



TITLE: Therapy Dogs and Horses for Mental Health: A Review of the Clinical Effectiveness

DATE: 10 August 2012

CONTEXT AND POLICY ISSUES

A multidisciplinary approach with a variety of treatment strategies is required for patients exhibiting psychiatric and medical issues.¹ Mental health issues present challenges that are not easily resolved, whether it be elderly adults with dementia, children with behavioural disorders, or patients suffering through post-traumatic stress disorder.¹⁻³ Animal-assisted therapy (AAT) is an increasingly common therapeutic intervention that has the potential to aid in the healing process in a variety of mental disorders.¹

The American Veterinary Medical Association defines animal-assisted therapy as “a goal directed intervention in which an animal meeting specific criteria is an integral part of the treatment process.”¹ AAT involves interactions between a client and a trained animal, facilitated by a human handler or therapist, with a therapeutic goal of providing relaxation or pleasure and ultimately improving physical or mental health symptoms.²

Two animals that can be used to help treat mental health challenges are dogs and horses. Dogs are the most commonly used animals to study AAT as they have the ability to develop a complex communication system with humans, are highly interactive, can be trained, and provide opportunities for physical, recreational and social activities.⁴ Horses have been used to treat physical disabilities for decades, but only more recently have they been used as psychotherapy for people with psychological issues and mental health needs.⁵ Horses are sensitive to human beings and therapy sessions may involve experiential activities such as grooming or riding.^{5,6} The mere presence of the horse at the session may open effective lines of communication between the client and therapist.⁵

The purpose of this review is to determine the clinical effectiveness of using dogs and horses as therapy for patients with mental health challenges.

Disclaimer: The Rapid Response Service is an information service for those involved in planning and providing health care in Canada. Rapid responses are based on a limited literature search and are not comprehensive, systematic reviews. The intent is to provide a list of sources and a summary of the best evidence on the topic that CADTH could identify using all reasonable efforts within the time allowed. Rapid responses should be considered along with other types of information and health care considerations. The information included in this response is not intended to replace professional medical advice, nor should it be construed as a recommendation for or against the use of a particular health technology. Readers are also cautioned that a lack of good quality evidence does not necessarily mean a lack of effectiveness particularly in the case of new and emerging health technologies, for which little information can be found, but which may in future prove to be effective. While CADTH has taken care in the preparation of the report to ensure that its contents are accurate, complete and up to date, CADTH does not make any guarantee to that effect. CADTH is not liable for any loss or damages resulting from use of the information in the report.

Copyright: This report contains CADTH copyright material. It may be copied and used for non-commercial purposes, provided that attribution is given to CADTH.

Links: This report may contain links to other information available on the websites of third parties on the Internet. CADTH does not have control over the content of such sites. Use of third party sites is governed by the owners' own terms and conditions.

RESEARCH QUESTIONS

1. What is the clinical effectiveness of therapy dogs for patients with mental health challenges?
2. What is the clinical effectiveness of therapy horses for patients with mental health challenges?

KEY MESSAGE

Dog and horse-assisted therapy is able to improve mental health function and socialization in patients with depression, trauma, schizophrenia, and dementia in the short term, but further research is needed to determine long-term effectiveness and how it compares to standard of care.

METHODS

Literature Search Strategy

A limited literature search was conducted on key resources including PubMed, PsycInfo, The Cochrane Library (2012, Issue 7), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2002 and July 16, 2012.

Selection Criteria and Methods

One reviewer screened the titles and abstracts of the retrieved publications and evaluated the full-text publications for the final article selection, according to selection criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients (of any age) with mental health conditions
Intervention	Therapy dogs Therapy horses
Comparator	Usual care, pharmaceuticals, other psychotherapy, treatment without therapy animals
Outcomes	Mental health improvement, reduction of symptoms, quality of life, improvement in social skills
Study Designs	Health technology assessment, systematic reviews, meta-analyses, randomized controlled trials (RCTs), and non-randomized studies

Exclusion Criteria

Studies were excluded if they did not meet the selection criteria, were duplicate publications or included in a selected systematic review, or were published prior to 2002.

Critical Appraisal of Individual Studies

The quality of included systematic reviews was assessed using the Assessment of Multiple Systematic Reviews (AMSTAR) tool.⁷ RCT and non-randomized study quality was evaluated using the Downs and Black instrument.⁸ A numeric score was not calculated for each study. Instead, strengths and weaknesses of each study were summarized and described.

SUMMARY OF EVIDENCE

Quantity of Research Available

The literature search yielded 492 citations. Upon screening titles and abstracts, 470 citations were excluded and 22 potentially relevant articles were retrieved for full-text review. No additional reports were identified through grey literature searching. Of the 22 potentially relevant reports, nine did not meet the inclusion criteria. Thirteen publications were included in this review. The study selection process is outlined in a PRISMA flowchart (Appendix 1). One meta-analysis, three RCTs, and nine non-randomized studies met inclusion criteria.

Summary of Study Characteristics

Details on study characteristics, critical appraisal and findings can be found in Appendices 2, 3 and 4, respectively.

Study design

One meta-analysis of data from RCTs was included in this review.⁹ Three RCTs, two of which were unblinded^{10,11} and one which was single-blinded¹² were also included. Of the nine non-randomized studies, two were cross-sectional studies,^{13,14} six were uncontrolled before-after studies,¹⁵⁻²⁰ and one was a controlled before-after study.²¹

Country of origin

The meta-analysis⁹ and one RCT¹⁰ came from the USA. The remaining two RCTs came from Taiwan¹¹ and Spain.¹² Of the non-randomized studies, two were conducted in the USA,^{14,18} two in Japan,^{19,20} two in Israel,^{13,21} and one each in Italy,¹⁷ Hungary,¹⁶ and Norway.¹⁵

Patient population

The meta-analysis included RCTs of patients with depressive symptoms.⁹ One RCT recruited participants with substance dependency seeking treatment at a facility.¹⁰ Two cross-sectional studies included patients that had experienced trauma: one study included teenage girls that had undergone physical or sexual abuse¹³, another study included children that had experienced family violence.¹⁴ Three uncontrolled before-after studies included elderly patients with dementia.¹⁸⁻²⁰ Two RCTs,^{11,12} two uncontrolled before-after studies,^{16,17} and one controlled before-after study²¹ included patients diagnosed with schizophrenia staying in a psychiatric institution or ward. One uncontrolled before-after study included male children diagnosed with attention deficit hyperactivity disorder (ADHD).¹⁵

Interventions and comparators

The meta-analysis included studies involving animal-assisted therapy or animal-assisted activities.⁹ Four studies compared therapy sessions conducted with one or more dogs to therapy sessions conducted in the absence of animals.^{10-12,21} Five studies employed dog-therapy sessions for patients with mental challenges without a control group.^{13,16,18-20} Dog-assisted therapy involved acquaintance, trust-building, training, walking, and feeding. Three studies looked at effectiveness of equine-assisted therapy.^{14,15,17} Horseback riding was employed in two of the studies,^{15,17} while one study¹⁴ did not involve horse riding and only had interactions with the horse such as grooming .

Outcomes measured

A variety of outcome measures were used to determine mental functioning in patients. Questionnaires were given to the patients to fill out or to be filled out by the investigator through interviewing the patient before and after the intervention. In the meta-analysis looking at patients with depression, depression symptoms were measured using validated self-report measures of depressive symptoms including various depression scales and inventories⁹ In the study that included participants with substance abuse issues, a Helping Alliance Questionnaire (HAQ-II) was used to measure the therapeutic bond between the participant and therapist.¹⁰ In one trauma study, questionnaires were used to determine well-being, post-traumatic stress disorder (PTSD) symptoms, and depressive symptoms.¹³ The trauma study focusing on children employed the Children's Global Assessment of Functioning (GAF) scale which measures psychological, social and school functioning for children.¹⁴ The dementia studies used the mini-mental state examination (MMSE) and a variety of mental state tests to measure mental function impairment and social interactions of the patients.¹⁸⁻²⁰ Three studies on schizophrenia used the positive and negative syndrome scale (PANSS), a commonly used tool to evaluate positive and negative symptoms, in addition to various tools to evaluate quality of life (QoL).^{12,17,21} One schizophrenia study evaluated anhedonia symptoms using the Snaith-Hamilton Pleasure Scale (SHAPS),²¹ while two studies used questionnaires to assess self-esteem, social support, psychiatric symptoms, and living skills.^{12,16} The study on children with ADHD used a strengths and difficulties questionnaire to assess behaviour.¹⁵

Summary of Critical Appraisal

The meta-analysis was based on a comprehensive literature search, but the included trials were of poor quality and employed a variety of intervention methods, making the data heterogeneous.⁹ In addition, the years that the databases were searched was not stated.

Of the three RCTs included in this review, one described a method of randomization of drawing names from a hat¹⁰ while the other two did not describe the randomization method.^{11,12} An attempt was made to blind the outcome assessor in one RCT,¹² but the participants were unable to be blinded due to the nature of intervention in all RCTs. None of the RCTs performed a power calculation to determine an adequate sample size, and two of the RCTs employed sample sizes of less than 30 participants,^{11,12} increasing the risk of bias.

All nine included non-randomized studies were prospective studies with sample sizes that ranged from 5 to 63 participants. One non-randomized study included a control group in which therapy was administered in the absence of an animal.²¹ The remaining eight studies had no

control group and employed a before after comparison, which weakens the results and conclusions.¹³⁻²⁰ Two studies used only one tool to assess improvement in symptoms.^{14,18}

Summary of Findings

What is the clinical effectiveness of therapy dogs for patients with mental health challenges?

Nine studies investigated the effectiveness of dog-assisted therapy to improve therapy sessions and reduce symptoms in patients with mental health challenges and are described below under the corresponding mental health issue.^{10-13,16,18-21}

Depression

The meta-analysis investigated the effectiveness of AAT or animal assisted activities (AAA) in reducing depressive symptoms in humans.⁹ This analysis found that the use of AAA and AAT significantly reduced depressive symptoms as measured by self-report tools. All included RCTs involved therapies with dogs.

Substance abuse

One RCT compared dog-assisted therapy to therapy with no dog present in clients with substance dependency and found that there was a significant improvement in the quality of the relationship between the client and therapist when a dog was present during sessions.¹⁰

Trauma

One cross-sectional and longitudinal study examined the effectiveness of dog-assisted therapy in reducing psychological distress in teenage girls that had experienced sexual abuse compared to girls that had not experienced previous trauma.¹³ This study found that there was a significant decline in post-traumatic stress disorder (PTSD) symptoms and a decrease in the risk of developing PTSD among teenage girls that had experienced abuse.¹³

Dementia

Three uncontrolled before-after studies examined the effectiveness of dog-assisted therapy in improving mental function and social interactions in elderly patients with dementia.¹⁸⁻²⁰ Two studies focused specifically on Japanese patients^{19,20} and all studies had varying frequencies of therapy sessions. In one study, an improvement in mental function was seen in the first 6 months but declined between 6 and 12 months, while patients' emotional well-being improved over the entire 12 months.²⁰ In another study, an improvement was seen in the apathy scale scores before and after dog therapy, but not in any other measured scale.¹⁹ A third study found that there was a statistically significant improvement in mental function, agitated behaviours, and social interactions immediately after the intervention, but this improvement was not maintained after therapy was stopped.¹⁸

Schizophrenia

Four studies were identified regarding the effectiveness of dog-assisted therapy for patients with schizophrenia.^{11,12,16,21} One RCT found that there was significant improvements in self-esteem, self-determination, positive psychiatric symptoms, and emotional symptoms after 8 weeks of dog-assisted therapy compared to therapy without the presence of a dog.¹¹ Another RCT found that there were significant improvements in positive symptoms and PANSS scores in both the dog-therapy group and control group with no statistical significance between groups.¹² A controlled before-after study found that dog-assisted therapy was able to significantly improve social interaction compared with the control group and rid anhedonia, a symptom of

schizophrenia.²¹ One uncontrolled before-after study found positive improvement in domestic and health activities after dog-assisted therapy.¹⁶

What is the clinical effectiveness of therapy horses for patients with mental health challenges?

Three studies looked at effectiveness of therapy horses for patients with mental health challenges.^{14,15,17}

Trauma

One cross-sectional study focused on children with mental health issues who had experienced family violence and found that equine-assisted therapy resulted in a significant improvement in psychological, social, and school functioning as determined by a specific rating scale.¹⁴

Schizophrenia

One uncontrolled before-after study employed therapeutic riding sessions in patients with schizophrenia and found a significant improvement in positive and negative symptoms.¹⁷ Another uncontrolled before-after study investigated the effect of therapeutic horseback riding in children with ADHD.¹⁵ This study found that therapeutic horseback riding had a positive effect on behaviour and health-related quality of life, and parents reported a significant change in hyperactivity and inattention and total difficulties.

Limitations

All but one of the included studies had sample sizes that were smaller than 63 participants, which would limit the generalizability of the results as the mental challenges discussed have a wide variety of manifestations. The majority of the non-randomized studies did not have a control group and performed a pre- and post-test analysis, which would also limit applicability to other settings and the validity of the results. A third factor that limited generalizability was the specificity of the populations and the small number of studies ($n \leq 5$) per mental health disorder. Three studies focused on populations within one country. The lengths of the studies ranged from 3 weeks to 2 years, with the majority of studies ($n=8$) being less than 1 year in length, so it is uncertain how long the positive effects of dog and horse therapy will last once therapy is terminated. One study was identified that found a decline in mental function in dementia patients after dog therapy was stopped, suggesting that longer-term studies should be performed to determine whether this is the case in other patient groups.¹⁸ Studies varied in the length of and frequency of animal-assisted therapy, making it difficult to compare results. In addition, a variety of different outcome measures and evaluation tools were employed even among studies focusing on the same mental disorder, further limiting the comparability of studies.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING

Dog-assisted therapy was found to improve mental function, quality of life, and socialization in patients that have experienced trauma, patients with dementia, and patients with schizophrenia. Horse-assisted therapy was found to be effective in children who have experienced family violence, patients with schizophrenia, and children with ADHD. These findings were taken mainly from a limited number of uncontrolled trials ($n=9$) with small sample sizes ($n \leq 63$) and therefore conclusions from these studies should be taken with caution.

Despite the lack of high quality evidence, the trials identified in this review demonstrate that dog or horse-assisted therapy can be effective across a range of ages and mental health indications.

As no studies that compared these interventions to other standards of care such as pharmaceuticals were identified, it is unknown whether animal-assisted therapy is more or less effective than these alternative therapies.

Longer-term controlled trials with larger sample sizes will be necessary to further evaluate the effectiveness of using dogs and horses to facilitate therapy session for patients with mental health challenges.

PREPARED BY:

Canadian Agency for Drugs and Technologies in Health

Tel: 1-866-898-8439

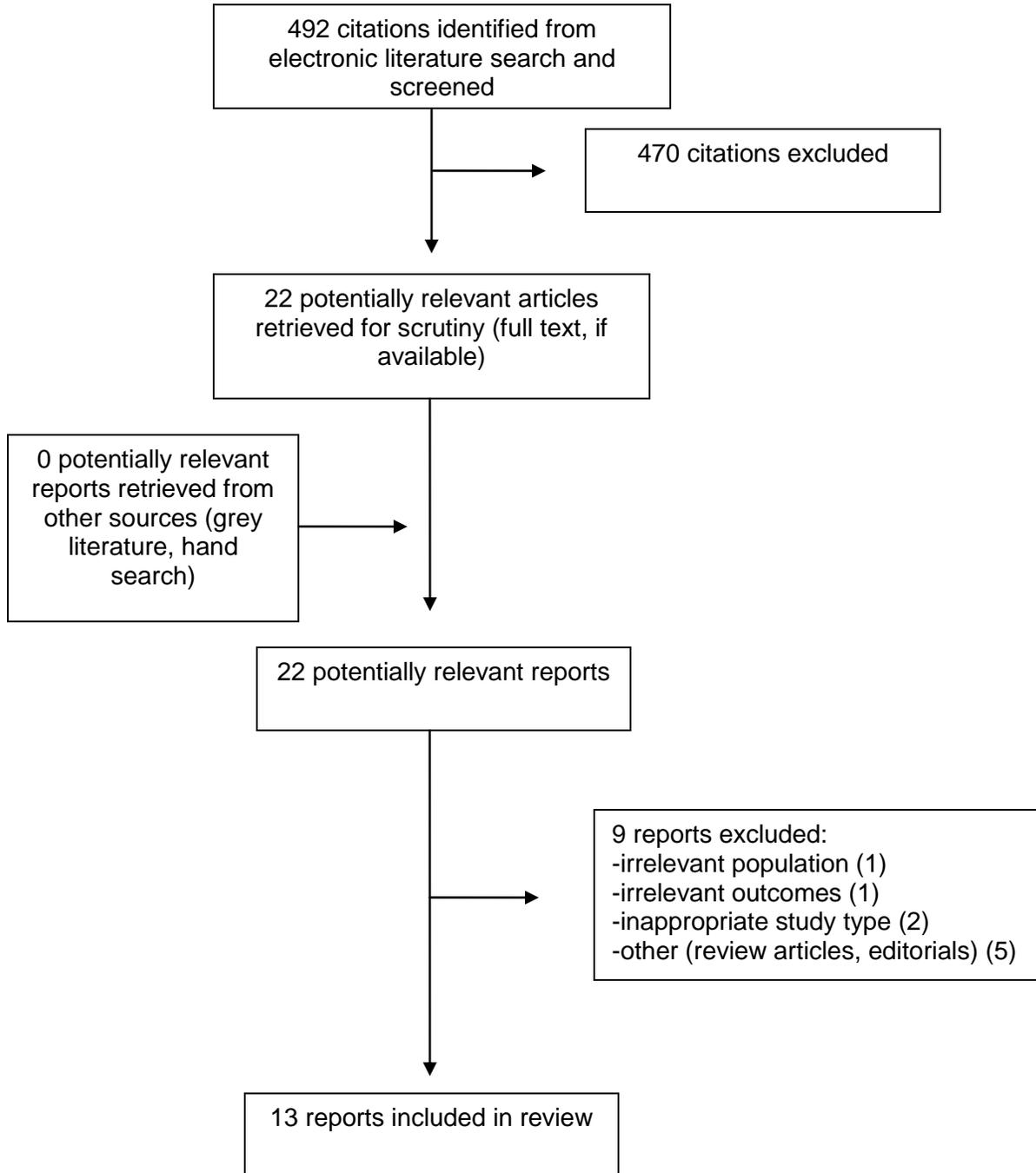
www.cadth.ca

REFERENCES

1. Rossetti J, King C. Use of animal-assisted therapy with psychiatric patients. *J Psychosoc Nurs Ment Health Serv.* 2010 Nov;48(11):44-8.
2. Filan SL, Llewellyn-Jones RH. Animal-assisted therapy for dementia: a review of the literature. *Int Psychogeriatr.* 2006 Dec;18(4):597-611.
3. Shubert J. Dogs and human health/mental health: from the pleasure of their company to the benefits of their assistance. *U S Army Med Dep J.* 2012 Apr;Apr-Jun:21-9.
4. Cirulli F, Borgi M, Berry A, Francia N, Alleva E. Animal-assisted interventions as innovative tools for mental health. *Ann Ist Super Sanita* [Internet]. 2011 [cited 2012 Jul 18];47(4):341-8. Available from: <http://www.iss.it/publ/anna/2011/4/474341.pdf>
5. Masini A. Equine-assisted psychotherapy in clinical practice. *J Psychosoc Nurs Ment Health Serv.* 2010 Oct;48(10):30-4.
6. Nilson R. Equine-facilitated psychotherapy. *Perspect Psychiatr Care.* 2004 Apr;40(2):-42.
7. Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Med Res Methodol* [Internet]. 2007 [cited 2012 Jul 30];7:10. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1810543/pdf/1471-2288-7-10.pdf>
8. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* [Internet]. 1998 Jun [cited 2012 Aug 8];52(6):377-84. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1756728/pdf/v052p00377.pdf>
9. Souter MA, Miller MD. Do animal-assisted activities effectively treat depression? A meta-analysis. *Anthrozoos.* 2007;20(2):167-80.
10. Wesley MC, Minatrea NB, Watson JC. Animal-assisted therapy in the treatment of substance dependence. *Anthrozoos.* 2009;22(2):137-48.
11. Chu CI, Liu CY, Sun CT, Lin J. The effect of animal-assisted activity on inpatients with schizophrenia. *J Psychosoc Nurs Ment Health Serv.* 2009 Dec;47(12):42-8.
12. Villalta-Gil V, Roca M, Gonzalez N, Domènec E, Cuca, Escanilla A, et al. Dog-assisted therapy in the treatment of chronic schizophrenia inpatients. *Anthrozoos.* 2009;22(2):149-59.
13. Hamama L, Hamama-Raz Y, Dagan K, Greenfeld H, Rubinstein C, Ben-Ezra M. A preliminary study of group intervention along with basic canine training among traumatized teenagers: a 3-month longitudinal study. *Children and Youth Services Review.* 2011;33(10):1975-80.

14. Schultz PN, Remick-Barlow GA, Robbins L. Equine-assisted psychotherapy: a mental health promotion/intervention modality for children who have experienced intra-family violence. *Health Soc Care Community*. 2007 May;15(3):265-71.
15. Cuypers K, De Ridder K, Strandheim A. The effect of therapeutic horseback riding on 5 children with attention deficit hyperactivity disorder: a pilot study. *J Altern Complement Med*. 2011 Oct;17(10):901-8.
16. Kovács Z, Kis R, Rózsa S, Rózsa L. Animal-assisted therapy for middle-aged schizophrenic patients living in a social institution. A pilot study. *Clin Rehabil*. 2004 Aug;18(5):483-6.
17. Cerino S, Cirulli F, Chiarotti F, Seripa S. Non conventional psychiatric rehabilitation in schizophrenia using therapeutic riding: the FISE multicentre Pindar project. *Ann Ist Super Sanita* [Internet]. 2011 [cited 2012 Jul 18];47(4):409-14. Available from: <http://www.iss.it/publ/anna/2011/4/474409.pdf>
18. Richeson NE. Effects of animal-assisted therapy on agitated behaviors and social interactions of older adults with dementia. *Am J Alzheimers Dis Other Demen*. 2003 Nov;18(6):353-8.
19. Motomura N, Yagi T, Ohyama H. Animal assisted therapy for people with dementia. *Psychogeriatrics*. 2004;4(2):40-2.
20. Kawamura N, Niiyama M, Niiyama H. Long-term evaluation of animal-assisted therapy for institutionalized elderly people: a preliminary result. *Psychogeriatrics*. 2007;7(1):8-13.
21. Nathans-Barel I, Feldman P, Berger B, Modai I, Silver H. Animal-assisted therapy ameliorates anhedonia in schizophrenia patients. A controlled pilot study. *Psychother Psychosom*. 2005;74(1):31-5.

APPENDIX 1: Selection of Included Studies



APPENDIX 2: Characteristics of Included Clinical Studies

First Author, Publication Year, Country	Study Design and Length	Patient Characteristics	Intervention	Comparator	Clinical Outcomes Measured
Depression					
Souter ⁹ 2007 USA	Systematic review and meta-analysis	5 RCTs (from 4 dissertations and one conference abstract) including 254 patients with depressive symptoms determined by a self-report questionnaire	Animal-assisted activities or Animal-assisted therapy (4 RCTs used dogs, 1 RCT used dogs and cats)	Control group (no therapy or therapy without animal)	Reduction in depressive symptoms as measured by self-report tools
Substance abuse					
Wesley ¹⁰ 2009 USA	Unblinded RCT (drawing names from a hat) 3 weeks	231 participants with substance dependency to at least one substance seeking treatment in a residential treatment facility	26 one-hour dog-assisted therapy group sessions with a therapist (n=135) Dog breed: Beagle-cross, repertoire of “tricks” used as psycho-educational tools for the therapist	Therapy with no dog present (n=96)	Therapeutic alliance (bond formed between client and therapist) measured by the Helping Alliance Questionnaire (HAQ-II) – self-report
Trauma					
Hamama ¹³ 2011 Israel	Longitudinal and cross-sectional study 3 months	9 teenage girls with a history of physical or sexual abuse within the last 4 years having low achievement in school and interpersonal difficulties Matched cohort of 9 teenage girls from the same school with no history of traumatic events or interpersonal difficulties	12 3-hour group sessions consisting of activities with canines (acquaintance, building trust, training, walking, farewell) with two social work students		Subjective well-being, coping with stressful life events, PTSD symptoms, depressive symptoms as determined by questionnaire or interview
Schultz ¹⁴ 2007 USA	Cross-sectional study 18 months	63 children who have experienced intra-family violence that were referred to a psychotherapist for treatment of various behavioural and mental health issues (36 mood	19 equine-assisted psychotherapy sessions with a therapist		The Children’s Global Assessment of Functioning (GAF) score – pre- and post-analysis

First Author, Publication Year, Country	Study Design and Length	Patient Characteristics	Intervention	Comparator	Clinical Outcomes Measured
		disturbance, 10 ADHD, 5 PTSD, 3 adjustment disorder, 3 disruptive disorder, 3 other)			
Dementia					
Kawamura ²⁰ 2007 Japan	Uncontrolled before-after study 12 months	10 Japanese patients with dementia (6 vascular dementia, 4 senile dementia) in a residential nursing home	2-hour sessions twice-monthly with 4 dogs (2 papillons, 1 miniature dashchund, 1 Yorkshire terrier) and volunteers where patients could freely feed, hold, and play with dogs		GBS Scale Japanese Version (GBSS-J), Mental Function Impairment Scale (MENFIS) – completed by staff and researcher
Motomura ¹⁹ 2004 Japan	Uncontrolled before-after study 4 days	8 elderly Japanese female patients with dementia in a nursing home	1-hour dog therapy sessions with 2 dogs over 4 consecutive days where patients could pet the dogs, interact with the dogs, and observe the dogs' exercises		Mental state tests (apathy scale, irritability scale, geriatric depression scale, physical self-maintenance scale, MMSE) – interview
Richeson ¹⁸ 2002 USA	Uncontrolled before-after study 9 weeks	15 patients >60 years old with dementia from 2 nursing homes	1-hour small group therapy sessions Monday-Friday with therapy dogs, a handler, and a therapeutic recreation professional where patients could play with dogs, feed the dogs, talk to it, and brush it		MMSE – completed by participants, CMAI – completed by therapist (agitation), AAT flow sheet – completed by therapist (social interactions)
Schizophrenia					
Chu ¹¹ 2009 Taiwan	Unblinded RCT 2 months	30 Taiwanese inpatients with schizophrenia from a psychiatric institution	Weekly 50-minute animal-assisted activity sessions with 2 healthy, friendly, medium-sized dogs of nonspecific breeds (n=15)	Treatment as usual with no animal present (n=15)	Self-report questionnaire assessing self-esteem, self-determination, extent of social support, increases/ decreases in adverse psychiatric symptoms
Villalta-Gil ¹²	Single-blinded	21 patients >18 years	25 45-minute	Sessions given	PANSS, Living

First Author, Publication Year, Country	Study Design and Length	Patient Characteristics	Intervention	Comparator	Clinical Outcomes Measured
2009 Spain	RCT	old with chronic schizophrenia from a psychiatric hospital	group sessions given twice-weekly with a therapy dog (2-year old female Labrador), a dog-handler and a psychologist (n=12) - sessions divided into subprograms (cognitive rehab, social perception, verbal communication, social abilities, interpersonal problem solving)	by a psychologist without a therapy dog or dog handler (n=9)	Skills Profile (social competence), QoL, Satisfaction with Treatment Questionnaire (STQ) – all evaluated by blinded psychologist
Cerina ¹⁷ 2011 Italy	Uncontrolled before-after study 2 years	24 patients 18-40 years old with schizophrenia	1-hour therapeutic riding sessions once-weekly for 24 months which included grooming the horse, riding the horse, and improving patients' knowledge of the horse		BPRS (evaluate psychiatric symptoms), PANSS – interview with patient and family members
Nathans-Barel ²¹ 2005 Israel	Controlled before-after study 10 weeks	20 inpatients 19-62 years old with chronic schizophrenia	10 weekly 1-hour sessions with a therapist and dog which involved grooming, petting, feeding, cleaning, teaching and taking the dog for a walk	Sessions with no dog present	SHAPS (measure anhedonia), PANSS, QoL – investigator interviewed patient
Kovacs ¹⁶ 2004 Hungary	Uncontrolled before-after study 9 months	7 patients with schizophrenia 18-65 years old living in the social institute for psychiatric patients	Weekly 50-minute sessions with a therapy dog and therapeutic staff, starting with social interactions with the dog then advancing to simple or complex exercises with the dog		Independent Living Skills Survey (measures living skills of chronic psychiatric patients) – assessed by an independent rater
Other disorders					
Cuypers ¹⁵ 2011 Norway	Uncontrolled before-after study 24 weeks	5 male children aged 10-11 years diagnosed with ADHD	1-hour therapeutic horseback riding lessons twice-weekly for 8 weeks with two hired instructors - gradual increase in riding time		Strength and Difficulties Questionnaire (to assess behaviour), HRQoL – recorded by subjects, parents, and teachers

ADHD=attention deficit hyperactivity disorder; BPRS=brief psychiatric rating scale; CMAI=Cohen-Mansfield Agitation Inventory; HRQoL=health-related quality of life; MMSE=mini-mental state examination; PANSS=positive and negative syndrome scale; PTSD=post-traumatic stress disorder; QoL=quality of life; RCT=randomized controlled trial; SHAPS=Snaith-Hamilton Pleasure Scale

APPENDIX 3: Summary of Critical Appraisal

First Author, Publication Year	Strengths	Limitations
Depression		
Souter ⁹ 2007	<ul style="list-style-type: none"> • Comprehensive literature search based on pre-defined criteria • Summary of study characteristics provided • Quality of included studies assessed • Tests were performed to determine heterogeneity 	<ul style="list-style-type: none"> • Years databases were searched not stated • Trials included in meta-analysis (n=5) • Trials employed intervention in various ways • Included trials were of small sample size • Risk of publication bias not assessed
Substance abuse		
Wesley ¹⁰ 2009	<ul style="list-style-type: none"> • Method of randomization described • Losses to follow-up described • All patients received assigned treatments 	<ul style="list-style-type: none"> • No blinding of participants or outcome assessors • Power calculation not performed to determine sample size • Raw numbers of results not presented, only statistical analysis
Trauma		
Hamama ¹³ 2011	<ul style="list-style-type: none"> • Prospective study • Interventions and outcome measures clearly described • All patients received treatments 	<ul style="list-style-type: none"> • No randomization or blinding • Sample size (n=18) • No control group that did not get intervention
Schultz ¹⁴ 2007	<ul style="list-style-type: none"> • Prospective study • Interventions and outcome measures clearly described • Patients lost to follow-up described 	<ul style="list-style-type: none"> • No randomization or blinding • Small sample size (n=63) • No intention to treat analysis • Patients had a variety of behavioural disorders • Outcome assessed using only one tool
Dementia		
Kawamura ²⁰ 2007	<ul style="list-style-type: none"> • Prospective study • Intervention and outcome measures described • All patients received intervention • P values reported 	<ul style="list-style-type: none"> • No control group • Sample size (n=10) • Sample mainly female, limiting generalizability • Sample all Japanese, limiting generalizability
Motomura ¹⁹ 2004	<ul style="list-style-type: none"> • Prospective study • Intervention and outcome measures described • Outcome measures assessed by multiple tools 	<ul style="list-style-type: none"> • No control group • Sample size (n=8) • Sample all female, limiting generalizability • Sample all Japanese, limiting generalizability
Richeson ¹⁸ 2002	<ul style="list-style-type: none"> • Prospective study • Intervention and outcome measures clearly described • All patients received intervention • P values reported 	<ul style="list-style-type: none"> • No control group • Small sample size (n=15) • Outcome assessed using only one tool
Schizophrenia		
Chu ¹¹ 2009	<ul style="list-style-type: none"> • Control group present • Intervention and outcome measures clearly described • Intervention and control groups similar at baseline • All patients received intervention unless otherwise stated 	<ul style="list-style-type: none"> • Method of randomization not described • No blinding of participants or outcome assessors • Sample size (n=30) • Outcome based on self-reporting, which may be biased • Sample all Taiwanese, limiting generalizability

First Author, Publication Year	Strengths	Limitations
Villalta-Gil ¹² 2009	<ul style="list-style-type: none"> • Control group present • Outcome assessors blinded • All patients receive assigned intervention 	<ul style="list-style-type: none"> • Method of randomization not described • Sample size (n=21) • Risk of non-blinding of outcome assessor due to communication with patients • High drop-out rate
Cerina ¹⁷ 2011	<ul style="list-style-type: none"> • Prospective study • Intervention and outcome measures clearly described • Outcome measures assessed by multiple tools 	<ul style="list-style-type: none"> • No control group • Small sample size (n=24)
Nathans-Barel ²¹ 2005	<ul style="list-style-type: none"> • Prospective study • Intervention and outcome measures clearly described • Outcome measures assessed by multiple tools 	<ul style="list-style-type: none"> • No randomization or blinding • Sample size (n=20) • Baseline characteristics of groups not described • Self-reporting by schizophrenic patients may be biased
Kovacs ¹⁶ 2004	<ul style="list-style-type: none"> • Prospective study • Intervention and outcomes measures clearly described 	<ul style="list-style-type: none"> • No control group • Small sample size (n=7) • Outcome measure assessed by a single tool
Other disorders		
Cuypers ¹⁵ 2011	<ul style="list-style-type: none"> • Prospective study • Interventions and outcome measures clearly described 	<ul style="list-style-type: none"> • No control group • Sample size (n=5) • Sample is all males, which may bias results • No P-values reported in analysis

APPENDIX 4: Summary of Findings

First Author, Publication Year	Main Study Findings	Authors' Conclusions
Depression		
Souter ⁹ 2007	<p>The effect sizes of the five included studies were pooled using a random-effects model and the mean difference effect sizes for depressive symptoms following AAA/AAT was found to be 0.61 (95% CI 0.03-1.19), which was statistically significant.</p> <p>Heterogeneity was found to be high ($I^2=70.61\%$) due to one study that had a standardized mean difference of -0.32 (95% CI -1.00-0.36). When this study was removed, the studies were found to be homogeneous and the mean difference was calculated to be 0.87 (95% CI 0.45-1.28).</p>	<p>"The results of our meta-analysis support the effectiveness of AAA, and in one case, AAT, as treatments for depression. Although the number of chosen studies was small, taken together, the results of these studies indicate that exposure to AAA/AAT produces significant improvement in depression, as measured with a range of well-accepted instruments." (p. 176)</p>
Substance abuse		
Wesley ¹⁰ 2009	<p>There was a significant difference between mean Health Alliance Questionnaire scores in the experimental and control group ($F=25.44$, $p<0.001$), with those in the dog-assisted therapy groups reporting a more positive opinion of the therapeutic alliance.</p> <p>Subgroups with significant differences between the dog-therapy and control groups ($p<0.05$): males, females, court ordered clients, pet owners, polysubstance dependence clients, cannabis dependence clients, and clients seeking treatment for methamphetamine dependence</p> <p>Subgroups with significant differences between the dog-therapy and control groups ($p>0.05$): dual diagnosis clients, clients with social service involvement, clients seeking treatment for alcohol</p>	<p>"This study shows that AAT can significantly improve the quality of the therapeutic relationship, which may result in higher treatment outcomes and reduced physiological indicators of psychological stress. Residential treatment centers, and potentially outpatient treatment programs, can improve treatment outcome by an improved therapeutic alliance with a trained therapy dog present in the group treatment." (p. 146)</p>
Trauma		
Hamama ¹³ 2011	<p>The intervention group had a higher proportion of participants with exposure to traumatic events ($p=0.014$), a lower level of subjective well-being ($p=0.041$), a higher level of PTSD symptoms ($p=0.017$), and depressive symptoms ($p=0.022$).</p> <p>The intervention group showed a rapid decline in PTSD symptoms ($p=0.018$) and had a significant reduction in the proportion of participants with elevated risk for PTSD ($p=0.046$).</p>	<p>"The main finding emerge from this study was the decline at the level of PTSD symptoms along with significant reduction in the risk to develop PTSD, among the group intervention that used canines assisted therapy." (p. 1978)</p>
Schultz ¹⁴ 2007	<p>All children showed an improvement in GAF scores. Mean GAF score pre- and post-treatment were 54.1 ± 3.2 and 61.7 ± 5.0 ($p<0.001$), respectively. There was a statistically significant correlation between the</p>	<p>"The present study has demonstrated a significant improvement in GAF scores in children with various DSM-IV diagnoses after receiving EAP. There is little doubt that there has been a positive effect. It is rapid and</p>

First Author, Publication Year	Main Study Findings	Authors' Conclusions
	<p>percentage improvement in GAF scores and the number of sessions given ($r=0.73$, $p<0.001$).</p> <p>Females had a significantly greater improvement in GAF scores than males (15.0% vs. 10.3%, $p=0.02$). The greatest improvement in GAF scores occurred in the youngest of subjects (<8 years old). A statistically significant greater percentage improvement in GAF scores were found in the group of children who had a history of physical abuse and neglect (15.9% vs. 10.6%, $p=0.01$)</p>	<p>appears to be more effective in some children than in others. It is not clear how age, gender, environment affect the results." (p. 270)</p>
Dementia		
Kawamura ²⁰ 2007	<p>During the first 6 months of the study, GBSS-J scores decreased (improvement) but increased (decline) during the 6-12 month period. Significant score decreases were seen in impaired spatial orientation ($p=0.047$) and emotional lability ($p=0.046$) during the first 6 months.</p> <p>Overall MEMFIS scores decreased during the first 6 months but increased from 6-12 months. Scores tended to decrease in impaired emotional functions, particularly in impaired suitability of emotional expression ($p=0.047$) and impaired stability of emotional expression ($p=0.047$) over 12 months.</p>	<p>"After 6 months of participation in AAT, there were some improvements in mental functions but a decrease in motor functions. The total scores of GBSS-J and MEMFIS (not including the motor function item) decreased during the first 6 months and then increased during the final 6 months. In other words, patients improved initially and then became slightly worse. In the emotional function item in MEMFIS, the scores decreased over the entire 12 months showing continuous improvements in patients' emotional well-being." (p. 11)</p>
Motomura ¹⁹ 2004	<p>No significant differences were seen in the irritability scale, the depression scale, physical self-maintenance scale, and mini-mental state examination before and after dog therapy. All patients improved their apathy state and a statistically significant difference was seen in apathy scale scores before and after dog therapy (19.4 vs. 14.0, $p<0.05$).</p> <p>Most patients had a good impression of dog therapy.</p>	<p>"We conducted AAT for patients with dementia and found that most of them prefer to take AAT. Furthermore, patients with dementia had improved apathy state by taking AAT." (p. 41)</p>
Richeson ¹⁸ 2002	<p>There was a statistically significant decrease (improvement) in mean MMSE score between baseline and after dog therapy (65.93 vs. 50.53, $p=0.001$). There was a statistically significant increase (decline) in mean MMSE score immediately after dog therapy and three weeks after dog therapy ended (50.53 vs. 54.86, $p=0.000$).</p> <p>No differences were found between the MMSE and the agitated behaviours of the participants recorded in the CMAI.</p> <p>The mean AAT flow sheet score for the last week of dog therapy was significantly greater than the mean for the first week (20.25 vs.</p>	<p>"Although the results of this pilot study are not generalizable due to the small sample size and lack of randomization, the findings are promising. The outcomes indicate that a therapeutic recreation AAT intervention can decrease the agitated behaviors and increase the social interactions of persons with dementia. The CMAI and AAT flow sheet revealed that the agitated behaviors of the participants decreased immediately following the intervention phase and increased during the follow-up phase of the pilot study. Social interactions increased significantly from the first week to the last week of the AAT intervention." (p. 357)</p>

First Author, Publication Year	Main Study Findings	Authors' Conclusions
15.25, p=0.009).		
Schizophrenia		
Chu ¹¹ 2009	<p>In the treatment group, there were significant improvements (p<0.05) in the mean rankings for self-esteem, self-determination, positive psychiatric symptoms, and emotional symptoms after 8 weeks of dog-assisted therapy. There was no significant improvement in scores for social support (p=0.164) and negative psychiatric symptoms (p=0.097).</p> <p>Investigators observed an improvement in interactions with patients in the presence of the dogs.</p>	<p>“Although long-term effects were not measured in this study, the results showed that 8 weeks of animal-assisted activity can temporarily improve self-esteem, self-determination, positive psychiatric symptoms, and emotional symptoms in patients with schizophrenia.” (p. 47)</p>
Villalta-Gil ¹² 2009	<p>Patients in the intervention group showed significant improvements in the area of social contact (p=0.014), in positive (p=0.005) and negative symptoms (p=0.005), in total PANSS score (p=0.014), and perceived QoL related to social relationships (p=0.024). Non-personal social behaviour significantly worsened (p=0.049).</p> <p>No significant differences were found between intervention and control groups in any of the variables assessed at baseline and post-intervention.</p>	<p>“The two groups of inpatients included in the study improved with the intervention based on the Integrated Psychological Treatment designed by Brenner et al (1994). Both groups showed significant improvements in positive symptoms, as well as in the total PANSS score. Although there were no statistical differences between the group which received therapy and the group which received the treatment without the assistance of a therapy dog, before and after comparisons within each group indicated some extra benefits for the group assisted by the dog.” (p. 156)</p>
Cerina ¹⁷ 2011	<p>There was a statistically significant decrease in BPRS score from baseline to post-intervention (80.1 vs. 64.1, p<0.001). This decrease was seen when the BPRS items were grouped into positive symptoms (46.6 vs. 38.4, p<0.0001) and negative symptoms (33.5 vs 25.7, p<0.0001), with a more evidence difference between beginning and final scores in negative symptoms.</p> <p>Similarly, there was a statistically significant decreased in PANSS score from baseline to post-intervention (33.3 vs 25.9, p<0.0001). When clustered into various groups of items, emotional flatterring, social isolation, decreased spontaneity and discorsured showed a very meaningful change between baseline and post-intervention (13.9 vs. 9.9, p<0.0001).</p>	<p>“Results overall indicate a significant improvement in most symptoms in all groups (both first onset and chronic). In particular, as concerns the BPRS scores, the changes in Cluster B (negative symptoms) were the most evident. With regards to the three Clusters of PANSS, all showed a significant reduction in the scores.” (p. 413)</p>
Nathans-Barel ²¹ 2005	<p>The hedonic tone, according to SHAPS score, after treatment was significantly higher in the dog-therapy group compared with the control group (p=0.02). The improvement in SHAPS score with time was significantly higher in the dog-therapy group compared to the control group (p=0.021).</p> <p>Quality of life measures showed a significant improvement of the dog-therapy group</p>	<p>“...our findings indicate amelioration of anhedonia in the active group and support the hypothesis that the participation of an animal has an effect over and above that of the psychosocial interaction without animal assistance...The degree of improvement as measured by the anhedonia scales was modest. The percentage of improvement in anhedonia scale scores was comparable however to that reported in negative</p>

First Author, Publication Year	Main Study Findings	Authors' Conclusions
	<p>compared to the control group on the utilization of the leisure factor of the QLESQ and the motivation factor of the SQLS (p=0.07).</p> <p>There was no significant difference in post-treatment scores of negative symptoms, general psychopathology and positive symptoms between the two groups according to the PANSS scores.</p>	<p>symptoms scale scores when inadequately responsive chronic schizophrenia patients were treated with clozapine or SSRI augmentation." (p. 34)</p>
Kovacs ¹⁶ 2004	<p>Scores from the Independent Living Skills Survey improved significantly in the areas of domestic activity (p=0.01) and health (0.02). There was positive improvement in the other domains (leisure, money management, transportation, eating, grooming), but this was not statistically significant.</p>	<p>"Our study demonstrates a positive effect of animal-assisted therapy for institutionalized middle-aged schizophrenic patients. Every area assessed by the ILSS changed positively, with significant changes in the domestic and health activities." (p. 485)</p>
Other disorders		
Cuypers ¹⁵ 2011	<p>The mean values of the SDQ scores revealed positive change in 15 of 18 subtests. Subjects reported a significant difference for emotional symptoms, conduct problems, hyperactivity/inattention, and total difficulties. Parents reported a significant change in hyperactivity/inattention and total difficulties. There was a significant positive change for behaviour between all pre- and post-tests.</p> <p>Before intervention, 3 of 5 participants assessed their HRQoL scores as low as chronically ill boys. After intervention, 2 of 5 participants assessed their HRQoL as low as chronically ill boys.</p>	<p>"The primary objective was to determine whether therapeutic horseback riding had a positive effect on behavior, health-related quality of life, and motor performance. The results demonstrate a treatment effect on behavior and quality of life after the intervention phase, while there was no significant change during the non-treatment phase." (p. 905)</p>

AAA=animal-assisted activities; AAT=animal-assisted therapy; BPRS=Brief Psychiatric Rating Scale; CI=confidence interval; CMAI=Cohen-Mansfield Agitation Inventory; GAF=Children's Global Assessment of Function; GBSS-J=GBS Scale Japanese Version; HRQoL=health related quality of life; ILSS=Independent Living Skills Survey; MENFIS=Mental Function Impairment Scale; QoL=quality of life; PTSD=post-traumatic stress disorder; QLESQ=Quality of Life Enjoyment and Satisfaction Questionnaire; SDQ=Strengths and Difficulties Questionnaire; SHAPS=Snaith-Hamilton Pleasure Scale; SQLS=Subjective Quality of Life Scale