

PROOF

Animal-assisted interventions in internal and rehabilitation medicine: a review of the recent literature

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While conventional wisdom has always affirmed the value of animals in promoting human well-being, only recently has their therapeutic role in medicine become the focus of dedicated research. Therapeutic modalities that use animals as a tool for improving the physical, emotional, cognitive and/or social functioning of humans are called animal-assisted interventions (AAI), and are classified into: animal-assisted activities (AAA); animal-assisted therapy (AAT); and service animal programs (SAP). The aim of this review is to analyze the papers published between 2001 and 2010 in the most influential medical journals dealing with AAI, and discuss their findings in the light of what may be of interest for internal medicine and rehabilitation. A total of 35 articles met the strict inclusion criteria for this review: 18 papers dealing with AAA, 8 with AAT, and 9 with SAP. The therapeutic outcomes associated with AAA are: enhancement of socialization; reduction of stress, anxiety and loneliness; improvement in mood and general well-being; and development of leisure/recreation skills. Regarding AAT, horses are often used as a complementary strategy to facilitate the normalization of muscle tone and improve motor skills in children with cerebral palsy and persons with lower limb spasticity. Finally, most SAP utilize dogs, that assist people with various disabilities in performing everyday activities, thus reducing their dependence on other persons. Further studies are needed to better define the fields and programs for the therapeutic use of animals and to increase their utilization in medicine, as a promising, complementary and natural means to improve both functional autonomy and quality of life.

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Animals have been our companions since ancient times, and we are well aware of the many ways that

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some of them have aided us, throughout history. While conventional wisdom has always advocated the value of animals in promoting human well-being, only recently has the role that animals can play in some fields of medicine become the specific focus of scientific research.¹⁻⁵ Therapeutic modalities that use animals as a tool for improving the physical, emotional, cognitive and/or social functioning of humans are called animal-assisted interventions (AAI).⁶ Some evidence-based findings indicate positive contributions to human health, and the practice of AAI is fairly common in healthcare facilities throughout the United States and has been progressively introduced in many other countries.⁴

To provide a better understanding of the different types of AAI, the American Veterinary Medical Association (AVMA)⁷ has classified them into three categories: 1) animal-assisted activities (that utilize companion animals); 2) animal-assisted therapy (that utilize therapy animals); and 3) service animal programs (that utilize service animals).⁸

1) Animal-assisted activities (AAA) are basically informal activities that involve human-animal interactions, promoting socialization, motivation, education, recreation and other therapeutic benefits to enhance the global quality of life for groups or individuals. AAA are performed in association with com-

panion animals. Companion animals are animals (not owned by the patient) used to contribute physically and emotionally to the human well-being, thanks to the benefits gained from the consequent human-animal bond. AAA are not employed as a means to reach specific targets; hence, while AAA have therapeutic value, they are not, strictly speaking, a real therapy.

Companion animals can be subdivided into two categories: those that physically interact with participants (“touchable” animals, such as dogs, cats or rabbits); and those that do not physically interact with participants (“not-touchable”: *e.g.* birds, fish in an aquarium). The activities can be organized in a variety of environments, such as the patient’s own home, hospitals, schools, health care facilities, residential facilities, prisons, and other treatment locations.⁸ The term “pet therapy” is widely used to refer to AAA, even if it considered inaccurate and misleading.

2) Animal-assisted therapy (AAT) is a more formal goal-directed intervention in which a therapy animal that meets specific criteria is an integral part of the treatment process, used as a therapeutic modality to improve human functioning in patients with acute or chronic diseases. In contrast to AAAs, AAT is delivered and/or directed by persons with specialized expertise as part of their professional activity (*e.g.* occupational therapist, certified therapeutic recreation specialist, nurse, mental health professional), has specified goals and objectives to achieve, and is documented in the person’s medical record (with the activities and progress noted) and evaluated.

Therapy animals are animals that - possessing the necessary skills and aptitude - facilitate therapy delivered by or under the supervision of a health care or human services professional. Equine-assisted therapies, such as hippotherapy and horseback riding therapy, are the most well known forms of AAT. Hippotherapy is a treatment strategy where a therapist (physical or occupational therapist) uses the horse as part of an integrated intervention program to achieve functional outcomes. Conversely, in horseback riding therapy patients are conducted by non-therapist riding instructors. Horses are also used in competitions for riders with disabilities, but such advanced activities are usually not considered as AAI (even if they promote health, social integration and self-esteem) but rather as para-equestrian sport.

3) Service animal programs (SAP) are healthcare interventions aimed to increase the autonomy of

disabled people through the use of service animals (usually dogs). Service animals (or assistance animals) are animals individually trained to provide assistance to individuals with a disability. They mainly guide people who are blind, but can also be used for other purposes, *e.g.* to alert people who are deaf, to pull wheelchairs, to alert and protect a person having a seizure, to assist persons with mobility impairments in balancing or in picking things up, or to perform other special tasks.

The scientific evidence for the different AAI (in terms of physiological, psychological and social benefits) is still under debate.¹ In order to clearly transmit the state-of-the-art of these therapeutic interventions to clinicians who could be potentially interested in them, **there is need for a thorough selection of the published research.**

The aim of this review was to analyze the papers published within the last ten years (2001-2010) in the most influential medical journals dealing with AAI, and discuss their findings in the light of what may be of interest for internal medicine and rehabilitation.

Methods

A broad literature search was conducted on research articles published in the last 10 years (2001-2010) in journals indexed by both Pubmed and Thomson Reuters Journal Citation Reports (JCR, both Science edition and Social Sciences edition) databases. The following key words were used: “animal assisted”, “hippotherapy”, “therapeutic horseback riding”, “therapy horseback riding”, “horseback program”, “pet therapy”, “service dogs” and “service animals”. The bibliographies of relevant literature obtained were then examined for additional significant articles with the same characteristics. Our research strategy was to select only recent clinical papers (2001-2010) indexed by PubMed and JCR and published in English language. Reviews and surveys, papers published in veterinarian journals, and studies on healthy subjects, or analyzing only human physiochemical responses, or effects of virtual pets and animal simulators were excluded.

Results

A total of 35 articles met the strict inclusion criteria for this review.

Table I shows 18 papers dealing with AAA.⁹⁻²⁶ Nine of these articles⁹⁻²¹ were classified as AAA according to AVMA definitions, even if the authors improperly claimed to have applied AAT. On the other hand, one article (found using the key words “animal assisted”) was excluded because it did not refer to a real AAI but to benefits from pet ownership in cancer patients.²²⁻²⁷ Ten of these papers had a control group. The patients were adults in 16 papers and children in 2 papers.

Table II shows the 8 articles selected dealing with AAT.²⁸⁻³⁵ All refer to equine-assisted therapy: hippo-therapy in 5 papers, and therapeutic horseback riding in 3 papers. Half of these papers had a control group. The patients were adults in 3 papers and children in 5 papers.

Table III lists the 9 papers on SAP,³⁶⁻⁴⁴ all dealing with dog services, for assistance of adults (7 papers) or children (2 papers).

Discussion

In the last decade, a large number of papers have been published concerning the therapeutic role of animals in human medicine, but only a limited number of these were published in journals indexed in both Pubmed and JCR databases. The terminology regarding AAA is still used inconsistently in these papers, particularly in the earlier ones. The classification we adopted has been widely accepted in the

TABLE I.—Characteristics of the studies dealing with animal-assisted activities.

Authors and year	N. of subjects [controls]	Adults (A) Children (C)	Diagnosis/condition	Animals	Outcome
Barak Y <i>et al.</i> 2001 ⁹	10 [10]	A	Schizophrenia	Dogs or cats	↑ social functioning
Banks MR <i>et al.</i> 2002 ¹⁰	15+15 [15]	A	Resident in long-term care facilities	Dogs	↓ loneliness
Edwards NE and Beck AM, 2002 ¹¹	62	A	Alzheimer's disease	Fish aquariums	↑ nutritional intake; ↓ nutritional supplementation
Martin F and Farnum J, 2002 ¹²	10	C	Pervasive developmental disorders	Dogs	↑ playful mood, attention, awareness of social environment
Barker SB <i>et al.</i> 2003 ¹³	35	A	Psychiatric patients	Dogs	↓ fear of electroconvulsive therapy
Kovacs Z <i>et al.</i> 2004 ¹⁴	7	A	Schizophrenia	Dogs	↑ domestic and health activities
Stasi MF <i>et al.</i> 2004 ¹⁵	15 [15]	A	Resident in long-term care facilities	Cats	↓ depression and blood pressure values
Antonoli C and Reveley MA, 2005 ¹⁶	30	A	Depression	Dolphins	↓ depression
Nathans-Barel I <i>et al.</i> 2005 ¹⁷	10 [10]	A	Schizophrenia	Dogs	↑ hedonic tone
Caprilli S and Messeri A, 2006 ¹⁸	138	C	Pediatric diseases (medical and surgical)	Dogs	Pleasure, positive experience of interaction
Colombo G <i>et al.</i> 2005 ¹⁹	48 [43+53]	A	Institutionalized elderly	Canary	↑ Psychological well-being
Macauley BL, 2006 ²⁰	3	A	Aphasia	Dogs	↑ Motivation; no differences vs. speech-language therapy
Cole KM <i>et al.</i> 2007 ²¹	26 [25+25]	A	Advanced heart failure	Dogs	↓ Anxiety; improvement in cardiopulmonary pressures and neurohormone levels
Orlandi M <i>et al.</i> 2007 ²²	89 [89]	A	Oncological	Dogs	↓ Depression
Johnson RA <i>et al.</i> 2008 ²³	10 [10+10]	A	Oncological	Dogs	No change in mood or sense of coherence
Chu CI <i>et al.</i> 2009 ²⁴	15 [15]	A	Schizophrenia	Dogs	↑ Self-esteem, self-determination and other psychiatric symptoms
Kawamura N <i>et al.</i> 2009 ²⁵	8	A	Institutionalized elderly women	Dogs	↑ Interest in self, others, and environment
Le Roux MC and Kemp R, 2009 ²⁶	8 [8]	A	Institutionalized elderly	Dogs	↓ Depression

TABLE II.—Characteristics of the studies dealing with animal-assisted therapy.

Authors and year	N. of subjects [Controls]	Adults (A) Children (C)	Diagnosis	Animals	Outcome
Sterba JA <i>et al.</i> 2002 ²⁸	17	C	Cerebral palsy	Horse*	↑ Gross motor function
Benda W <i>et al.</i> 2003 ²⁹	7 [8]	C	Cerebral palsy	Horse§	↑ Symmetry in muscle activity
Bizub AL <i>et al.</i> 2003 ³⁰	5	A	Psychiatric disorders	Horse*	↑ Sense of self-efficacy and self-esteem
Lechner HE <i>et al.</i> 2003 ³¹	32	A	Spinal cord injury	Horse§	↓ Spasticity of lower extremities
Lechner HE <i>et al.</i> 2007 ³²	4 [8]	A	Spinal cord injury	Horse§	↓ Spasticity; ↑ well-being
Bass MM <i>et al.</i> 2009 ³³	19 [15]	C	Autism	Horse*	↑ Sensory seeking, sensory sensitivity, social motivation; ↓ inattention, distractibility, sedentary behaviors
McGibbon NH <i>et al.</i> 2009 ³⁴	25 [22]	C	Cerebral palsy	Horse§	↑ Self-concept, gross motor function and symmetry of muscle activity
Shurtleff TL <i>et al.</i> 2009 ³⁵	11	C	Cerebral palsy	Horse§	↑ Trunk stability and upper extremity reaching/targeting
Bass MM <i>et al.</i> 2009 ³³	19 [15]	C	Autism	Horse*	↑ Sensory seeking, sensory sensitivity, social motivation, ↓ inattention, distractibility, sedentary behaviors

*horseback riding; §hippotherapy

TABLE III.—Characteristics of the studies dealing with service animal programs.

Authors and year	N° Subjects (Controls)	Adults (A) Children (C)	Diagnosis	Animals	Outcome
Camp MM, 2001 ³⁶	5	A	Physical disabilities	Dog	↑ Independence in occupational performance areas and psychosocial functioning
Strong V <i>et al.</i> 2002 ³⁷	10	A	People with seizures	Dog	↓ Seizure frequency
Dalziel DJ <i>et al.</i> 2003 ³⁸	63	A	People with seizures	Dog	Success depends largely on the handler's awareness and response to the dog's alerting behavior
Ortiz R and Liporace J, 2005 ³⁹	2	A	People with seizures	Dog	Not effective in predicting seizures
Guest CM <i>et al.</i> 2006 ⁴⁰	51	A	Deaf people	Dog	↓ Hearing-related problems, tension, anxiety, and depression; ↑ Social involvement and independence
Burrows KE <i>et al.</i> 2008 ⁴¹	10	C	Autism	Dog	↑ Companionship, social acknowledgement, and quality of life of children and parents
Rintala DH <i>et al.</i> 2008 ⁴²	18 (15)	A	Mobility/hearing impairment	Dog	↓ Dependence and assistance costs
Shintani M <i>et al.</i> 2010 ⁴³	10	A	Physical disabilities	Dog	↑ Health-related quality of life
Viau R <i>et al.</i> 2010 ⁴⁴	42	C	Autism	Dog	Behavioral benefits

last few years ⁶ and seems to avoid the main sources of misunderstanding.

The literature shows that there are different kinds of animal-assisted interventions (AAA, AAT and

SAP) that can provide health benefits in a variety of settings (including health care facilities) and for different types of individuals.⁴ But, limiting the field of interest to only recent (in the last 10 years) studies

published in most influential journals, the positive results seem to be confined to quite specific clinical groups interacting with a limited range of animals (mainly dogs for AAA and SAP, and horses for AAT).

In addition, the key components for successful use of animals in these programs are: appropriate animal selection, appropriately trained personnel, expert supervision and welfare (very important in relation to both animal and human health, and to environmental concerns),⁴⁵ interdisciplinary cooperation, and development of protocol and training programs with realistic planning of measurable goals and objectives.⁴

We list and discuss here the main results, subdivided by category (animal-assisted activities, animal-assisted therapies, and service animal programs).

Animal-Assisted Activities

Small domestic animals (usually dogs) are employed to obtain psychological benefits and/or improve social contacts in humans across the entire lifespan.

COGNITIVELY UNIMPAIRED INSTITUTIONALIZED ELDERLY

In these subjects the presence of an animal is able to: reduce loneliness;¹⁰ improve psychological well-being (in particular regarding depressive symptoms^{15, 19, 26} and perceived quality of life);¹⁹ develop interest in one's self, other residents, and the environment;²⁵ and induce a significant decrease in blood pressure.¹⁵

PEOPLE WITH PSYCHIATRIC DISORDERS OR DEMENTIA

In adult patients affected by psychiatric disorders AAA can: promote significant improvements in self-esteem, self-determination and general well-being;²⁵ enhance social functioning;⁹ improve hedonic tone;¹⁷ increase patient ability to perform skills related to domestic activities and own health;^{9, 14} and reduce fear in fear-inducing therapeutic procedures (electroconvulsive therapy).¹³ Furthermore, one study showed a positive influence of fish aquariums (fish tank contemplation) in improving nutritional intake of subjects with dementia.¹¹

PEOPLE AFFECTED BY CANCER (UNDERGOING CHEMOTHERAPY OR RADIOTHERAPY)

Dogs as companion animals reduced depression in day-hospital patients,²² but did not change mood or sense of coherence in patients undergoing radiation therapy.²³

CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDERS

Children with disorders characterized by lack of social communication and abilities exhibited a more playful mood, were more focused, and were more aware of their social environment in the presence of a companion dog.¹²

An anxiety reduction has also been found after AAA with dogs in patients with advanced heart failure.²¹ In addition, in a pilot study three persons with aphasia who received AAA during speech-language therapy showed more motivation and enjoyed the sessions more, compared with traditional therapy.²⁰ Similarly, the introduction of pets into the pediatric wards produced a mood of pleasure and a positive interaction with dogs, satisfying both parents and medical staff.¹⁸

Only one study used dolphins as AAA, showing that swimming with these animals in nature could be effective for mild to moderate depression.¹⁶ But, the efficacy of this kind of intervention has been questioned, as not only ineffective as a therapeutic tool,⁴⁶ but also potentially harmful to both parties.⁴⁷

Animal-Assisted Therapy

AAT refers to the use of animals as an integral part of a therapeutic treatment process. The recent literature in this field is focused on equine-assisted therapies. These interventions appear useful for the following categories of persons with motor or developmental disabilities.

ADULTS WITH PSYCHIATRIC DISABILITIES

After a 10-week program of horseback riding therapy and postriding training (including artistic and creative exercises), a group of 5 subjects with longstanding history of psychiatric disorders reported success in learning basic horsemanship and an augmented sense of self-efficacy and self-esteem.³⁰

ADULTS WITH SPINAL CORD INJURY

Lechner *et al.* showed that in these patients hippotherapy significantly reduced spasticity of lower extremities.³¹ In a following paper the same group demonstrated that hippotherapy was more efficient than sitting astride a Bobath roll or on a rocking seat in reducing spasticity temporarily, and had a positive, short-term effect on subjects' mental well-being.³²

CHILDREN WITH CEREBRAL PALSY

In these subjects hippotherapy can improve functional motor skills,³⁴ and has positive effects on muscular symmetry.^{29, 34} Moreover, a rehabilitation intervention consisting in 12 weekly sessions (45' per session) improved head/trunk stability and upper extremity reaching/targeting and the changes were maintained after the intervention ceased.³⁵ Similarly, horseback riding therapy may improve gross motor function in these children, after a program of 1-hour sessions lasting 18 weeks.²⁸

CHILDREN WITH AUTISM

Bass *et al.*³³ demonstrated that following a 12-week program of horseback riding therapy children with autism exhibited greater sensory seeking, sensory sensitivity, social motivation, and less inattention, distractibility and sedentary behavior compared to those on the wait-list (controls).

Service Animal Programs

Even though the efficacy of SAP is particularly evident in helping blind people,⁴⁸ the effects of service dogs have been analyzed in the following categories of subjects.

PEOPLE WITH MOBILITY IMPAIRMENT

Service dogs help promote occupation in these patients, provide opportunities for them to master and improve their environment,³⁶ and also alleviate the mental burden of daily activities, subjectively improving their physical functioning.⁴³

PEOPLE WITH HEARING IMPAIRMENTS

They can benefit from SAP because service dogs not only reduce hearing-related problems⁴² but also

improve tension, anxiety, depression, social involvement and independence.⁴⁰

PEOPLE WITH EPILEPTIC SEIZURE

A pilot study showed that dogs can be trained to recognize specific changes preceding an epileptic seizure and alert people with epilepsy of the impending seizure.³⁷ A subsequent paper,³⁸ however, concluded that further study is required to monitor dogs present in a room while their owners are having a seizure, and a case report failed to demonstrate the effectiveness of two "seizure dogs".³⁹ The debate is still open and further study is needed in this area.⁴⁹

CHILDREN WITH AUTISM

A study examining the effect of service dogs on ten families with an autistic child assessed that such intervention improved the quality of life of both children and their families.⁴¹ Equally, in another study⁴⁴ autistic children reacted positively to service dogs, showing a decrease in problematic behaviors, as judged by their parents. For parents the addition of a service dog is important to alleviate the stress they experience in raising a child with a developmental disorder.⁴¹

Conclusions

The delivery of AAI varies with respect to the animal used, the setting in which the interventions are delivered, the duration of the intervention, the clinical problem and age of people involved, and whether the intervention is delivered in group or to an individual. The main therapeutic results of the AAA reported in these studies are as follows:

- enhancement of socialization (often an increase in social interactions can improve the social climate of an institution, and help in achieving treatment goals);
- reduction of stress, anxiety and loneliness (often obtained simply by attracting and holding the subjects' attention);
- improvement in mood and general well-being;
- development of leisure/recreation skills.

Overall, these benefits seem similar in some regards to those of owning a pet: basically, improved

mood and social interaction, and decreased distress and loneliness.⁴ Moreover, companion animals can reduce individuals' negative responses to demanding situations and environments (*e.g.* a hospital). The use of some animals in therapy may be beneficial to subjects who like them, thanks to the natural tendency of these animals to create a bond with people and generate a strong non-verbal communication.

Animals involved in the AAA here reviewed are mainly dogs. They are friendly, facilitate communication and interaction, and may also reinforce some positive behaviours in patients (*e.g.* throwing a ball, walking, or verbal responses).³

As for AAT, the animals most involved are horses (hippotherapy - therapeutic horseback riding). They offer a riding experience that is often used in rehabilitation medicine as a complementary strategy to facilitate the normalization of muscle tone (spasticity reduction) and improve motor skills (posture, balance and coordination) in children with cerebral palsy^{28, 29, 34-35} and persons with spinal cord injury^{31, 32} and multiple sclerosis.⁵⁰

Finally, most of the SAP involve dogs, that can assist people with various disabilities in doing everyday jobs such as guiding people visually challenged, discriminating sounds for people with hearing impairments, performing tasks in response to voice commands and so on.⁸ These services reduce the dependence of their owners on other persons and thus also hours of paid assistance.⁴²

These results are in line with the general literature on this topic retrievable through Medline and Google Scholar and discussed in some recent reviews (that often include books, theses, abstracts and papers published in journals not indexed by the main scientific databases).^{2-5, 8, 50}

But our findings were more limited in their indications, and the reviewed papers were, on average, more rigorous in scientific methodology. More than 50% of these studies on AAA and AAT had control groups (sometimes using a randomized controlled trial as study design). Still, methodological weaknesses are regrettably apparent, indicating the need for more high-quality studies.⁴ These weaknesses include: small sample size; lack of randomization or of a control group (or its inadequacy); selection bias, with poor generalizability; scant reporting of the psychometric characteristics of outcome measures used and of attrition rates.

Needless to say, further studies are essential to

better define the fields and programs for the therapeutic use of animals and to increase their utilization in medicine, as a promising, complementary and natural means to improve both patients' functional autonomy and quality of life.

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