psychiatric diagnoses had a significant decline in

343 depression from baseline to six months after a farm animal-assisted intervention at Green
344 care farms.

345 In our study a significant increase in self-efficacy was seen in the intervention group,
346 and this could possibly be linked to coping experiences and achieving new work skills.
347 Thematic interviews conducted in our study support this interpretation. The possibility to
348 experience coping was a main theme for the participants (Pedersen, Ihlebæk and Kirkevold
349 2010). Hine, Peacock and Pretty (2008) found a significant increase in self-esteem during a
350 Green care intervention and Berget, Ekeberg and Braastad (2008) found significant increase
351 in self-efficacy at six-month follow-up compared to a control group. Diminished self-worth
352 and self-esteem are symptoms of depression, and Bandura (1997) emphasizes masterful
353 experiences as means for alleviating depression. Generalized self-efficacy is negatively
354 correlated to depression (Schwarzer 1993; Luszczynska, Gutierrez-Dona and Schwarzer
355 2005), and Maciejewski, Prigerson and Mazure (2000) showed that high self-efficacy at
356 baseline predicted less depression at follow-up. In our study enhanced self-efficacy could be
357 a reason for the observed alleviation in depressive symptoms.

358 Several studies emphasize the social setting at the farm and social support as
359 important (Ketelaars, Baars and Kroon 2001; Bjørgen and Johansen 2007; Elings and
360 Hassink 2008; Hassink et al. 2010). Results from qualitative interviews of the participants
361 (Pedersen, Ihlebæk and Kirkevold 2010) indicate that both the farmer and farm animals could
362 be sources of social support. The participants expressed that the farmer was a colleague and
363 equal partner, and they felt calmness when in contact with the animals. Also some factors
364 connected to more unspecific benefits of the intervention should be considered. Inactivity is a
365 common consequence of depression. The work tasks provided during the intervention could
366 enhance physical activity which is seen to be beneficial in depression and anxiety treatment
367 (Martinsen 2008; Mead et al. 2009). Withdrawal and behavioral avoidance are often seen in

368 depression, and the intervention could counteract this. Behavioral activation acts as positive
369 reinforcement and training of social skills (Cuijpers, van Straten and Warmerdam 2007;
370 Kanter et al. 2010) and engagement in pleasant activities could alleviate depression
371 (Lewinsohn and Graf 1973; Harmon, Nelson and Hayes 1980; Bylsma, Taylor-Clift and
372 Rottenberg 2011). Having an appointment and absorption in activities could protect against
373 rumination and disturbing thoughts and thereby lead to less depressive symptoms (Ehring,
374 Frank and Ehlers 2008; Lo, Ho and Hollon 2010). Taken together; enhanced self-efficacy,
375 perceived social support, activity, and animal contact may have contributed to reduced
376 depression in our study.

377 Even though no significant differences between groups were obtained, a substantially
378 larger part of the participants in the intervention group showed reliable change and clinically
379 significant change and thereby improvement and normal functioning. The intervention
380 consisted of a variety of work tasks, in addition to contact with animals and the farmer. The
381 participants' choice of intervention content could therefore influence the outcome. Video
382 recordings of the participants support this. A favorable association was seen between time
383 spent doing complex and challenging work tasks and decline in depression (Pedersen et al. in
384 press). Individualization is recognized as an important factor in mental health rehabilitation
385 (Lieberman 2008). It is improbable that the same intervention content fits all participants and a
386 non-standardized intervention as ours could fulfill the requirement of individualization. At
387 the same time this easily produces subgroups. Several studies advocate identifying subgroups
388 and support the usefulness of this approach in mental health interventions when identifying
389 factors contributing to outcome variation (Kraemer et al. 2002; Rubin and Panzano 2002;
390 Razzano et al. 2005; Macias et al. 2008). Essential factors for a successful intervention could
391 be enhanced self-efficacy and social support, and this should be further investigated and
392 identified within farm animal-assisted interventions.

393 **Limitations**

394 The sample size was small and low power opens for the possibility that clinically significant
395 differences between groups do not become statistically significant. By increasing the number
396 of participants to 25 in each group, the differences would be statistically significant at the
397 0.05 level. Even though corrections were made with regard to dropouts, a high dropout rate is
398 negative when drawing conclusions about the intervention effectiveness. No blind evaluation
399 of outcome was included, and also participants' expectation to the intervention could
400 influence the outcome. The intervention was not standardized, and intervention content and
401 attendance could influence outcome in the intervention group. This should be addressed in
402 further research. In the present study differences between groups in background variables like
403 years lived with depression and concurrent treatment, could be confounding factors. Missing
404 data made it impossible to use this information as covariates in analyses, and future research
405 must clarify if these variables may contribute to outcome. Conclusions must therefore be
406 drawn with caution.

407

408 **Conclusion**

409 Those who participated in animal assisted therapy experienced statistically significant
410 changes in depression and generalized self-efficacy. Although the changes were not
411 significantly different from those in the control group, remarkably more participants in the
412 intervention group experienced clinically significant changes. A farm animal-assisted
413 intervention could therefore be beneficial for subgroups of clients and act as a useful
414 supplement within mental health care.

415

416

417

418 **References**

419

- 420 Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., Bryson, H., de
 421 Girolamo, G., Graaf, R., Demyttenaere, K., Gasquet, I., Haro, J. M., Katz, S. J.,
 422 Kessler, R. C., Kovess, V., Lepine, J. P., Ormel, J., Polidori, G., Russo, L. J., Vilagut,
 423 G., Almansa, J., Arbabzadeh-Bouchez, S., Autonell, J., Bernal, M., Buist-Bouwman,
 424 M. A., Codony, M., Domingo-Salvany, A., Ferrer, M., Joo, S. S., Martinez-Alonso,
 425 M., Matschinger, H., Mazzi, F., Morgan, Z., Morosini, P., Palacin, C., Romera, B.,
 426 Taub, N. and Vollebergh, W. A. 2004. Prevalence of mental disorders in Europe:
 427 results from the European Study of the Epidemiology of Mental Disorders (ESEMeD)
 428 project. *Acta psychiatrica Scandinavica Supplementum*: 21-27.
- 429 APA. 1994. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-*
 430 *IV)* Washington D.C.: American Psychiatric Association.
- 431 Bandura, A. 1997. *Self-efficacy : The Exercise of Control*. New York: W.H. Freeman and
 432 Company.
- 433 Barbui, C., Butler, R., Cipriani, A., Geddes, J. and Hatcher, S. 2007. Depression in adults:
 434 drug and physical treatments. *Clinical Evidence (Online)*, from
 435 [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Ci](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=19454086)
 436 [tation&list_uids=19454086](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=19454086)
- 437 Barker, S. B., Pandurangi, A. K. and Best, A. M. 2003. Effects of animal-assisted therapy on
 438 patients' anxiety, fear, and depression before ECT. *Journal of ECT* 19: 38-44.
- 439 Beck and Steer, R. A. 1987. *Manual for the Beck Depression Inventory*. San Antonio, TX:
 440 The Psychological Corporation.
- 441 Beck, Steer, R. A. and Carbin, M. G. 1988. Psychometric properties of the Beck Depression
 442 Inventory: Twenty-five years of evaluation. *Clinical psychology review* 8: 77-100.
- 443 Berget, B., Ekeberg, O. and Braastad, B. O. (2008). Animal-assisted therapy with farm
 444 animals for persons with psychiatric disorders: effects on self-efficacy, coping ability
 445 and quality of life, a randomized controlled trial, *Clinical practice and epidemiology*
 446 *in mental health* (2008/04/15 ed., Vol. 4).
- 447 Berget, B., Ekeberg, Ø., Pedersen, I. and Braastad, B. O. 2011. Animal-assisted therapy with
 448 farm animals for persons with psychiatric disorders: effects on anxiety and
 449 depression. A randomized controlled trial. *Occupational Therapy in Mental Health*
 450 27: 50-64.
- 451 Bjørgen, D. and Johansen, K. J. 2007. *Bruker spør bruker, evaluering av Inn på tunet.*
 452 *Brukerevaluering av tilbud til mennesker med psykiske vansker i tre kommuner i Sør-*
 453 *Trøndelag: Mental helse i Sør- Trøndelag. Prosjektrapport I/2007.*
- 454 Butler, R., Hatcher, S., Price, J. and Von Korff, M. 2007. Depression in adults: psychological
 455 treatments and care pathways. *Clinical Evidence (Online)*, from
 456 [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Ci](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=19454109)
 457 [tation&list_uids=19454109](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=19454109)
- 458 Bylsma, L. M., Taylor-Clift, A. and Rottenberg, J. 2011. Emotional Reactivity to Daily
 459 Events in Major and Minor Depression. *Journal of Abnormal Psychology* 120: 155-
 460 167.
- 461 Cobb, S. 1976. Social support as Moderator of Life Stress. *Psychosomatic Medicine* 38: 300-
 462 314.

- 463 Colombo, G., lo Buono, M., Smania, K., Raviola, R. and De Leo, D. 2006. Pet therapy and
 464 institutionalized elderly: A study on 144 cognitively unimpaired subjects. *Archives of*
 465 *Gerontology and Geriatrics* 42: 207-216.
- 466 Cuijpers, P., van Straten, A. and Warmerdam, L. 2007. Behavioral activation treatments of
 467 depression: A meta-analysis. *Clinical psychology review* 27: 318-326.
- 468 Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson,
 469 G., Ayuso-Mateos, J. L., Page, H. and Dunn, G. 2006. Negative life events, social
 470 support and gender difference in depression - A multinational community survey with
 471 data from the ODIN study. *Social Psychiatry and Psychiatric Epidemiology* 41: 444-
 472 451.
- 473 Dunn, E. C., Wewiorski, N. J. and Rogers, E. S. 2008. The meaning and importance of
 474 employment to people in recovery from serious mental illness: results of a qualitative
 475 study. *Psychiatric rehabilitation journal* 32: 59-62.
- 476 Ebmeier, K. P., Donaghey, C. and Steele, J. D. 2006. Recent developments and current
 477 controversies in depression. *Lancet* 367: 153-167.
- 478 Ehring, T., Frank, S. and Ehlers, A. 2008. The role of rumination and reduced concreteness in
 479 the maintenance of posttraumatic stress disorder and depression following trauma.
 480 *Cognitive Therapy and Research* 32: 488-506.
- 481 Eklund, M., Hansson, L. and Ahlqvist, C. 2004. The importance of work as compared to
 482 other forms of daily occupations for wellbeing and functioning among persons with
 483 long-term mental illness. *Community mental health journal* 40: 465-477.
- 484 Elings, M. and Hassink, J. 2008. Green Care Farms, A Safe Community Between Illness or
 485 Addiction and the Wider Society. *International journal of therapeutic communities*
 486 29: 310-322.
- 487 Ernst, E., Rand, J. I. and Stevinson, C. 1998. Complementary therapies for depression: an
 488 overview. *Archives of general psychiatry* 55: 1026-1032.
- 489 Fava, M. 2003. Diagnosis and definition of treatment-resistant depression. *Biological*
 490 *Psychiatry* 53: 649-659.
- 491 Fergusson, D., Aaron, S. D., Guyatt, G. and Hebert, P. 2002. Post-randomisation exclusions:
 492 the intention to treat principle and excluding patients from analysis. *British Medical*
 493 *Journal* 325: 652-654.
- 494 Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. and Kirkevold, M. 2009.
 495 Therapeutic horticulture in clinical depression: a prospective study. *Research and*
 496 *theory for nursing practice* 23: 312-328.
- 497 Gonzalez, M. T., Hartig, T., Patil, G. G., Martinsen, E. W. and Kirkevold, M. 2010.
 498 Therapeutic horticulture in clinical depression: a prospective study of active
 499 components. *Journal of Advanced Nursing* 66: 2002-2013.
- 500 Hamer, R. M. and Simpson, P. M. 2009. Last observation carried forward versus mixed
 501 models in the analysis of psychiatric clinical trials. *The American journal of*
 502 *psychiatry* 166: 639-641.
- 503 Harmon, T. M., Nelson, R. O. and Hayes, S. C. 1980. Self-Monitoring of Mood Versus
 504 Activity by Depressed Clients. *Journal of Consulting and Clinical Psychology* 48: 30-
 505 38.
- 506 Hassink, J., Elings, M., Zweckhorst, M., van den Nieuwenhuizen, N. and Smit, A. 2010. Care
 507 farms in the Netherlands: attractive empowerment-oriented and strengths-based
 508 practices in the community. *Health & Place* 16: 423-430.
- 509 Hassink, J. and van Dijk, M. (eds.). 2006. *Farming for health. Green-Care Farming Across*
 510 *Europe and the United States of America* (Vol. 13). Dordrecht: Springer.

- 511 Haubenhofer, D. K., Elings, M., Hassink, J. and Hine, R. E. 2010. The Development of Green
512 Care in Western European Countries. *Explore-the Journal of Science and Healing* 6:
513 106-111.
- 514 Hine, R., Peacock, J. and Pretty, J. 2008. Care Farming in the UK: Contexts, Benefits and
515 Links with Therapeutic Communities. *International journal of therapeutic*
516 *communities* 29: 245-260.
- 517 Hoffmann, A. O. M., Lee, A. H., Wertenaue, F., Ricken, R., Jansen, J. J., Gallinat, J. and
518 Lang, U. E. 2009. Dog-assisted intervention significantly reduces anxiety in
519 hospitalized patients with major depression. *European Journal of Integrative*
520 *Medicine* 1: 145-148.
- 521 Hollis, S. and Campbell, F. 1999. What is meant by intention to treat analysis? Survey of
522 published randomised controlled trials. *British Medical Journal* 319: 670-674.
- 523 Jacobson, N. S. and Truax, P. 1991. Clinical-Significance - a Statistical Approach to Defining
524 Meaningful Change in Psychotherapy-Research. *Journal of Consulting and Clinical*
525 *Psychology* 59: 12-19.
- 526 JMP. 2008. JMP users guide (Version 8). Cary, NC, USA: SAS Institute Inc.
- 527 Kanter, J. W., Manos, R. C., Bowe, W. M., Baruch, D. E., Busch, A. M. and Rusch, L. C.
528 2010. What is behavioral activation?: A review of the empirical literature. *Clinical*
529 *psychology review* 30: 608-620.
- 530 Kessler, R. C., Soukup, J., Davis, R. B., Foster, D. F., Wilkey, S. A., Van Rompay, M. I. and
531 Eisenberg, D. M. 2001. The use of complementary and alternative therapies to treat
532 anxiety and depression in the United States. *The American journal of psychiatry* 158:
533 289-294.
- 534 Ketelaars, D., Baars, E. and Kroon, H. 2001. *Healing trough working. A study of Therapeutic*
535 *Communities for persons with Psychiatric Problems*. New York, USA: Mercury
536 Press.
- 537 Koletsi, M., Niersman, A., van Busschbach, J. T., Catty, J., Becker, T., Burns, T., Fioritti, A.,
538 Kalkan, R., Lauber, C., Rossler, W., Tomov, T. and Wiersma, D. 2009. Working with
539 mental health problems: clients' experiences of IPS, vocational rehabilitation and
540 employment. *Social psychiatry and psychiatric epidemiology* 44: 961-970.
- 541 Kovacs, Z., Kis, R., Rozsa, S. and Rozsa, L. 2004. Animal-assisted therapy for middle-aged
542 schizophrenic patients living in a social institution. A pilot study. *Clinical*
543 *Rehabilitation* 18: 483-486.
- 544 Kraemer, H. C., Wilson, G. T., Fairburn, C. G. and Agras, W. S. 2002. Mediators and
545 moderators of treatment effects in randomized clinical trials. *Archives of general*
546 *psychiatry* 59: 877-883.
- 547 Lehtinen, V., Sohlman, B. and Kovess-Masfety, V. (2005). Level of positive mental health in
548 the European Union: results from the Eurobarometer 2002 survey, *Clinical practice*
549 *and epidemiology in mental health* (2005/07/27 ed., Vol. 1).
- 550 Lewinsohn, P. M. and Graf, M. 1973. Pleasant Activities and Depression. *Journal of*
551 *Consulting and Clinical Psychology* 41: 261-268.
- 552 Liberman, R. P. 2008. *Recovery from disability: manual of psychiatric rehabilitation*.
553 Washington, D.C.: American Psychiatric Publ.
- 554 Lo, C. S., Ho, S. M. and Hollon, S. D. 2010. The Effects of Rumination and Depressive
555 Symptoms on the Prediction of Negative Attributional Style Among College Students.
556 *Cognitive therapy and research* 34: 116-123.
- 557 Luppá, M., Heinrich, S., Angermeyer, M. C., König, H.-H. and Riedel-Heller, S. G. 2007.
558 Cost-of-illness studies of depression: A systematic review. *Journal of affective*
559 *disorders* 98: 29-43.

- 560 Luszczyńska, A., Gutierrez-Dona, B. and Schwarzer, R. 2005. General self-efficacy in
561 various domains of human functioning: Evidence from five countries. *International*
562 *Journal of Psychology* 40: 80-89.
- 563 Luszczyńska, A., Scholz, U. and Schwarzer, R. 2005. The general self-efficacy scale:
564 multicultural validation studies. *The Journal of Psychology* 139: 439-457.
- 565 Macias, C., Jones, D. R., Hargreaves, W. A., Wang, Q., Rodican, C. F., Barreira, P. J. and
566 Gold, P. B. 2008. When programs benefit some people more than others: tests of
567 differential service effectiveness. *Administration and policy in mental health* 35: 283-
568 294.
- 569 Maciejewski, P. K., Prigerson, H. G. and Mazure, C. M. 2000. Self-efficacy as a mediator
570 between stressful life events and depressive symptoms. Differences based on history
571 of prior depression. *The British journal of psychiatry* 176: 373-378.
- 572 Mallon, G. P. 1994. Cow as Co-Therapist: Utilization of Farm Animals as Therapeutic Aides
573 with Children in Residential Treatment. *Child and Adolescent Social Work Journal*
574 11: 455-474.
- 575 Mallon, G. P., Ross, S. B., Klee, S. and Ross, L. 2006. Designing and Implementing Animal-
576 Assisted Therapy Programs in Health and Mental Health organizations. In *Handbook*
577 *on Animal-Assisted therapy. Theoretical foundations and guidelines for practice*, 149-
578 163, ed. A. Fine. San Diego: Academic press, Elsevier Inc.
- 579 Marr, C. A., French, L., Thompson, D., Drum, L., Greening, G., Mormon, J., Henderson, I.
580 and Hughes, C. W. 2000. Animal-assisted therapy in psychiatric rehabilitation.
581 *Anthrozoös* 13: 43-47.
- 582 Martinsen, E. W. 2008. Physical activity in the prevention and treatment of anxiety and
583 depression. *Nordic journal of psychiatry* 62 Suppl 47: 25-29.
- 584 McNicholas, J. and Collis, G. M. 2006. Animals as Social Supports: Insights for
585 Understanding Animal-Assisted Therapy. In *Handbook on Animal-Assisted therapy.*
586 *Theoretical foundations and guidelines for practice*, 49-72, ed. A. Fine. San Diego:
587 Academic press, Elsevier Inc.
- 588 Mead, G. E., Morley, W., Campbell, P., Greig, C. A., McMurdo, M. and Lawlor, D. A.
589 (2009). Exercise for depression, *Cochrane Database of Systematic Reviews*.
- 590 Milne, D. L. 1999. *Social Therapy: A Guide to Social Support Interventions for Mental*
591 *Health Practitioners*. Chichester: John Wiley.
- 592 Mitchell, D. 1998. Promoting enjoyment and self-belief through work rehabilitation. *Archives*
593 *of psychiatric nursing* 12: 344-350.
- 594 Montori, V. M. and Guyatt, G. H. 2001. Intention-to-treat principle. *CMAJ* 165: 1339-1341.
- 595 Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V. and Ustun, B. 2007. Depression,
596 chronic diseases, and decrements in health: results from the World Health Surveys.
597 *Lancet* 370: 851-858.
- 598 Nathans-Barel, I., Feldman, P., Berger, B., Modai, I. and Silver, H. 2005. Animal-assisted
599 therapy ameliorates anhedonia in schizophrenia patients - A controlled pilot study.
600 *Psychotherapy and Psychosomatics* 74: 31-35.
- 601 Pedersen, I., Ihlebæk, C. and Kirkevold, M. 2010. Farm animal-assisted intervention: an
602 interview study on key elements for persons with depression. Paper presented at the
603 12th International IAHAIO Conference People & Animals - For Life, Stockholm,
604 Sweden, July 1-4.
- 605 Pedersen, I., Nordaunet, T., Martinsen, E. W., Berget, B. and Braastad, B. O. in press. Farm
606 Animal-Assisted Intervention: Relationship between Work and Contact with Farm
607 Animals and Change in Depression, Anxiety and Self-efficacy among Persons with
608 Clinical Depression. *Issues in Mental Health Nursing*.

- 609 Razzano, L. A., Cook, J. A., Burke-Miller, J. K., Mueser, K. T., Pickett-Schenk, S. A., Grey,
610 D. D., Goldberg, R. W., Blyler, C. R., Gold, P. B., Leff, H. S., Lehman, A. F., Shafer,
611 M. S., Blankertz, L. E., McFarlane, W. R., Toprac, M. G. and Ann Carey, M. 2005.
612 Clinical factors associated with employment among people with severe mental illness:
613 findings from the employment intervention demonstration program. *The Journal of*
614 *nervous and mental disease* 193: 705-713.
- 615 Relf, P. D. 2006. Agriculture and Health Care. The care of plants and animals for therapy and
616 rehabilitation in the United States. In *Farming for health. Green-Care Farming*
617 *Across Europe and the United States of America*, ed. J. Hassink and M. van Dijk.
618 Dordrecht: Springer.
- 619 Rubin, W. V. and Panzano, P. C. 2002. Identifying meaningful subgroups of adults with
620 severe mental illness. *Psychiatric Services* 53: 452-457.
- 621 Ruesch, P., Graf, J., Meyer, P. C., Rossler, W. and Hell, D. 2004. Occupation, social support
622 and quality of life in persons with schizophrenic or affective disorders. *Social*
623 *psychiatry and psychiatric epidemiology* 39: 686-694.
- 624 Scholz, U., Dona, B. G., Sud, S. and Schwarzer, R. 2002. Is general self-efficacy a universal
625 construct? Psychometric findings from 25 countries. *European Journal of*
626 *Psychological Assessment* 18: 242-251.
- 627 Schwarzer, R. 1993. *Measurement of perceived self-efficacy. Psychometric scales for cross-*
628 *cultural research*. Berlin: Freien Universität.
- 629 Schwarzer, R. and Jerusalem, M. 1995. Generalized Self-Efficacy scale. In *Measures in*
630 *health psychology: A user's portfolio. Causal and control beliefs*, 35-37, ed. J.
631 Weinman, S. Wright and M. Johnston. Windsor: NFER-NELSON.
- 632 Seggar, L. B., Lambert, M. J. and Hansen, N. B. 2002. Assessing clinical significance:
633 Application to the beck depression inventory. *Behavior Therapy* 33: 253-269.
- 634 Sempik, J., Hine, R. and Wilcox, D. (eds.). 2010. *Green Care: A conceptual Framework. A*
635 *Report of the Working Group on the Health Benefits of Green Care. COST 866,*
636 *Green Care in Agriculture*: Loughborough University.
- 637 Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J. and Weiler, E. 1998.
638 The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and
639 validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10.
640 Norwegian version. *Journal of Clinical Psychiatry* 59 (Suppl.): 22-33.
- 641 Spielberger, C. D., Gorsuch, R. I. and Lushene, R. E. 1983. *Manual for the State-Trait*
642 *Anxiety Inventory*. Palo Alto, Ca: Consulting Psychologists Press.
- 643 Stokke, K. and Paulsen Rye, S. K. 2007. *Inn på tunet. Nasjonal og regional organisering.*
644 *Gårdbrukerens økonomi og erfaringer*. Oslo: Norsk institutt for landbruksøkonomisk
645 forskning.
- 646 Tower, R. B. and Nokota, M. 2006. Pet companionship and depression: results from a United
647 States Internet sample. *Anthrozoös* 19: 50-64.
- 648 Villalta-Gil, V., Roca, M., Gonzalez, N., Domenec, E., Cuca, Escanilla, A., Asensio, M. R.,
649 Esteban, M. E., Ochoa, S. and Haro, J. M. 2009. Dog-Assisted Therapy in the
650 Treatment of Chronic Schizophrenia Inpatients. *Anthrozoös* 22: 149-159.
- 651 von Knorring, L., Akerblad, A. C., Bengtsson, F., Carlsson, A. and Ekselius, L. 2006. Cost of
652 depression: effect of adherence and treatment response. *European Psychiatry* 21: 349-
653 354.
- 654 Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C. and Murray, C. J. 2004. Global
655 burden of depressive disorders in the year 2000. *The British journal of psychiatry* 184:
656 386-392.

657 Zimolag, U. and Krupa, T. 2009. Pet Ownership as a Meaningful Community Occupation for
658 People With Serious Mental Illness. *American Journal of Occupational Therapy* 63:
659 126-137.
660
661

Paper II

Running head: Farm Animal-Assisted Interventions in Depression

Farm Animal-Assisted Intervention: Relationship between Work and Contact with Farm Animals and Change in Depression, Anxiety and Self-efficacy among Persons with Clinical Depression

Ingeborg Pedersen¹, Trine Nordaunet¹, Egil W. Martinsen^{2,3}, Bente Berget¹ and Bjarne O. Braastad¹

¹Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, Ås, Norway

²Department of Mental Health and Addiction, Oslo University Hospital, Norway

³Institute of Psychiatry, University of Oslo, Norway

ABSTRACT

Fourteen adult persons with clinical depression participated twice a week in a twelve-week farm animal-assisted intervention consisting of work and contact with dairy cattle. Each participant was recorded on video tape twice during the intervention, and the recordings were categorized with respect to various work tasks, animal and human contact. Levels of anxiety and depression decreased and self-efficacy increased during the intervention. Interaction with farm animals via work tasks showed a greater potential for improved mental health than via sole animal contact, but only when a progress in working skills was achieved, indicating the role of coping experience for a successful intervention.

Key words: Animal-assisted intervention, clinical depression, farm animals, green care, mental health care

Depression is a major public health challenge, and the World Health Organization (WHO) has estimated that the one year prevalence for depressive disorder is 3.2 % (Moussavi et al., 2007). Estimates for lifetime risk vary. Alonso et al. (2004) found a lifetime prevalence of 12.8 % in six European countries, while (Andrews, Poulton, & Skoog, 2005) predicted that almost half the population can expect one or more depressive episodes during their lifetime. Globally, depression is responsible for 12.1 % of years lived with disability (Üstün, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004), and accounts more for poor health than several chronic diseases (Moussavi, et al., 2007). Together these factors show that depression is a major public health problem worldwide. Conventional forms of treatment, like medication and psychotherapy, have well documented effect (Barbui, Butler, Cipriani, Geddes, & Hatcher, 2007; Butler, Hatcher, Price, & Von Korff, 2007; Ebmeier, Donaghey, & Steele, 2006). However, non-responders and lack of adherence are not unusual during pharmacological treatment (Fava, 2003; von Knorring, Akerblad, Bengtsson, Carlsson, & Ekselius, 2006), and for psychotherapy lack of availability is a problem.

Complementary forms of treatment are widely used, and more than 50 % of people with depression have reported using one of these alone or as a supplement to conventional treatment (Kessler et al., 2001). The research basis for these interventions is limited (Ernst, Rand, & Stevinson, 1998). Work and work-related activities may contribute positively to mental health (Dunn, Wewiorski, & Rogers, 2008; Eklund, Hansson, & Ahlqvist, 2004; Mitchell, 1998), and reviews have shown that interaction with companion animals is beneficial for human health and depression (Barker & Wolen, 2008; Knight & Herzog, 2009; Nimer & Lundahl, 2007; Souter & Miller, 2007; Wells, 2009). However, less effort has been invested in examining to which degree

farm work and interaction with farm animals might alleviate depression. Scientific studies of a possible new complementary intervention should be of interest.

Green care or Care farming includes a variety of work-related activities offered at ordinary farms, and with farm animals as an important part of the milieu. The common basis is the use of nature and the natural environment to improve or promote health and wellbeing (Sempik, Hine, & Wilcox, 2010). Today, approximately 650 farms in Norway offer a Green care service (Stokke & Paulsen Rye, 2007), and other European countries have similar figures (Hassink & van Dijk, 2006; Haubehofer, Elings, Hassink, & Hine, 2010). Green Chimneys outside New York is an early example of using farm animals in health care (Mallon, 1994; Mallon, Ross, Klee, & Ross, 2006), and other institutions in the U.S.A. can facilitate this kind of service (Relf, 2006).

THEORETICAL FRAMEWORK

The theoretical foundations of the benefits of human-animal interactions are poorly understood, and Kruger and Serpell (2006) state that plausible mechanisms are still to be confirmed. Social support is frequently presented as a potential mechanism, and several studies show that a close and long-term relationship with a companion animal could contribute to enhanced mental health (McNicholas & Collis, 2006; Tower & Nokota, 2006; Zimolag & Krupa, 2009). International surveys do demonstrate a significant relationship between perceived social support and mental health (Dalgard et al., 2006; Lehtinen, Sohlman, & Kovess-Masfety, 2005), and social support is also considered an important element in mental health rehabilitation. House (1981) divided social support into four different categories: emotional, appraisal, informational, and instrumental support. Informational support consisting of giving advice, information, and

instructions is a natural part of farm animal-assisted interventions. Emotional support comprising of concern, listening, and trust from farmers or other participants would possibly be a component. The participants could also interpret close contact with farm animals as emotional support. Appraisal support, with affirmation and feedback, is also likely to be a part of the contact between the farmer and the participant.

Farm animal-assisted interventions may be suitable arenas for coping experiences and enhanced self-efficacy. The latter is described as a person's belief that one can successfully achieve the desired outcome (Bandura, 1977). According to this theory both information from the surroundings and the person's own cognitions and physiological state will be the basis for a person's belief in his/her efficacy. However, the most powerful sources to improved self-efficacy are a person's own accomplishment of a task or coping in a situation. A low generalized self-efficacy is correlated with both depression and anxiety (Schwarzer, 1993). A study by Maciejewski, Prigerson, and Mazure (2000) showed that high self-efficacy at baseline predicted less depression at follow up. For people with previous depression, 40 % of the probability of relapse was mediated by negative change in self-efficacy.

GREEN CARE RESEARCH

In contrast to animal-assisted interventions with pets, the number of studies addressing the potential of Green care and farm animals on mental health is limited. Qualitative studies in The Netherlands (Elings & Hassink, 2008) and Norway (Bjørngen & Johansen, 2007) emphasized the farmer contact and the social setting as important aspects for participants with mental health issues. In an interview study among health care professionals (Hassink, Elings, Zweekhorst, van den Nieuwenhuizen, & Smit, 2010), the non-care context with normal contact with society and

other people via work was central. In a study within a therapeutic farm milieu, patients with mental disorders had higher quality of life and lower score on mental distress when discharged, compared to those who were admitted (Ketelaars, Baars, & Kroon, 2001). In an English study without a control group, 72 participants within Green care experienced significant increase in self-esteem (Rosenberg Self-Esteem Questionnaire) and positive mood (including depression) during a stay at a farm (Hine, Peacock, & Pretty, 2008).

As far as we know only one randomized controlled study has been conducted. The authors (Berget, Ekeberg, & Braastad, 2008; Berget, Ekeberg, Pedersen, & Braastad, 2011) compared an animal-assisted intervention with dairy cows to a control group receiving treatment as usual among participants with various mental disorders. There was no difference in outcome between the groups during the intervention, but at a six-month follow-up the intervention group had significantly larger reductions in state anxiety and an increase in generalized self-efficacy compared with the control group. Berget et al. (2007) also showed that, among persons with affective disorders, increases in intensity and exactness in performed work tasks were significantly correlated to increase in self-efficacy and a decrease in state anxiety.

These studies indicate mental health benefits associated with Green care, and it should be of interest to examine the potential associations between the performed work tasks, animal contact, and mental health outcomes. This could contribute to our understanding and development of a theoretical framework within farm animal-assisted interventions.

STUDY AIMS

The main aim of this study was to examine the relationships between various elements in a farm animal-assisted intervention, and changes in depression, anxiety, and self-efficacy for persons with clinical depression. The specific hypotheses were:

1. There will be a favorable association between high levels of performed work tasks, decline in depression, state anxiety symptoms, and an increase in self-efficacy.
2. There will be a favorable association between high levels of animal contact, decline in state anxiety, and depression symptoms.
3. There will be a favorable association between high levels of dialog with the farmer and a decline in state anxiety and depression symptoms.

MATERIAL AND METHODS

Participants

Nineteen participants were recruited through advertising, invitation letters from the Labour and Welfare Service, and contact with health personnel. All potential participants received an information letter and signed a written consent before being included in the study. The inclusion criterion was a score on the Beck Depression Inventory (BDI-IA) of a minimum of 14 (Beck & Steer, 1987). Due to practical limitations only a subset of the sample (60 %) conducted a Mini International Neuropsychiatric Interview (Sheehan et al., 1998). All who were interviewed met the DSM-IV criteria for major depression. The BDI-IA scores of those with formal diagnoses were not significantly different from the others. The mean BDI-IA score was

25.9, indicating that the majority of patients were moderately depressed. In the following we will use the term clinical depression. Five participants dropped out, due to a variety of reasons; allergic reactions, work offer, vocational rehabilitation, and one participant refused to contribute in the video recording the second time. Therefore a total of 14 participants (3 men and 11 women) are the basis in the present study. Mean age was 37.4 years (range 23-54). They were all full or part-time on sick leave, out of work, in rehabilitation, or on disability pension. All participants continued their initial treatment, consisting of medication (3 participants), psychotherapy (2 participants) or both (6 participants). Three participants did not provide this information.

Farms and farmers

Eight dairy farms from five different counties in Norway were recruited to the project. The farming system was equally distributed between free range stalls and tie-stalls. Both female (n=3) and male farmers (n=5) had the main responsibility for the participants. All farms had dairy cattle as the main production, and the average number of dairy cows was 25.5 (range 14-60). All farms also had companion animals like horses, cats, dogs or rabbits.

Intervention

The intervention consisted of work and contact with farm animals twice a week for twelve weeks. Due to variation in farm size and degree of mechanization between farms, each session lasted between 1.5 and 3.0 hours. A first visit was used by the participants to get familiar with the farm and the farmer. When they returned the next time, the participants worked together with the farmer in the cowshed. They were allowed to choose their own work tasks with the cow

herd or spent their time in contact with the farm animals. The minimum adherence to the intervention was set to 50 %.

Video recordings

Each participant was video-recorded for a whole session early (during the two first weeks) and late (during the two last weeks) in the intervention. The mean (SD) recording time was 97.8 (26.5) minutes early, and 98.0 (25.0) minutes late in the intervention. Different work tasks conducted in the cow shed, and all animal contact and dialog with the farmer were classified into different behavioral categories (Table 1).

(Table 1 here)

As a result of the possibility to talk and work at the same time; dialog with the farmer and talking to animals was separately analyzed. The complete recordings were coded by continuous time sampling using The Observer 7.0 software (Noldus, 2007), and analyzed by first and second author according to the different behavioral categories in Table 1. The various behaviors were expressed as time spent in percent of total recording time early and late in the intervention, and as an average between these.

Mental health assessments

Participants filled in questionnaires before and after the intervention. They were sent by post to the participants with information about how and when to fill in the questionnaires, and the participants were identified via a number written on each questionnaire. A return envelope already addressed and with stamp was provided. Beck Depression Inventory (BDI-IA) was used

to assess the level of depression (Beck & Steer, 1987). This questionnaire consists of 21 items which are scored on a 0 (no symptoms) to 3 (severe symptoms) scale, giving a range of 0-63 in sum score. The normal range of the sum score is 0-9, score of 10-19 are considered as mild and 20-29 as moderate depression. We chose a sum score in the middle of the range of mild depression (14) as inclusion criterion. State-Trait Anxiety Inventory – State Subscale (STAI-SS) was used to measure state anxiety (Spielberger, Gorsuch, & Lushene, 1983). The instrument consists of 20 items scored on a four point Likert scale from 1 (not at all) to 4 (a great deal), each item describing an anxiety symptom at the present time. Total scores range from 20 to 80. Perceived self-efficacy was measured by Generalized Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995). This inventory consists of 10 statements connected to the participant's perceived ability to cope with a variety of difficult demands. The answer options were ranging from 1 (absolutely wrong) to 4 (absolutely right), which creates a maximum score of 40 demonstrating the highest level of generalized self-efficacy.

Statistics

Missing single items of an instrument were handled by the following method; a mean value was calculated for the registered items and the closest value above this was given to the missing item. When more than three items were missing, the whole questionnaire was regarded as absent, and was replaced by the last observation carried forward. Correlations between time spent with different work tasks or animal contact, and change in depression, anxiety and self-efficacy from start to end of intervention, were calculated as Spearman's rho. All analyses were conducted by using the statistical software JMP 7.0 (2008).

Ethical approval

The project was approved by the Regional Committee for Medical Research Ethics and the Privacy Ombudsman for Research.

RESULTS

Time spent with various work tasks, dialog with farmer and animal contact early and late in the intervention period are shown in Table 2.

(Table 2 here)

In many of the categories there were changes from early to late in the intervention. The greatest decrease was seen in dialog with the farmer, and also inactivity and observing animals decreased from early to late. For the behavioral categories milking, moving animals, grooming animals, cleaning and fetching feed, there were numerical increases between early and late. Summed up this made an increase in time spent doing work activities during the intervention.

Table 3 shows the scores of the three outcome measures (BDI-IA, STAI-SS and GSE) at recruitment, start and end of the intervention.

(Table 3 here)

The depression score declined from recruitment to start with 2.8, and during the intervention with 6.9. Anxiety increased from recruitment to start with 0.9 followed by a decline

during the intervention of 5.7. A similar trend was seen for generalized self-efficacy score with a minor reduction before the intervention (0.3) and then a rise from start to the end of the intervention by 3.3.

The correlations between average time spent in various behavioral categories and changes in depression, anxiety and self-efficacy are shown in Table 4. Some minor work categories did naturally belong within other, broader categories, and were therefore merged with them.

(Table 4 here)

Depression

Several work tasks were negatively correlated with reduced depression, illustrating that the greatest decline in depression was associated with high levels of these work tasks. Two of the associations were significant, milking procedures (milking and technical preparations), ($r = -0.62$, $p = 0.02$) and moving animals, ($r = -0.58$, $p = 0.03$). Other examples of work tasks with a favorable association to depression are cleaning, feeding, and dialog with the farmer. For the behaviors mucking (remove manure from animal area), grooming (brush the animals' coat), inactivity (no work activity), and pure animal contact (physical contact, observing and talking to animals), the relationships with depression were in the opposite direction. The result indicates an unfavorable association between high levels of these behaviors and a change in symptoms of depression, and the association between depression and animal contact was close to significant ($r = 0.50$, $p = 0.07$).

Anxiety

Milking procedures showed a favorable significant association with anxiety ($r = -0.67$, $p = 0.01$). Similar relationships were found for other work tasks; moving animals, cleaning, feeding, and dialog with the farmer. The correlations between moving animals and reduction in anxiety were significant, ($r = -0.66$, $p = 0.01$), and also high levels of dialog with the farmer were significantly correlated with a decline in anxiety ($r = -0.53$, $p=0.05$). The behaviors mucking, grooming, inactivity, and pure animal contact showed a reverse association, and the results indicate an unfavorable association between high levels of these behaviors and change in symptoms of anxiety. Significant correlation was only found between anxiety and grooming ($r = 0.63$, $p = 0.02$),

Generalized self-efficacy

There was only one significant correlation between generalized self-efficacy and the registered behaviors, high levels of mucking gave a reduction in perceived self-efficacy ($r = -0.64$, $p = 0.01$). There was a trend towards a favorable significant relationship between generalized self-efficacy and high levels of performed milking procedures ($r = 0.48$, $p = 0.08$).

DISCUSSION

Time spent doing various work activities increased during the intervention. A decrease was seen in dialog with the farmer, inactivity and observing animals. There was a numeric decline in depressive and anxiety symptoms and increase in perceived generalized self-efficacy during the intervention. Change in mental health scores were favorably correlated to time spent with milking procedures, feeding, cleaning, moving animals and dialog with farmer, and unfavorably correlated with mucking, grooming, sole animal contact and inactivity.

One of the most complex and challenging work tasks in the cow shed is the milking procedure. Increase in this behavior was also seen in the study of Berget et al. (2007), and they interpreted this behavior as positive progress in work skills. In our study, milking was the only work task where the time spent with these tasks were significantly correlated with decline in both state anxiety and depression. The increase in self-efficacy showed a trend towards significance. Moving animals is another challenging work task and is naturally only done when the animals are unfastened. Walking around in a cow herd and making such big animals obey you requires a certain psychological strength, and our study also revealed a favorable association between this work task and a reduction in both anxiety and depression symptoms. As for the performed milking procedures, this work task could possibly be connected to a coping experience. On this basis, the participants' mastery experience could be essential for change in mental health, as stated by Bandura (1997). This is also in accordance with conclusions done by Hassink et al. (2010) and Rappe (2007), where Green care interventions are described as empowerment and coping oriented.

Some of the work tasks, like mucking and grooming, could be considered typical work tasks for beginners, with no need for earlier experience or rehearsal. The time spent in these two work tasks also showed unfavorable associations with all the mental health measures, and this was statistically significant between mucking and self-efficacy, and between grooming and state anxiety. Participants who spent a large amount of time in these beginner's activities probably had not acquired new working skills, and therefore did not experience coping and mastery to a noticeable degree. Pure animal contact, somewhat surprisingly, showed the same unfavorable association with all mental health measures. Several studies on companion animals (Banks & Banks, 2005; Barker & Dawson, 1998; Barker, Pandurangi, & Best, 2003; Chu, Liu, Sun, & Lin,

2009; Hoffmann et al., 2009; Marr et al., 2000) reveal a positive effect on mental health related to contact with animals, but this was not seen in our study. One explanation could be that animal contact was already covered via work tasks. The unfavorable association between sole animal contact and the mental health measures may be interpreted as a sign of impaired development of new working skills among those with high levels of this behavior.

Social support is recognized as an important factor in mental health interventions (Milne, 1999). Several studies found contact with the farmer as an important element within Green care (Bjørngen & Johansen, 2007; Elings & Hassink, 2008; Hassink, et al., 2010; Ketelaars, et al., 2001), and Enders-Slegers (2008) describes the farmer as a ‘therapeutic tool’ in this kind of interventions. The reduction in time spent in dialog with the farmer during the intervention in our study is likely to be an effect of less time spent giving work instructions. As a consequence dialogue early in the intervention could be regarded as a mixture of social dialog and work instructions, whereas the lower frequency late in the intervention consisted more of pure conversation. A high percent of dialog was associated with a favorable change in all the mental health measures, and was statistically significant for state anxiety symptoms. This indicated a positive connection between a close contact with the farmer and improvement in the participants’ mental health. This could have been mediated as representing one or more classes of social support.

Limitations

Even though dairy management consists mainly of routine work, video recordings made early and late in the intervention do not necessarily give a correct assessment of the participants’ different behaviors over a time period. In addition, the participant’s choice of work tasks could

be influenced by an observer effect. It is possible that the participants overestimate the work motivation in a wish to appear clever, or underestimate this because of a nervous reaction towards the observer.

We present many correlations and the possibility of Type I errors will thereby increase. It is also important to emphasize that observed correlations between work tasks and mental health measures do not reveal any causal relations. The developments in mental health cannot solely be attributed to the intervention, as no control group data were provided in this study.

CONCLUSIONS

The study supports our hypothesis about a favorable association between high levels of performed work tasks, a decline in depression, and state anxiety symptoms, but this was seen only for challenging and complex work tasks. With regard to beginners' activities this association was unfavorable. Our assumption about a favorable association between high levels of sole animal contact and a decline in state anxiety and depression symptoms was not supported. These results indicate that interaction with farm animals via work tasks had a greater potential for a positive change in mental health than sole animal contact, but only when a progress in working skills was achieved. The participants' mastery experiences could be essential to achieve positive effects of farm animal-assisted interventions.

Our study revealed a favorable association between high levels of dialog with the farmer, and a decline in anxiety and depressive symptoms. Even though no analysis in dialog content was possible in this study, a connection to several of the classes within social support could be the source of the observed association. A close farmer contact may also influence positively on participants' progress into new work skills.

Our prediction about a favorable association between high levels of performed work tasks and an increase in self-efficacy was only partly confirmed the correlation between time spent with milking procedures and increase in generalized self-efficacy was close to significant. GSE is a trait inventory and a global measure, not directly connected to coping within an animal-assisted intervention with farm animals. This could be the reason why the generally positive change seen in our study is difficult to connect to any specific behavior.

Declaration of interest: This research was funded by grant nr. 173302/I10 from the Research Council of Norway. The authors report no conflicts of interest. The authors alone are responsible for the content and the writing of the paper.

REFERENCES

- Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., Bryson, H. (2004). Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta psychiatrica Scandinavica, Supplementum*(420), 21-27.
- Andrews, G., Poulton, R., & Skoog, I. (2005). Lifetime risk of depression: restricted to a minority or waiting for most? *British Journal of Psychiatry, 187*, 495-496.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191-215.
- Bandura, A. (1997). *Self-efficacy : The Exercise of Control*. New York: W.H. Freeman and Company.
- Banks, M. R., & Banks, W. A. (2005). The effects of group and individual animal-assisted therapy on loneliness in residents of long-term care facilities. *Anthrozoös, 18*(4), 396-408.
- Barbui, C., Butler, R., Cipriani, A., Geddes, J., & Hatcher, S. (2007). Depression in adults: drug and physical treatments. *Clinical Evidence (Online), 2007*.
- Barker, S. B., & Dawson, K. S. (1998). The effects of animal-assisted therapy on anxiety ratings of hospitalized psychiatric patients. *Psychiatric Services, 49*(6), 797-801.
- Barker, S. B., Pandurangi, A. K., & Best, A. M. (2003). Effects of animal-assisted therapy on patients' anxiety, fear, and depression before ECT. *Journal of ECT, 19*(1), 38-44.
- Barker, S. B., & Wolen, A. R. (2008). The Benefits of Human-Companion Animal Interaction: A Review. [Proceedings Paper]. *Journal of Veterinary Medical Education, 35*(4), 487-495.

- Beck, & Steer, R. A. (1987). *Manual for the Beck Depression Inventory*. San Antonio, TX: The Psychological Corporation.
- Berget, B., Ekeberg, O., & Braastad, B. O. (2008). Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on self-efficacy, coping ability and quality of life, a randomized controlled trial. *Clinical practice and epidemiology in mental health, 4*.
- Berget, B., Ekeberg, Ø., Pedersen, I., & Braastad, B. O. (2011). Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on anxiety and depression. A randomized controlled trial. *Occupational Therapy in Mental Health, 27(2)*, 50-64.
- Berget, B., Skarsaune, I., Ekeberg, Ø., & Braastad, B. O. (2007). Humans with Mental Disorders Working with Farm Animals: A Behavioral Study. *Occupational Therapy in Mental Health, 23(2)*, 101-117.
- Bjørger, D., & Johansen, K. J. (2007). Bruker spør bruker, evaluering av Inn på tunet. Brukerevaluering av tilbud til mennesker med psykiske vansker i tre kommuner i Sør-Trøndelag: Mental helse i Sør- Trøndelag. Prosjektrapport I/2007.
- Butler, R., Hatcher, S., Price, J., & Von Korff, M. (2007). Depression in adults: psychological treatments and care pathways. *Clinical Evidence (Online)*, 2007.
- Chu, C. I., Liu, C. Y., Sun, C. T., & Lin, J. (2009). The Effect of Animal-Assisted Activity on Inpatients with Schizophrenia. [Article]. *Journal of Psychosocial Nursing and Mental Health Services, 47(12)*, 42-48.
- Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson, G. (2006). Negative life events, social support and gender difference in depression - A multinational community survey with data from the ODIN study. [Article]. *Social Psychiatry and Psychiatric Epidemiology, 41(6)*, 444-451.
- Dunn, E. C., Wewiorski, N. J., & Rogers, E. S. (2008). The meaning and importance of employment to people in recovery from serious mental illness: results of a qualitative study. *Psychiatric rehabilitation journal, 32(1)*, 59-62.
- Ebmeier, K. P., Donaghey, C., & Steele, J. D. (2006). Recent developments and current controversies in depression. *Lancet, 367(9505)*, 153-167.
- Eklund, M., Hansson, L., & Ahlqvist, C. (2004). The importance of work as compared to other forms of daily occupations for wellbeing and functioning among persons with long-term mental illness. *Community mental health journal, 40(5)*, 465-477.
- Elings, M., & Hassink, J. (2008). Green Care Farms, A Safe Community Between Illness or Addiction and the Wider Society. *International journal of therapeutic communities, 29(3)*, 310-322.
- Enders-Slegers, M. J. (2008). Therapeutic farming or therapy on a farm. In J. Desein (Ed.), *Farming for health. Proceedings of the Community of Practice Farming for Health, 6-9 November 2007* (pp. 37-44). Ghent: Merelbeke, Belgium: ILVO.
- Ernst, E., Rand, J. I., & Stevinson, C. (1998). Complementary therapies for depression: an overview. *Archives of general psychiatry, 55(11)*, 1026-1032.
- Fava, M. (2003). Diagnosis and definition of treatment-resistant depression. *Biological Psychiatry, 53(8)*, 649-659.
- Hassink, J., Elings, M., Zweekhorst, M., van den Nieuwenhuizen, N., & Smit, A. (2010). Care farms in the Netherlands: attractive empowerment-oriented and strengths-based practices in the community. *Health & Place, 16(3)*, 423-430.

- Hassink, J., & van Dijk, M. (Eds.). (2006). *Farming for health. Green-Care Farming Across Europe and the United States of America* (Vol. 13). Dordrecht: Springer.
- Haubenhofer, D. K., Elings, M., Hassink, J., & Hine, R. E. (2010). The Development of Green Care in Western European Countries. *Explore-the Journal of Science and Healing*, 6(2), 106-111.
- Hine, R., Peacock, J., & Pretty, J. (2008). Care Farming in the UK: Contexts, Benefits and Links with Therapeutic Communities. *International journal of therapeutic communities*, 29(3), 245-260.
- Hoffmann, A. O. M., Lee, A. H., Wertenaue, F., Ricken, R., Jansen, J. J., Gallinat, J. (2009). Dog-assisted intervention significantly reduces anxiety in hospitalized patients with major depression. *European Journal of Integrative Medicine*, 1(3), 145-148.
- House, J. S. (1981). *Work stress and social support*. Reading, Mass.: Addison-Wesley.
- JMP. (2008). JMP users guide (Version 8). Cary, NC, USA: SAS Institute Inc.
- Kessler, R. C., Soukup, J., Davis, R. B., Foster, D. F., Wilkey, S. A., Van Rompay, M. I. (2001). The use of complementary and alternative therapies to treat anxiety and depression in the United States. *The American journal of psychiatry*, 158(2), 289-294.
- Ketelaars, D., Baars, E., & Kroon, H. (2001). *Healing through working. A study of Therapeutic Communities for persons with Psychiatric Problems*. New York, USA: Mercury Press.
- Knight, S., & Herzog, H. (2009). All Creatures Great and Small: New Perspectives on Psychology and Human-Animal Interactions. [Editorial Material]. *Journal of Social Issues*, 65(3), 451-461.
- Kruger, K. A., & Serpell, J. A. (2006). Animal-Assisted Interventions in Mental Health: Definitions and Theoretical Foundations. In A. Fine (Ed.), *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice*. (2 ed., pp. 21-38). San Diego: Academic press, Elsevier Inc.
- Lehtinen, V., Sohlman, B., & Kovess-Masfety, V. (2005). Level of positive mental health in the European Union: results from the Eurobarometer 2002 survey. *Clinical practice and epidemiology in mental health*, 1.
- Maciejewski, P. K., Prigerson, H. G., & Mazure, C. M. (2000). Self-efficacy as a mediator between stressful life events and depressive symptoms. Differences based on history of prior depression. *The British journal of psychiatry*, 176, 373-378.
- Mallon, G. P. (1994). Cow as Co-Therapist: Utilization of Farm Animals as Therapeutic Aides with Children in Residential Treatment. *Child and Adolescent Social Work Journal*, 11(6), 455-474.
- Mallon, G. P., Ross, S. B., Klee, S., & Ross, L. (2006). Designing and Implementing Animal-Assisted Therapy Programs in Health and Mental Health organizations. In A. Fine (Ed.), *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice* (2 ed., pp. 149-163). San Diego: Academic press, Elsevier Inc.
- Marr, C. A., French, L., Thompson, D., Drum, L., Greening, G., Mormon, J. (2000). Animal-assisted therapy in psychiatric rehabilitation. *Anthrozoös*, 13(1), 43-47.
- McNicholas, J., & Collis, G. M. (2006). Animals as Social Supports: Insights for Understanding Animal-Assisted Therapy. In A. Fine (Ed.), *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice* (2 ed., pp. 49-72). San Diego: Academic press, Elsevier Inc.
- Milne, D. L. (1999). *Social Therapy: A Guide to Social Support Interventions for Mental Health Practitioners*. Chichester: John Wiley.

- Mitchell, D. (1998). Promoting enjoyment and self-belief through work rehabilitation. *Archives of psychiatric nursing*, 12(6), 344-350.
- Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet*, 370(9590), 851-858.
- Nimer, J., & Lundahl, B. (2007). Animal-assisted therapy: A meta-analysis. *Anthrozoös*, 20(3), 225-238.
- Noldus. (2007). The Observer XT (Version 7.0). The Netherlands: Noldus Information Technology bv.
- Rappe, E. (2007). *Green Care in the framework of health promotion*. Paper presented at the 1st European COST Action 866 conference. Green Care in Agriculture: Health effects, Economics and Policies, Vienna, Austria.
- Relf, P. D. (2006). Agriculture and Health Care. The care of plants and animals for therapy and rehabilitation in the United States. In J. Hassink & M. van Dijk (Eds.), *Farming for health. Green-Care Farming Across Europe and the United States of America* (Vol. 13). Dordrecht: Springer.
- Schwarzer, R. (1993). *Measurement of perceived self-efficacy. Psychometric scales for cross-cultural research*. Berlin: Freien Universität.
- Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor: NFER-NELSON.
- Sempik, J., Hine, R., & Wilcox, D. (Eds.). (2010). *Green Care: A conceptual Framework. A Report of the Working Group on the Health Benefits of Green Care. COST 866, Green Care in Agriculture*: Loughborough University.
- Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., & Weiler, E. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Norwegian version. *Journal of Clinical Psychiatry*, 59 (Suppl.), 22-33.
- Souter, M. A., & Miller, M. D. (2007). Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoös*, 20(2), 167-180.
- Spielberger, C. D., Gorsuch, R. I., & Lushene, R. E. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, Ca: Consulting Psychologists Press.
- Stokke, K., & Paulsen Rye, S. K. (2007). Inn på tunet. Nasjonal og regional organisering. Gårdbrukerens økonomi og erfaringer (pp. 50). Oslo: Norsk institutt for landbruksøkonomisk forskning.
- Tower, R. B., & Nokota, M. (2006). Pet companionship and depression: results from a United States Internet sample. *Anthrozoös*, 19(1), 50-64.
- von Knorring, L., Akerblad, A. C., Bengtsson, F., Carlsson, A., & Ekselius, L. (2006). Cost of depression: effect of adherence and treatment response. *European Psychiatry*, 21(6), 349-354.
- Wells, D. L. (2009). The Effects of Animals on Human Health and Well-Being. [Review]. *Journal of Social Issues*, 65(3), 523-543.
- Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C., & Murray, C. J. (2004). Global burden of depressive disorders in the year 2000. *The British journal of psychiatry*, 184, 386-392.

Zimolag, U., & Krupa, T. (2009). Pet Ownership as a Meaningful Community Occupation for People With Serious Mental Illness. *American Journal of Occupational Therapy*, 63(2), 126-137.

TABLE 1: The Various Behavioral Categories and their Definition.

Activity	Definition
Milking	All work tasks connected directly to the milking procedure
Feeding	All work tasks connected directly to feeding, including cleaning the feed bunk
Fetching feed	Fetching all kind of feed, including milk to calves
Cleaning	Cleaning all kinds of equipment and washing the milking parlor
Moving animals	Moving animals within the barn, or from the pasture to the barn
Milk-feeding calves	All work tasks directly connected to milk-feeding calves
Hand-feeding animals	Offering feed to animals from the hand
Technical preparation before milking	All work tasks connected to technical preparation before milking
Grooming animals	Brush and clean the coat of the animals with a suitable equipment
Mucking	Remove manure and other dirt from the tie-stall or free range area, also litter the animals
Physical contact with animals	Patting, stroking and all kinds of physical contact which is not work related
Observing animals	Attention towards animals but without physical contact
Inactivity	No work activity and no attention directed towards animals
Other activity	All other behaviors, also walking between work tasks in different barns
Dialog with the farmer	All vocalization directed towards and from farmer, including instructions received and small talk
Talking to animals	Vocalization from the participant directed towards an animal

TABLE 2: Percentage of Time Spent with Various Work Tasks and Animal and Human Contact in the Cow Shed Early and Late in the Intervention Period (n=14), and the Average Between them; Mean and (SE).

Activity	% Early	% Late	% Average
Milking	13.6 (4.16)	17.4 (4.48)	15.5 (4.09)
Feeding	6.9 (1.84)	7.3 (1.64)	7.1 (1.45)
Mucking	11.6 (2.71)	10.4 (3.45)	11.0 (2.80)
Fetching feed	5.1 (1.23)	7.5 (2.78)	6.3 (1.60)
Cleaning	3.7 (1.00)	5.1 (1.07)	4.4 (0.93)
Grooming animals	2.7 (2.56)	4.4 (3.04)	3.5 (2.03)
Moving animals	5.3 (1.82)	7.1 (1.91)	6.2 (1.76)
Technical preparation before milking	1.7 (0.84)	0.3 (0.15)	1.5(0.80)
Hand-feeding animals	0.1 (0.05)	0.3 (0.18)	0.2 (0.18)
Milk-feeding calves	2.7 (0.98)	2.3 (0.63)	2.5 (0.67)
Other activity	14.2 (3.00)	13.1 (2.59)	13.7 (2.39)
Work in total	67.4 (7.32)	75.1 (6,22)	71.3(6.64)
Dialog with farmer	29.1 (6.20)	19.0 (2.73)	24.0 (3.43)
Inactivity	15.5 (4.88)	11.9 (3.72)	13.7 (4.08)
Physical contact with animals	7.2 (1.70)	6.9 (2,70)	7.0 (1.89)
Talking to animals	2.5 (0.85)	2.5 (0.93)	2.5 (0.83)
Observing animals	9.9 (2.62)	6.0 (1.87)	8.0 (2.03)

TABLE 3: Measures of Depression (BDI-IA), State Anxiety (STAI-SS) and Generalized Self-Efficacy (GSE) at Recruitment, at Start and at the End of the Intervention Period (n=14); Mean and Standard Error (SE).

	Recruitment	Start	End
BDI-IA	28.7 (2.3)	25.9 (2.8)	19.1 (3.9)
STAI-SS	54.4 (3.0)	55.3 (2.7)	49.6 (4.1)
GSE	22.6 (1.5)	22.3 (1.6)	25.6 (2.1)

TABLE 4: Correlations Between Average Time Spent in Merged Behavioral Categories and Changes in Depression (BDI-IA), State Anxiety (STAI-SS) and Generalized Self-Efficacy (GSE).

	BDI-IA	STAI-SS	GSE
Behavior			
All milking procedures	-0.62*	-0.67*	0.48
All behaviors connected to feeding	-0.41	-0.35	0.05
Mucking	0.34	0.16	-0.64 *
Cleaning	-0.42	-0.44	0.14
Moving animals	-0.58*	-0.66*	0.38
Grooming	0.43	0.63*	-0.13
Dialog with farmer	-0.36	-0.53*	0.23
Inactivity	0.14	0.26	-0.03
Animal contact	0.50	0.44	-0.21

* Spearman's rho correlation shows a significant association between the variables ($p \leq 0.05$)

Paper III

Running head: Animal-assisted interventions in depression

Important elements in farm animal-assisted interventions for persons with clinical depression - a qualitative interview study

Ingeborg Pedersen

Norwegian University of Life Sciences, Department of Animal and Aquacultural Sciences
Research group of nature, health and quality of life, Ås, Norway

Camilla Ihlebæk

Norwegian University of Life Sciences, Department of Animal and Aquacultural Sciences
Research group of nature, health and quality of life, Ås, Norway
Research group of stress, health and rehabilitation, Uni health, Uni Research, Bergen,
Norway

Marit Kirkevold

University of Oslo, Institute of Health and Society, Department of Nursing Science, Norway
University of Aarhus, Institute of Public Health, Department of Nursing Science, Denmark

Abstract

Purpose. The main aim of this study was to obtain participants' own experience of a farm animal-assisted intervention, and what they perceived as important elements in relation to their mental health.

Method. A qualitative study, inspired by a phenomenological-hermeneutical perspective was conducted. Eight persons with clinical depression who had completed a 12-week farm animal-assisted intervention at a dairy farm participated in thematic interviews between May and June 2009.

Results. The intervention was regarded as a positive experience for the participants. The analyses revealed that central elements in the intervention were the possibility to experience an ordinary work life, but also the importance of a distraction to their illness. Furthermore, the intervention's flexibility made it possible to adjust the intervention to the participants' shifting reality and was thereby a key element in farm animal-assisted intervention. The flexibility and adapted work tasks were important elements that the participants associated with their experience of coping. A model showing the interaction between the different elements reported as important by the participants was constructed.

Conclusions. Our study shows that a farm animal-assisted intervention could be a supplement in mental health rehabilitation. All the elements in our model could possibly influence positively on mental health.

Keywords: mental health, rehabilitation, farm animal-assisted intervention, green care

Introduction

Lifetime prevalence of clinical depression in six European countries is calculated to 12.8 % [1], for Norway the numbers are between 8 to 18 % [2,3]. A WHO survey concluded that depression leads to poorer health than several chronic diseases [4], and is estimated to be the fourth leading cause of disease burden worldwide [5]. For millions of people suffering from depression the illness causes decreased quality of life and impairment, thereby representing a major cause for sick leave and work disability [6]. A wide range of treatments, therapeutic interventions and health care pathways is needed to counteract the comprehensive impact of depression.

In Europe a new complementary intervention has developed within the agricultural sector in the last decades. Different expressions like Green care, Care farming or Social farming all include a variety of work-related activities offered at ordinary farms. All parts of the farm are utilized, creating a diversity of interventions. The common basis is the use of nature and the natural environment to improve or promote health and wellbeing [7]. Farm animals are an important part of the Green care milieu at most farms, and a farm animal-assisted intervention could be described an intervention where the participants work and contact with farm animals are in focus. Today approximately 650 farms in Norway offer a Green care service [8], and similar figures are seen in several other European countries [9].

A study from England showed a significant increase in self-esteem and mood (including decrease in depression) for participants within Care farming [10], and a Norwegian study shows that nature-based interventions at farms could be effective for depression [11,12]. The results of a focus group study from Green care farms in The Netherlands [13] indicate that an increase in self-confidence due to a feeling of being useful, and the social setting were the most important aspects for participants with mental health issues. Similar findings were seen in a Norwegian interview study [14], where the farmer's

commitment and conduct were emphasized as important together with the social setting at the farm.

A new interest for animals' possible beneficial effects on human health has developed the last decades. Reviews and meta-analysis has revealed a positive result of animal-assisted interventions with pets on human health in general [15], and for depression in particular [16]. In contrast to animal-assisted interventions with pets, there are a limited number of studies related to farm animals, and the possible effect on mental health issues. A randomized controlled study including persons with different mental illnesses working with farm animals reported a significant decline in state anxiety and an increase in self-efficacy in the intervention group compared with the control group six months after the intervention [17,18]. The authors [19] also showed that among persons with affective disorders, increases in intensity and exactness in performed work tasks were significantly correlated to increase in self-efficacy and a decrease in state anxiety.

Several mechanisms may explain the possible beneficial effects of farm animal-assisted interventions on participants with depression. Ulrich [20] has emphasized the relationship between nature, reduced stress and health, and Green care and farm animal contact could very well fit into this theoretical framework. Firstly, several studies have described a decline in levels of stress hormones (cortisol, adrenalin and noradrenalin) when people interact and have physical contact with pet animals [21-23]. At the same time, the beneficial substance oxytocin is reported to increase in humans when interacting with pet animals [24,25]. Secondly, Green care and farm animals could very well act as an arena for coping experiences and enhanced self-efficacy. The latter is described as a person's belief that one can successfully achieve the desired outcome [26]. According to this theory several sources are basis for a persons' belief in own efficacy. Both information from a persons' milieu and own cognitions and physiological state act as sources for self-efficacy belief.

However, the most influential source to improved self-efficacy is a when a person complete a task or cope in a situation. A low generalized self-efficacy is correlated with both depression and anxiety [27], and a study showed that high self-efficacy at baseline predicted less depression at follow up [28]. Also social support is recognized as a buffer against stress and as an important part of mental health interventions [29], and is seen to be negatively correlated with depression [30]. In a farm animal-assisted intervention it could be expected that both the farmer and the farm animals may offer an experience of social support.

No qualitative study has to our knowledge focused particularly on farm animals within Green care. This focus is interesting both due to the possibility to make comparisons with animal-assisted interventions with companion animals, and to clarify farm animals' function. It may also contribute to create a connection between perceived benefits and possible mechanisms involved.

Aim

The aim of this study was to obtain the participants' own experiences of a farm animal-assisted intervention, and what they perceived as important elements in relation to their mental health.

Material and method

Participants

A purposive sample of ten persons who had completed a farm animal-assisted intervention on dairy farms in 2008 or 2009 was recruited through letter of invitation. Inclusion criteria for the intervention was clinical depression, confirmed by a Mini International Neuropsychiatric Interview [31] and/or a Beck Depression Inventory score of minimum 14 [32]. Two

participants did not want to attend the study, but seven women and one man between 25 and 54 year of age accepted the invitation. They were all full or part-time out of work, on sick leave, in rehabilitation or on disability pension. A first visit was used by the participants to get familiar with the farm and the farmer. When they returned the next time the participants worked together with the farmer, performing on their own choice ordinary work tasks in the cowshed, like grooming, mucking, feeding, taking care of the calves and milking. They could also choose to spend their time in physical contact with the farm animals. The intervention lasted for twelve weeks and the participants attended the farm twice a week. Six farms in five counties in Norway were recruited, all located close to towns. Both female (3) and male farmers (3) had the main responsibility for the participants. The range of dairy cows at the farm was from 14 to 60; all farms also had companion animals like horses, cats, dogs or rabbits.

Design and data collection

A qualitative study, inspired by a phenomenological-hermeneutical perspective was conducted based on individual thematic interviews. The qualitative data was obtained by accomplishing individual thematic interviews that were audio taped. The interviews, lasting between 16 and 51 min, were conducted by the first author and all the participants were interviewed in their homes in the period between May 2009 and July 2009. It was then from 14 to 0 months since the intervention ended. The interview guide was developed on the basis of earlier qualitative research within this area, the theoretical frameworks developed within animal-assisted interventions with companion animals, and earlier informal conversations between the first author and the participants. The interview questions addressed relevant themes connected to the participants' experiences with farm animal-assisted intervention, like their relationship to the farmer, the different work tasks, and the animal contact. But it was

emphasized from the start of the interview that this were only examples and that any other themes they wanted to bring forth were welcome.

Ethical considerations

The research protocol, the interview guide, the information letter and the data handling procedures were approved by the Regional Committee for Medical Research Ethics and the Privacy Ombudsman for Research. All participants gave a written consent prior to the interview.

Data analysis

The transcripts were analyzed according to a modified version of systematic text condensation by Malterud [33,34]. All the authors read the transcripts independently and participated in the text analysis. Each participant was given a number during the analysis process thereby assuring anonymity. First all the interviews were read by the authors to get a general sense of the entire data material and to get an overall impression of the content related to the study aim. Then the interviews were reread by the authors who independently identified units of meaning that represented the participants' experiences with the intervention. Different subthemes related to this experience were identified by the authors, and together they discussed and decided which units of meaning belonged to each subtheme. During this process four main themes emerged from the text and were labelled 'Being sick', 'Ordinary life', 'Flexibility', and 'Coping', and the different subthemes were assembled into these themes. During this final step in the analytic process we looked for relationships or connections between the four main themes and their subordinate subthemes, and a model was created to visualize these. Throughout the analysis, we returned to the interview texts to check that the evolving themes and subthemes reflected the meanings conveyed. Quotes from

the interviews used in the results were translated from Norwegian to English by the first author, and reviewed by the two others. The participants' number in the study is added in brackets at the end of each quote.

Rigour

At the end of each interview a verbal summary was done to ensure a common understanding and to help the participant to recall any forgotten aspects. There were no new themes or topics emerging from the interviews as the eighth interview took place, and saturation of the topics seemed to be achieved. The units of meaning in the text were independently identified by the authors to ensure openness and prevent premature closure with regard to themes and subthemes to pursue. After this first stage, the text analysis and the interpretation were done in a group setting to avoid one author's personal view to unduly affect the result.

Results

The overall impression was that the intervention was regarded as a positive experience for the participants and three of them considered the intervention to be the turning point for a process towards recovery from depression. The participants generally felt very welcome during their stay at the farm, and they especially expressed that they felt their personal (illness) situation were understood and taken into account. How much the participants took part in the work tasks varied somewhat between them and during the intervention. Some of the participants initially felt insecure with regard to having contact with such big animals. However, during the intervention this changed, and all participants expressed that the contact with the animals had been a positive experience. All the participants had mental health issues that influenced their everyday life, with fluctuating good and bad periods. This influenced their participation in, and their experience of the intervention. The two themes, 'Ordinary life' and 'Being sick',

represent this experience. The two remaining themes 'Flexibility' and 'Coping' were described as general qualities of the intervention by the participants. In the following sections, the themes are further described.

Ordinary life

A majority of the participants expressed that it was very important that the intervention gave them a possibility to experience an ordinary life. To be considered as an ordinary co-worker gave them a contrast to their illness, which they appreciated, and the experience of being useful was important and very positive. The different elements concerning 'Ordinary life' consisted of the subthemes ordinary work, being appreciated, and being a colleague.

Ordinary work

The participants expressed that it was important and positive that the farm work was experienced as an ordinary work setting. This included having an appointment, getting out of the house and being active. This was also related to the fact that they felt they accomplished something useful and that their illness was somehow not relevant and not in focus:

"It is an ordinary setting, and you get this...you experience yourself as a person again, you feel like a human being again". (7)

Almost all the participants expressed the experience of being useful as an important quality of the intervention. It was expressed in general terms but also very often linked to work tasks related to the animals or to the farmer. One participant said:

” I think it is nice to do some work during the day, and I can very much do so at the farm. It is nice, doing something useful for someone. Because you do, feeding the animals for example”. (7)

A majority of the participants mentioned the possibility to get out of the house and being active as a positive part of the intervention. The benefits included meeting people, being tired after job, having the opportunity of being away and having an important incitement to get out of their own home. As one said in the interview:

“Just to get out of the house, because the first step is always the hardest”. (2)

And another done said:

” In addition to being mentally tired, to be physically tired is much better; you may sleep better and such stuff”. (8)

Being appreciated

One of the topics mentioned most frequently by the participants was the feeling of being appreciated. They emphasized that this was both due to the farm animals and the farmer. This feeling was connected to the impression of being needed; the animals needed care and the farmer needed help. This was expressed clearly by the farmer, but the participants also interpreted this from the animals' behaviour. As one said:

“The animals showed it of course, because they call out when you enter the cowshed and....you can see they appreciate the forage”. (4)

Several of the participants also experienced appreciation, not only when feeding and caring for the animals. The opportunity to care and interact with the cows enhanced the feeling of doing something good for other living creatures who appreciated it:

“They showed me that they appreciated it, when I stroked and brushed them”. (4)

With regard to the farmer the appreciation was expressed openly or was interpreted by the participant, as one said:

“And he seemed very grateful for the help he got”. (3)

Another one said:

” They said that I helped them a lot, because when we were two milking we could share the work between us”. (5)

Being a colleague

The participants perceived themselves as a part of the workforce at the farm, feeling included and respected as an ordinary worker. Conversations did not focus on treatment or illness, but concentrated on the work tasks and everyday life at the farm. This was regarded as a different and valuable experience by the participants, and they appreciated the feeling of being a colleague and not a client, as one participant said:

“We did not talk about illnesses or anything like that; we talked about all sorts of things”. (3)

This was also reflected in the participation in and distribution of work tasks that the participants took part in and one participant said:

“I worked together with him, we took one half each”. (8)

Another one said:

“The farmer said it was so easy to work together with me, because I understood what to do, and then I did it. So we worked very well together”. (5)

Being sick

Even though it was important for the participants to experience and participate in ‘Ordinary life’, it was equally important that their condition and situation was understood by the farmer as a factor that should be considered. In addition, another important topic related to ‘Being sick’ was the experience that the intervention served as a distraction from their illness, and created some distance to their problems. This was expressed in different manners during the interviews, and was condensed into four subthemes.

Considerate relations

The possibility to be open about their condition was expressed as important by several of the participants. They felt the farmer understood their situation and that they could easily express how they felt. The farmer was also sensitive with regard to the participant’s daily status. As a result a close relationship developed, as one participant said:

“I felt I could tell him and talk with him about....almost everything, actually”. (8)

And another one said:

“So we became very close. And I could always tell her if something were wrong or stupid or sad”. (7)

Closeness, warmth and calmness

All the participants did in different manners express the importance of physical contact with the animals. These contacts was achieved through cuddling, stroking, calves sucking on their fingers, or just sit or stand close to animals. The positive element was expressed both due to the warmth from the animals, a sense of closeness, and their affection. As one participant said:

*“First I went to the calf barn and cuddled with the calves, and then my mood was elevated”,
.....when I am dejected I do feel lonely, totally alone in the world. And this is perhaps
what changes when I am with the calves, because I give them love and in return I get
closeness”. (5)*

Another participant said:

*“If I have a bad day, so....the cows are there. It is always possible to get a little hug or
.....just such small things”. (7)*

Contact with the animals also made a majority of the participants feel calmer. This was related directly to physical contact, but also to a peaceful feeling connected to being among the cows and to perform work tasks with them. One participant said:

“It is a special tranquillity when you are in the milk parlor milking; it is.....a sort of harmony”. (7)

Another one said:

“With big animals, to be in, I could say sort of in their sphere, it provides calmness”. (6)

And one said:

“Because you feel very safe and calm, when you look after and have contact with animals”. (1)

Forget my difficulties

The farm work distracted some of the participants from their daily worries and tiresome rumination. It could also act as a distraction beforehand, because the participant could look forward and make plans for their stay at the farm every week. For some it also gave an opportunity to forget physical pain, as one participant said:

” when I am at the farm, it doesn’t hurt, it doesn’t matter.....aches, they a sort of, vanish,.....When I’m in the barn, I doesn’t think, I just am. So...I don’t think on all the negative stuff...that were there before, it just disappears”. (7)

Another participant said:

“I have become more attentive and aware. It must be connected to the possibility to fill my day with something different from the “internal” work”. (5)

Kept me going

The participants considered the intervention to help them through their difficulties both due to a sense of being strengthened by getting more energy, and as a help to endure hard periods.

One participant said:

“I got sort of stronger; I....You see, my mood improved, and the days became lightened”. (4)

Another participant said:

“It has been very important in enduring days” (7)

As earlier described, most of the participants appreciated the feeling of being tired after participating in physical activities and work. However, several participants emphasized that the work and especially the work with the animals also gave them energy. In their previous jobs they may have felt that they were drained of energy (resources) during a work day, whereas working with the animals had the opposite effect:

“I felt that I got tired, but it offered me more than I had given, if you understand”. (5)

And one said:

“My energy level was much higher after a day at the farm, compared to days when I wasn’t there”. (8)

Flexibility

The possibility to adjust their work due to their daily condition was emphasized as important by most of the participants. This was done both by alternating between work tasks, and by the opportunity to adjust the total work load. Equally essential was the adapted instruction given during the training process. These adjustments were covered by a whole range of actions carried out by the farmer. One example is how the participants already from the start felt the farmer understood their situation. They felt no pressure during the intervention regarding how fast they completed the work, and it was easy for the participants to ask for help and advice.

In the interview one said:

“It was very clear from the beginning that you do what you want, and manage and are able to. You don’t need to do anything else.” (4)

Although this feeling of suitable demands was explained in regard to the farmer, the farm animals did also play an important part. This was especially emphasized concerning expectations, demands and judgments. The cows and the calves accepted hesitation and insecurity, they accepted the participants’ fluctuating mood and condition, and regardless of how they performed the animals appreciated their effort. In the interview one said:

“You can still have a bad day when you are in contact with animals, because the cows don’t care if you are in a bad mood or if you haven’t put your make up on. So you knew you could go anyway”. (4)

Another participant claimed:

“It’s not demanding, the animals never judge you. They just appreciate what they get”, (6)

This flexibility made the participants able to alternate between ‘Being sick’ and experiencing ‘Ordinary life’, not only from day to day, but also during one session. In addition, there was a possibility to vary between contacts with animals, performing work tasks, and interacting and communicating with the farmer. The flexibility was also the basis for the last theme emerging from the results, ‘Coping’.

Coping

A majority of the participants experienced coping as a central aspect at the farm. This was mainly connected to be able to accomplish work tasks, which also led to a diversity of other positive experiences described as self-confidence, independence, achieving goals and learning new skills. The participants felt they were given tasks they could manage, and this gave a positive feeling of accomplishment:

“It was the work tasks, to care for the calves alone, and manage,all the time it was this experience of coping that builds up. It affects you”. (8)

Another one said:

“My self-confidence has increased after I started at the farm, because I understand that I manage things. I have been allowed to do a lot of things, and I felt I could manage them”. (7)

But the coping experience was not only due to work, it was also seen in completely different matters, like in relation to managing to show up every time or in relation to getting control of the herd. As one participant said:

“I have had problems with self-assertion.....so then I started to fetch the cow herd alone. I had to be firm with them, and then they listened to me”. (5)

Figure I illustrates the relationship between the four main themes. In the figure, the subthemes related to ‘Being sick’ and ‘Ordinary life’ are placed according to whether they were identified by the participants as a contrast to their illness or as consideration, comfort and distraction from their illness. The themes ‘Flexibility’ and ‘Coping’ are described more as general qualities of the intervention by the participants. ‘Flexibility’ made it possible for the participants to alternate between being sick and an ordinary life, not only from day to day, but also during one session. In the model, ‘Flexibility’ also has a horizontal direction, making it possible to vary between contacts with animals, performing work tasks, and interact and communicate with the farmer. As delineated above, ‘Flexibility’ was the basis for ‘Coping’. The experience of coping could occur at all “levels” in the intervention, from managing to show up at the farm, to an experience of being an ordinary worker in an ordinary work setting. As for ‘Flexibility’, ‘Coping’ also has a horizontal direction; the participants experienced coping in all the three areas, work tasks, contact with animals and with other

people. The interview guide was originally structured into the different elements which the intervention could possibly consist of. As these elements were all confirmed by the participants to be essential aspects of the intervention, this division is kept in the model, creating three vertical two headed arrows; personal relationship, performing work tasks, and animal contact.

Insert figure 1 here

Discussion

Study limitations

The participants were part of a selected group, who all had completed the intervention. This could of course create a bias regarding positive experiences, and affect the results towards more positive attitudes to such an intervention. Also the authors' preliminary understanding of important elements in the intervention could create a bias in the result, although this was limited through the authors' different closeness and experiences with animal-assisted intervention and different disciplinary perspectives. Due to the gender bias in the sample and the research setting being close to cities a transfer of our results to a general population of persons with a depression diagnosis should be done with caution.

Discussion of results

One of the themes in our results is ‘Ordinary life’, and the possibility to be in an ordinary work setting is also emphasized as important by other authors. Liberman [35] list a whole range of positive implications of activities in an ordinary work context for persons with mental illnesses. It provides purpose and function in daily life, possibility to interact with co-workers, self-esteem, empowerment and hope. Daily occupation is connected to themes like meaningful occupation and to be able to manage [36], and in another study the participants described many positive factors in a work situation contributing to a recovery from their mental illness. Work has personal meaning, they felt needed and appreciated, and it was a source to enhanced self-esteem [37]. Statements about being useful and appreciated were frequently mentioned in our study, and also other studies have shown ordinary work and the opportunity to feel useful as important within Green care [13,38]. The possibility to perform meaningful tasks and thereby increase the experience of one’s personal value is essential in difficult life situations, and the author [39] emphasizes that coping experiences within Green care lead to personal empowerment. Contact between co-workers is described as an important element in these examples, and in our study the farmer is considered both an ordinary co-worker and a considerate relationship. Also other studies have found the farmer to be an important aspect within Green care [13,14], and describes the relationship to the farmer as a therapeutic ‘tool’ [40].

In a study daily activities and social contact are described as important needs for persons with severe mental illness [41], and distraction from illness, support and understanding were important themes during work rehabilitation [42]. The main theme ‘Being sick’ includes some of these important but more unspecific benefits of the intervention described as distraction and distance. Inactivity, withdrawal and behavioural avoidance are common consequences of depression, and the intervention could counteract

this. Being active and engaging in physical work were reported positive by the participants, and physical activity is found to be beneficial in depression [43]. Behavioural activation act as positive reinforcement and training of social skills [44,45] and engagement in pleasant activities could alleviate depression [46-48]. Having an appointment was emphasized by participants and absorption in activities could protect against rumination and disturbing thoughts and lead to less depressive symptoms [49,50].

The participants in our study contributed in an ordinary work setting on their own premises, which was made possible by the flexibility of the intervention. Meeting each participant's individual needs is a fundamental pillar in mental health rehabilitation [35], and flexibility made it possible to adjust the intervention to the participants' shifting reality between ordinary life and being sick. The flexibility also protected the participants against the experience of failure, and thereby gave them a continuing opportunity to experience coping. Within mental health coping experiences are essential because the participants could have a great deal of ambivalent thoughts and negative expectations about a positive change in their illness.

Even though many positive experiences are described, dealing with stressful situations is an issue in mental health rehabilitation and vocational activities for persons with mental illnesses [51-54]. This was not mentioned as a problem at all by the participants in our study. The interventions' flexibility could create this stress free milieu, but also a calming effect of animal contact should be considered. In many studies with stress inducing tasks a possible calming effect of companion animals were investigated [23,25,55-62]. Decline in heart rate, blood pressure and hormones connected to stress (cortisol, adrenalin, and noradrenalin) were seen in several of these studies. And also an increase in oxytocin, which has been found to be released as a result of positive social interactions, including touch and warmth [63]. Calmness, warmth and closeness were some of the descriptions the participants

in our study provided about animal contact, and it is possible that physiological changes could be part of the reason for this perception. The positive contribution to the participants' mental state could be important in a process leading to a decrease in depressive symptoms. This should be further studied.

The results from our study revealed a connection to several mechanisms possibly involved in farm animal-assisted interventions. Coping experience was seen as a central factor, probably resulting in positive changes in self-efficacy and empowerment. Social support could easily be the background for several of the subthemes in our study. An essential element of the experience of the intervention as ordinary work was the appraisal and informational support from the farmer and the subtheme 'considerate relation' describes emotional support with concern, listening and trust. The participants could also interpret close animal contact as social support as seen within companion animal research [64,65]. A link to companion animal research should also be considered from the subtheme 'closeness, warmth and calmness', which may have a physiological explanation.

Conclusions

Our study shows that a farm animal-assisted intervention within Green care could be a supplementary intervention in mental health care and rehabilitation. The mechanisms involved may explain why our study provided a stress free milieu for the participants and thereby a possibility to recover from depression. Our results show that farm animals should be considered an important part of Green care interventions by offering closeness, warmth and calmness which is difficult to replace by other means. The farmer offers the participants both an experience of being an ordinary co-worker and a considerate relation, and the farmer's attitude and commitment should be stressed as essential when planning interventions for clients with clinical depression. The experiences related to 'Ordinary life' underscore the

importance of preparing interventions which create a realistic working community with ordinary work tasks. Such interventions is feasible to implement since a variety of realistic but flexible work tasks already exist in small scale farms providing possibilities of continuing coping experiences. Planning and implementing this kind of intervention involves different occupational groups and our model could be a useful tool by facilitating a common understanding in an interdisciplinary field.

Acknowledgements

We thank the farmers who facilitated the intervention, participants in the project for their cooperation and Silje Liastøl for her work with transcribing the audiotapes.

Declaration of interest

The study was funded by grant nr. 173302/I10 from the Research Council of Norway. The authors report no conflicts of interest.

References

1. Alonso J, Angermeyer MC, Bernert S, Bruffaerts R, Brugha TS, Bryson H, de Girolamo G, Graaf R, Demyttenaere K, Gasquet I and others. Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta psychiatrica Scandinavica* 2004;Supplementum(420):21-27.
2. Kringlen E, Torgersen S, Cramer V. A Norwegian psychiatric epidemiological study. *The American journal of psychiatry* 2001;158(7):1091-8.
3. Kringlen E, Torgersen S, Cramer V. Mental illness in a rural area: a Norwegian psychiatric epidemiological study. *Social psychiatry and psychiatric epidemiology* 2006;41(9):713-719.
4. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet* 2007;370(9590):851-858.
5. Üstün TB, Ayuso-Mateos JL, Chatterji S, Mathers C, Murray CJ. Global burden of depressive disorders in the year 2000. *The British journal of psychiatry* 2004;184:386-392.
6. Paykel ES, Brugha T, Fryers T. Size and burden of depressive disorders in Europe. *Eur Neuropsychopharmacol* 2005;15(4):411-23.

7. Sempik J, Hine R, Wilcox D, editors. Green Care: A conceptual Framework. A Report of the Working Group on the Health Benefits of Green Care. COST 866, Green Care in Agriculture: Loughborough University; 2010.
8. Stokke K, Paulsen Rye SK. Inn på tunet. Nasjonal og regional organisering. Gårdbrukerens økonomi og erfaringer. Oslo: Norsk institutt for landbruksøkonomisk forskning; 2007. 50 p.
9. Hassink J, van Dijk M, editors. Farming for health. Green-Care Farming Across Europe and the United States of America. Volume 13. Dordrecht: Springer; 2006.
10. Hine R, Peacock J, Pretty J. Care Farming in the UK: Contexts, Benefits and Links with Therapeutic Communities. *International journal of therapeutic communities* 2008;29(3):245-260.
11. Gonzalez MT, Hartig T, Patil GG, Martinsen EW, Kirkevold M. Therapeutic horticulture in clinical depression: a prospective study of active components. *Journal of Advanced Nursing* 2010;66(9):2002-2013.
12. Gonzalez MT, Hartig T, Patil GG, Martinsen EW, Kirkevold M. Therapeutic horticulture in clinical depression: a prospective study. *Research and theory for nursing practice* 2009;23(4):312-328.
13. Elings M, Hassink J. Green Care Farms, A Safe Community Between Illness or Addiction and the Wider Society. *International journal of therapeutic communities* 2008;29(3):310-322.
14. Bjørgen D, Johansen KJ. Bruker spør bruker, evaluering av Inn på tunet. Brukerevaluering av tilbud til mennesker med psykiske vansker i tre kommuner i Sør-Trøndelag. *Mental helse i Sør-Trøndelag. Prosjektrapport I/2007*; 2007.
15. Nimer J, Lundahl B. Animal-assisted therapy: A meta-analysis. *Anthrozoös* 2007;20(3):225-238.
16. Souter MA, Miller MD. Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoös* 2007;20(2):167-180.
17. Berget B, Ekeberg O, Braastad BO. Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on self-efficacy, coping ability and quality of life, a randomized controlled trial. *Clinical practice and epidemiology in mental health* 2008;4.
18. Berget B, Ekeberg Ø, Pedersen I, Braastad BO. Animal-assisted therapy with farm animals for persons with psychiatric disorders: effects on anxiety and depression. A randomized controlled trial. *Occupational Therapy in Mental Health* 2011;27(2):50-64.
19. Berget B, Skarsaune I, Ekeberg Ø, Braastad BO. Humans with Mental Disorders Working with Farm Animals: A Behavioral Study. *Occupational Therapy in Mental Health* 2007;23(2):101-117.
20. Ulrich RS. Biophilia, Biophobia and natural landscapes. In: Kellert SR, Wilson EO, editors. *The Biophilia hypothesis*. Washington, D.C.: Island Press; 1993. p 73-137.
21. Barker SB, Knisely JS, McCain NL, Best AL. Measuring stress and immune response in healthcare professionals following interaction with a therapy dog: a pilot study. *Psychological Reports* 2005;98:713-729.
22. Cole KM, Gawlinski A, Steers N, Kotlerman J. Animal-assisted therapy in patients hospitalized with heart failure. *American Journal of Critical Care* 2007;16(6):575-585.
23. Odendaal JSJ. Animal-assisted therapy - magic or medicine? *Journal of Psychosomatic Research* 2000;49(4):275-280.

24. Miller SC, Kennedy C, Devoe D, Hickey M, Nelson T, Kogan L. An Examination of Changes in Oxytocin Levels in Men and Women Before and After Interaction with a Bonded Dog. *Anthrozoös* 2009;22(1):31-42.
25. Odendaal JS, Meintjes RA. Neurophysiological correlates of affiliative behaviour between humans and dogs. *Veterinary journal* 2003;165(3):296-301.
26. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychological review* 1977;84(2):191-215.
27. Schwarzer R. Measurement of perceived self-efficacy. Psychometric scales for cross-cultural research. Berlin: Freien Universität; 1993.
28. Maciejewski PK, Prigerson HG, Mazure CM. Self-efficacy as a mediator between stressful life events and depressive symptoms. Differences based on history of prior depression. *The British journal of psychiatry* 2000;176:373-378.
29. Milne DL. *Social Therapy: A Guide to Social Support Interventions for Mental Health Practitioners*. Chichester: John Wiley; 1999. 267 p.
30. Dalgard OS, Dowrick C, Lehtinen V, Vazquez-Barquero JL, Casey P, Wilkinson G, Ayuso-Mateos JL, Page H, Dunn G. Negative life events, social support and gender difference in depression - A multinational community survey with data from the ODIN study. *Social Psychiatry and Psychiatric Epidemiology* 2006;41(6):444-451.
31. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiler E. The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Norwegian version. *Journal of Clinical Psychiatry* 1998;59 (Suppl.):22-33.
32. Beck AT, Steer RA. *Manual for the Beck Depression Inventory*. San Antonio, TX: The Psychological Corporation; 1987.
33. Malterud K. Qualitative research: standards, challenges, and guidelines. *Lancet* 2001;358(9280):483-488.
34. Malterud K. *Kvalitative metoder i medisinsk forskning - en innføring*. Oslo: Universitetsforlaget; 2003. 240 p.
35. Liberman RP. *Recovery from disability: manual of psychiatric rehabilitation*. Washington, D.C.: American Psychiatric Publ.; 2008. 588 p.
36. Sundsteigen B, Eklund K, Dahlin-Ivanoff S. Patients' experience of groups in outpatient mental health services and its significance for daily occupations. *Scandinavian Journal of Occupational Therapy* 2009;16(3):172-80.
37. Dunn EC, Wewiorski NJ, Rogers ES. The meaning and importance of employment to people in recovery from serious mental illness: results of a qualitative study. *Psychiatric rehabilitation journal* 2008;32(1):59-62.
38. Ketelaars D, Baars E, Kroon H. *Healing through working. A study of Therapeutic Communities for persons with Psychiatric Problems*. New York, USA: Mercury Press; 2001. 206 p.
39. Rappe E. Green Care in the framework of health promotion. In: Gallis C, editor 2007; Vienna, Austria. University Studio Press. p 269.
40. Enders-Slegers MJ. Therapeutic farming or therapy on a farm. In: Dessen J, editor. *Farming for health. Proceedings of the Community of Practice Farming for Health, 6-9 November 2007*. Ghent: Merelbeke, Belgium: ILVO; 2008. p 37-44.
41. Wiersma D. Needs of people with severe mental illness. *Acta psychiatrica Scandinavica. Supplementum* 2006(429):115-9.
42. Hillborg H, Svensson T, Danermark B. Towards a working life? Experiences in a rehabilitation process for people with psychiatric disabilities. *Scandinavian Journal of Occupational Therapy* 2010;17(2):149-161.

43. Mead GE, Morley W, Campbell P, Greig CA, McMurdo M, Lawlor DA. Exercise for depression. *Cochrane Database of Systematic Reviews* 2009.
44. Cuijpers P, van Straten A, Warmerdam L. Behavioral activation treatments of depression: A meta-analysis. *Clinical psychology review* 2007;27(3):318-326.
45. Kanter JW, Manos RC, Bove WM, Baruch DE, Busch AM, Rusch LC. What is behavioral activation?: A review of the empirical literature. *Clinical psychology review* 2010;30(6):608-620.
46. Lewinsohn PM, Graf M. Pleasant Activities and Depression. *Journal of Consulting and Clinical Psychology* 1973;41(2):261-268.
47. Bylsma LM, Taylor-Clift A, Rottenberg J. Emotional Reactivity to Daily Events in Major and Minor Depression. *Journal of Abnormal Psychology* 2011;120(1):155-167.
48. Harmon TM, Nelson RO, Hayes SC. Self-Monitoring of Mood Versus Activity by Depressed Clients. *Journal of Consulting and Clinical Psychology* 1980;48(1):30-38.
49. Ehring T, Frank S, Ehlers A. The role of rumination and reduced concreteness in the maintenance of posttraumatic stress disorder and depression following trauma. *Cognitive Therapy and Research* 2008;32(4):488-506.
50. Lo CS, Ho SM, Hollon SD. The Effects of Rumination and Depressive Symptoms on the Prediction of Negative Attributional Style Among College Students. *Cognit Ther Res* 2010;34(2):116-123.
51. Blank L, Peters J, Pickvance S, Wilford J, Macdonald E. A systematic review of the factors which predict return to work for people suffering episodes of poor mental health. *Journal of occupational rehabilitation* 2008;18(1):27-34.
52. Eriksson T, Karlstrom E, Jonsson H, Tham K. An exploratory study of the rehabilitation process of people with stress-related disorders. *Scandinavian Journal of Occupational Therapy* 2010;17(1):29-39.
53. Koletsi M, Niersman A, van Busschbach JT, Catty J, Becker T, Burns T, Fioritti A, Kalkan R, Lauber C, Rossler W and others. Working with mental health problems: clients' experiences of IPS, vocational rehabilitation and employment. *Social psychiatry and psychiatric epidemiology* 2009;44(11):961-70.
54. Rossler W. Psychiatric rehabilitation today: an overview. *World Psychiatry* 2006;5(3):151-7.
55. Allen K, Blascovich J, Mendes WB. Cardiovascular reactivity and the presence of pets, friends, and spouses: the truth about cats and dogs. *Psychosom Med* 2002;64(5):727-39.
56. Allen MK, Blascovich J, Tomaka J, Kelsey RM. Presence of human friends and pet dogs as moderators of autonomic responses to stress in women. *Journal of Personality and Social Psychology* 1991;61(4):582-589.
57. Barker SB, Knisely JS, McCain NL, Schubert CM, Pandurangi AK. Exploratory Study of StressBuffering Response Patterns from Interaction with a Therapy Dog. *Anthrozoös* 2010;23(1):79-91.
58. Demello LR. The effect of the presence of a companion-animal on physiological changes following the termination of cognitive stressors. *Psychology & Health* 1999;14(5):859-868.
59. Friedmann E, Thomas SA, Cook LK, Tsai CC, Picot SJ. A friendly dog as potential moderator of cardiovascular response to speech in older hypertensives. *Anthrozoös* 2007;20(1):51-63.
60. Kingwell BA, Lomdahl A, Anderson WP. Presence of a pet dog and human cardiovascular responses to mild mental stress. *Clinical Autonomic Research* 2001;11(5):313-317.

61. Straatman I, Hanson E, Endenburg N, Mol J. The Influence of a Dog on Male Students During a Stressor. *Anthrozoös* 1997;10(4):191-197.
62. Wilson CC. The Pet as an Anxiolytic Intervention. *Journal of Nervous and Mental Disease* 1991;179(8):482-489.
63. Uvnäs-Moberg K. Lugn och beröring. Oxytocinets läkande verkan i kroppen. Stockholm: Natur och Kultur; 2000. 216 p.
64. McNicholas J, Collis GM. Animals as Social Supports: Insights for Understanding Animal-Assisted Therapy. In: Fine A, editor. *Handbook on Animal-Assisted therapy. Theoretical foundations and guidelines for practice*. 2 ed. San Diego: Academic press, Elsevier Inc; 2006. p 49-72.
65. Zimolag U, Krupa T. Pet Ownership as a Meaningful Community Occupation for People With Serious Mental Illness. *American Journal of Occupational Therapy* 2009;63(2):126-137.

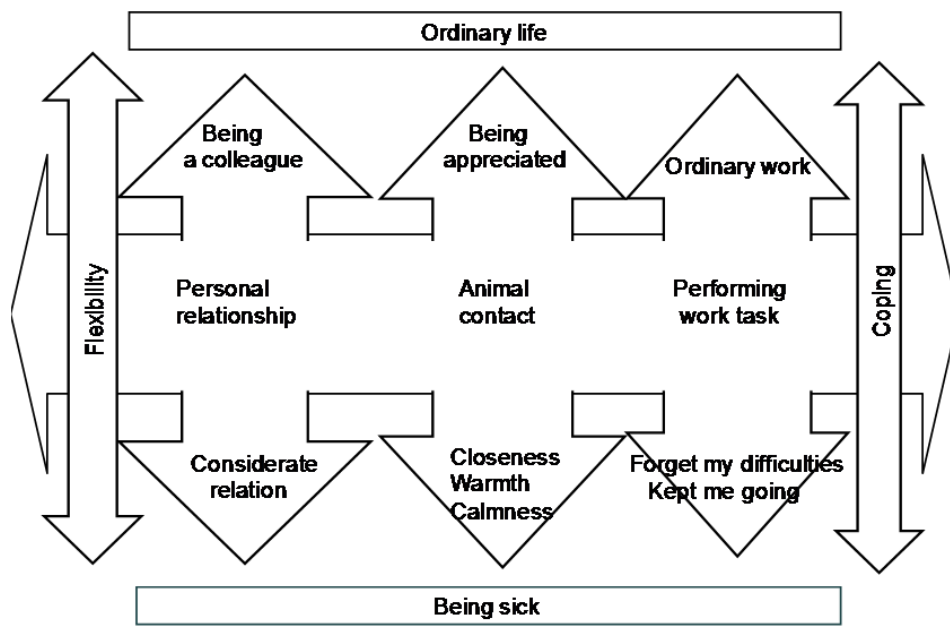


Figure 1. The four main themes as interacting elements in a farm animal-assisted intervention