Human & Veterinary Medicine
International Journal of the Bioflux Society HVM

OPEN ACCESS
Review

Does animal-assisted intervention work? Research review on the effectiveness of AAI with the use of different animal species

Joanna Kapustka, Monika Budzyńska
Department of Animal Ethology and Wildlife Management, Faculty of Animal Sciences and Bioeconomy, University of Life Sciences in Lublin, Lublin, Poland.

Abstract. Animal-assisted interventions (AAI) which include animal-assisted therapy (AAT), animal-assisted activities (AAA) and animal-assisted education (AAE) are becoming more and more popular. Humans began to see many reasons for animals' presence in various types of therapeutic interventions, not only for people with motor and intellectual disabilities, but also to improve the quality of life in elderly people or terminally ill patients. The aim of this article is to characterize the effectiveness of AAI by reviewing scientific literature on this subject. The paper concentrates on different animal species and analyses the research on the influence of equine-assisted interventions, canine-assisted interventions and other types of therapeutic interventions using animals such as: domestic cattle and other farm animals, donkeys, guinea pigs and aquarium fish. Significant positive effects of AAI were observed in most of the studies cited in this paper. Animals can be great motivators during therapy or rehabilitation for both children and adults. There is a growing interest among parents, educators as well as therapists and clinicians in interventions with various species of therapeutic animals that are aimed at improving social and physical functioning. Reviews of the literature suggest that AAIs are effective treatments for a variety of psychosocial and physical problems. The number of studies which investigate and confirm the effectiveness of AAI is increasing. However, more scientific research efforts will be necessary to overcome some weaknesses and improve the empirical basis of AAI.

Key Words: animal-assisted intervention, autism, cerebral palsy, intellectual disability, therapeutic animal

Corresponding Author: M. Budzyńska, email: monika.budzynska@up.lublin.pl

Introduction

The term 'animal therapy' (currently referred to as animal-assisted therapy) was first used by Bovis Levinson in 1964 with reference to his dog, who was much better at interacting with autistic patients than Levinson himself, despite him being a psychiatrist (Fine 2015). Over time, humans began to see more and more reasons for animals' presence in various types of therapeutic interventions, not only for people with motor and intellectual disabilities, but also to improve the quality of life in seniors or terminally ill people (Souter & Miller 2007) and to support the treatment of soldiers returning from the front lines (Charry-Sánchez et al 2018). AAI is a general term for all three types: animal-assisted therapy (AAT), animal-assisted activities (AAA) and animal-assisted education (AAE). AAT refers to therapy with an animal, focused on health improvement and achieving a specific therapeutic goal, AAA refers generally to having a contact with an animal, more focused on wellness and recreational aspect of human–animal relation and AAE refers to interaction with an animal for educational purposes (Cirulli et al 2011; Fine 2015; Lundqvist et al 2017). The aim of this article is to characterize the effectiveness of AAI by reviewing scientific literature on this subject.

The paper concentrates on different animal species and analyses the research on the influence of equine-assisted interventions, canine-assisted interventions and other types of therapeutic interventions using such animals as: domestic cattle and other farm animals, donkeys, guinea pigs and aquarium fish. This paper contains the results of the research on the effectiveness of AAI with different animal species, published in the years 2000-2019 in English-language magazines. Data was obtained by searching for phrases: 'animal-assisted therapy', 'animal-assisted intervention', 'pet therapy', 'equine-assisted therapy', 'equine-assisted activities', 'hippotherapy', 'dog-assisted therapy', 'dog-assisted activities', 'autism', 'cerebral palsy', 'disability', 'multiple sclerosis', 'depression'. Databases such as Science Direct, Taylor & Francis, Wiley Online Library, Springer, Brill, MEDLINE, Oxford Journals and Web of Science were used. Therapeutic sessions can be carried out with various animals, however, the most frequently used are horses and dogs.

Table 1. The effects of equine-assisted interventions on patients

Range of activities	Type of disease, number of patients	Results and References
AAT, AAA Therapeutic horseback riding, daily horse care	Autism, Asperger's Syndrome, 42	↑Oral, motor and planning skills ↓Irritability, lethargy, stereotyped behaviors, hyperactivity (Gabriels et al 2012)
	Autism, 15	↑Empathy↓ Maladaptive behaviors (Anderson & Meints 2016)
	Autism, 20	↑Quality of interaction with parents ↓Autism symptoms (Kern et al 2011)
AAT Therapeutic horseback riding	Autism, 26	↑Gait regularity, social interactions, communication, self-care (Steiner & Kertesz 2015)
	Autism, 19	↑Social cognition, cognitive functions, activity ↓Inattention (Bass et al 2009)
	Spastic cerebral palsy, 25	↑Symmetry of adductor muscle activity, self-concept (Mc Gibbon et al 2009)
	Cerebral palsy, 17	↑Gross motor skills (Sterba et al 2002)
	Cerebral palsy, 11	↑Head and trunk stability (Shurtleff et al 2009)
	Cerebral palsy, 41	No effect on motor functions and quality of life (Davis et al 2009)
	Intellectual disability, 10	↑Motor and cognitive skills (Giagazoglou et al 2012)
	Stroke, 20	↑ Lower body mobility, gait independence (Beinotti et al 2010)
	Spinal cord injury, 12	↑Well-being↓ Spasticity (Lechner et al 2007)
	Intellectual disability, 7	↑Motor and cognitive skills (Lee & Yun 2017)
	MS, 12	↑Balance, step length and regularity (Muñoz-Lasa et al 2011)
	PTSD, 7	↓PTSD symptoms (incl. anxiety, depression, obsessive-compulsive disorder) (Malinowski et al 2018)
AAA Contact with a horse	PTSD, 16	↑Focus ↓Symptoms of trauma, anxiety, depression, alcohol consumption (Earles et al 2015)

Explanation: PTSD - Post-traumatic Stress Disorder, MS – Multiple Sclerosis); ↑ Increase, ↓ Decrease

Equine-assisted interventions and their effects on participants

Equine-assisted interventions are used in therapy and rehabilitation of people with various types of disabilities. The examples of studies showing their influence on patients are presented in Table 1.

What makes equine-assisted therapy (also referred to as horse-assisted therapy or hippotherapy) different from canine-assisted therapy is the fact that it involves not only interaction with a therapeutic animal, but also includes riding it and therefore is very often used as a form of rehabilitation for people with physical disabilities. During horseback riding the pelvis movement of the patient is similar to human movement while walking (Lechner et al 2007). Riding experience appears useful to normalize muscle tone (reduction of spasticity) as well as improve motor functions (posture, balance, coordination) (Muñoz-Lasa et al 2011). Children with autism, which may cause lifelong disability, are frequent participants of hippotherapy (Steiner & Kertesz 2015).

Studies show that regular hippotherapeutic sessions improve motor (Bass et al 2009; Gabriels et al 2012; Steiner & Kertesz 2015), cognitive and emotional functions in children with autism (Bass et al 2009; Kern et al 2011; Gabriels et al 2012; Anderson & Meints 2016). It is also confirmed in the review by Trzmiel et al (2019). The second most common disease in the study is cerebral palsy, causing an inability to move and coordinate the movements (Mc Gibbon et al 2009). It may require lifelong rehabilitation (Sterba et al 2002). Therapeutic horseback riding has a positive impact on motor skills in children with cerebral palsy (Sterba et al 2002; Shurtleff et al 2009), including those with spasticity (Mc Gibbon et al 2009). Mc Gibbon et al (2009) also emphasize that interacting with a horse contributes to an increase in children's self-esteem. Only Davis et al (2009) did not observe a significant impact of hippotherapy on motor skills or quality of life among children with cerebral palsy. People with mental disabilities may suffer from both motor and cognitive impairments, which are caused by brain developmental constraints (Giagazoglou et al 2012), as opposed to a stroke (Beinotti et al 2010) or a spinal cord injury (Lechner et al 2007) which also lead to movement disorders (e.g. loss of independent mobility, spasticity), but they are a consequence of accidents.

Hippotherapy helps to improve motor skills (Beinotti et al 2010; Giagazoglou et al 2012; Lee & Yun 2017). Moreover, it may sometimes result in a recovery, allowing patients to move independently again (Beinotti et al 2010). An attempt is being

Table 2. Effects of canine-assisted interventions on the patients

Range of activities	Type of disease, number of patients	Results and References
AAT **Therapeutic activities incorporating dog**	Hospitalized children, 30	↑Well-being, activity (Kaminski et al 2002)
	Autism, 10	↑Mood, playfulness, social interactions (Martin & Farnum 2002)
	Autism, 22	↑Language use, social interactions (Sams et al 2006)
AAA **Contact and playing with a dog**	Depression, anxiety disorder, 107	↓ Anxiety, depression symptoms (Hunt & Chizkov 2015)
	Depression, anxiety disorder, 8	↑ Mood, social interactions (Le Roux & Kemp 2009)
	Dementia, depression, 28	↑ Well-being ↓Depression symptoms (Olsen et al 2016)
	Exam stress, 48	↑ Mood ↓Salivary cortisol levels (Delgado et al 2017)

↑Increase, ↓ Decrease

made to get the same results in rehabilitation of multiple sclerosis (MS) in order to limit disease progression (Muñoz-Lasa et al 2011). Contact with an animal itself can have a therapeutic effect on patients. Studies on the impact of equine-assisted intervention on post-traumatic stress disorder (PTSD), which may be the result of drastic experiences related to war (Malinowski et al 2018), a serious accident or rape (Earles et al 2015), showed a reduction of numerous PTSD symptoms (Earles et al 2015; Malinowski et al 2018). Certain aspects of mental health were also positively influenced by interaction with a horse. It caused, among other things, an increase in empathy (Anderson & Meints 2016), better contact with parents (Kern et al 2011), lessening the symptoms of anxiety and depression (Earles et al 2015). Muñoz-Lasa et al (2015) analyzed the research on patients with cerebral palsy, autism, spinal cord injury, multiple sclerosis and people after a stroke and found an improvement not only in motor, but also in mental and social skills. Participation in equine-assisted intervention sessions is a special event for patients, since it is not every day they have an opportunity to interact with a horse (Fine 2015).

Canine-assisted interventions and their effects on participants

Canine-assisted therapy (also referred to as dog-assisted therapy or kynotherapy) is, along with hippotherapy, one of the most frequently used types of AAT (Charry-Sánchez et al 2018). This has been proven by numerous studies which focus on the effectiveness of such therapy on patients with various diseases. Canine-assisted intervention as a tool for improving the quality of life in people suffering from chronic stress, loneliness or staying in hospitals has also been a subject of many research studies (Souter & Miller 2007). Table 2 presents some examples of studies on the impact of canine-assisted interventions on improving the health and quality of life in patients.

It can be observed that dog-assisted interventions have a positive impact on the cognitive and emotional sphere. Therapeutic dogs work in centers where children (Kaminski et al 2002; Martin & Farnum 2002; Sams et al 2006; Chur-Hansen et al 2014), as well as adults and elderly people, are staying (Odendaal 2000; Souter & Miller 2007; Le Roux & Kemp 2009; Hunt & Chizkov 2015; Olsen et al 2016). It is used as a treatment method for people with autism. The authors of the research papers emphasize that contact with a dog is often a first step, after which children with autism become more responsive to the environment (Martin & Farnum 2002; Sams et al 2006). Other studies show improvement in children's mood (Muñoz-Lasa et al 2015). Children prefer interacting with a real dog, rather than playing with a ball or a toy dog (Martin & Farnum 2002). Studies in the elderly people, suffering from dementia or Alzheimer's disease, show that regular visits of a therapeutic dog have positive effects on the quality of life and reduce the symptoms of depression (Olsen et al 2016). This is also confirmed by Souter & Miller (2007) as well as Muñoz-Lasa et al (2015). After analyzing the research papers on the effects of AAI, Perkins et al (2008) also made a conclusion that human-dog interaction may have a positive impact on dementia patients in care facilities. For most children, hospitals are usually not a very pleasant place to be (Chur-Hansen et al 2014). Dogs visiting hospitalized children can improve their well-being and quality of life. Kaminski et al (2002) conducted detailed research on the impact of dog-assisted therapy on children staying in hospitals. Although there were no significant changes in physiological parameters, the children's opinions were positive. Therefore, the authors concluded that visits of therapeutic dogs in hospitals are worth organizing. Lonely seniors staying in care facilities and often suffering from depression (Banks & Banks 2002) may feel much better after such visits. Depression can affect anyone, not only lonely and elderly people. Studies by Hunt & Chizkov (2015) indicate that canine-assisted therapy, which effectively reduces stress and depression symptoms in patients, may be a valuable addition to psychotherapy. Delgado et al (2017) conducted research on how canine-assisted activity affects students, for whom numerous aspects of undertaking higher education might be extremely stressful. In those who had contact with a therapeutic dog, a decrease in blood cortisol levels and improved mood before exams were observed. A properly prepared dog can be beneficial for people with various ailments and help them improve their health and well-being (Cirulli et al 2011).

Table 3. Animal-assisted interventions with the use of various animal species and their effects on patients

Animal	Range of activities	Type of disease, number of patients	Results and References
Domestic donkey	AAA Contact with animals	Intellectual disability, 15	↑ Self-reliance, social interaction (Borioni et al 2012)
Farm animals (cattle, horse, poultry, pig, sheep)	AAI Care and contact with animals	Mental disorders (schizophrenia, cognitive and anxiety disorders, personality disorders), 60	↑ Self-reliance, coping with new situations ↓ Anxiety symptoms (Berget et al 2008; Berget & Braastad 2011)
Dairy cattle	AAI Care and contact with animals	Depression, 14	A close to significant positive effect on well-being and self-confidence (Pedersen et al 2011)
Guinea pig	AAT Contact with animals, observation of animal behavior	Autism, 9	↑ Quantity and quality of social contact (Kršková et al 2010)
Aquarium fish	AAA Observation of animal behavior	Alzheimer's disease, 62	↑ Food consumption ↓ Consumption of dietary supplements (Edwards & Beck 2002)

↑Increase, ↓ Decrease

Therapy interventions with various animal species and their impact on participants

AAI is not limited to dogs or horses. In publications on this subject, other animal species, such as donkeys (Borioni et al 2012), farm animals (Berget et al 2008; Berget & Braastad 2011; Pedersen et al 2011; Borioni et al 2012), birds, aquarium fish (Cherniack & Cherniack 2014) and even guinea pigs (Kršková et al 2010) can be found. AAI, which includes AAT, also uses other animal species, e.g. alpaca (Kapustka & Budzyńska 2020), dolphin (Brensing et al 2003), cat (Motlová 2018), however, the research on the effectiveness of these species are very limited or not available. Research by Brensing et al (2003) on ultrasounds emitted by dolphins did not confirm their therapeutic effect on human tissues. Their hypothesis that dolphins manifest a behavior resulting in human exposure to ultrasound in doses similar to those in medical treatment sessions, had to be rejected because the time of ultrasound emission directly reaching a patient is not long enough. Feline-assisted intervention (also referred to as cat-assisted intervention) is also becoming more and more popular. Motlová (2018) suggests that feline-assisted intervention may bring benefits to nursing home residents, taking into account many aspects of their lives (physical activity, mood, memory and concentration), but still there is no direct evidence (a long-term study) to support this. Cat-assisted activities can be provided individually or in a group using at least two forms: passive (watching the cat) or active (a senior-cat interaction, e.g. playing, stroking, feeding). Interaction with a cat may have positive impact on life quality of elderly people in nursing homes by increasing their physical activity, improving mood, memory and concentration, and also reducing stress, loneliness and isolation. Kapustka & Budzyńska (2020) suggest that alpacas are suitable animals to be used in AAI because of their gentleness and ability to be trained. Table 3 presents the effects of therapeutic interventions with various animal species.

In their research, Norwegian scientists (Berget et al 2008; Berget & Braastad 2011) focused on the effects of working and being surrounded by farm animals, on patients diagnosed with various mental disorders. Animals such as cattle, horses, rabbits, poultry, pigs, sheep, cats and dogs living on a farm were included in research (Berget et al 2008; Berget & Braastad 2011). In both studies, working on the farm and taking care of the animals served as a form of therapy. The methodologies were very much alike. The results showed a significant increase in self-reliance and coping with new situations and a decrease in the occurrence of anxiety symptoms, suggesting that this type of activities might be a good addition to conventional therapy methods (Berget et al 2008; Berget & Braastad 2011). Similar studies were conducted by Pedersen et al (2011), but they did not show a strong impact of work with dairy cattle on improving the participants' health. Research on the impact of working with farm animals on psychiatric patients was analyzed by Berget & Braastad (2011). They confirmed the benefits mentioned above, however, they indicated that the support of the host (farmer) was also important. In Australia, pilot surveys were conducted on AAI as a method of improving the quality of life in refugees from Afghanistan, Iran or India, who often miss their home and culture. It was found that the best animal for this type of activity would be a donkey (Every et al 2017). Borioni et al (2012) noticed that contact with donkeys improved the condition of patients with mental retardation. Hence, it is pointed out that onotherapy (donkey-assisted therapy) may be an effective alternative to hippotherapy (Borioni et al 2012). An interesting study was carried out by Edwards & Beck (2002). Many research studies were conducted on dogs and cats, since they are frequent guests in care centers. However, effects of aquarium fish on patients had not been checked before. Edwards & Beck (2002) noticed some positive changes in patients who observed the behavior of aquarium fish, namely, an increase in food consumption, weight gain and a decrease in consumption of dietary supplements. Kršková et al (2010) examined the

impact of contact with guinea pigs on autistic children. The presence of an animal significantly affected the quantity and quality of children's contacts with people they knew. However, when confronted with a stranger, young patients preferred to interact with an animal.

Conclusions

Animal-assisted interventions are becoming more and more popular. Applying them as a valuable addition to a treatment or rehabilitation, however, should be supported by scientific research confirming their effectiveness (Odendaal 2000). Unfortunately, this research area is still lacking standardization (Palley et al 2010; Chur-Hansen et al 2014). Significant positive effects of AAI were observed in most of the studies cited in this paper, although some authors admitted to certain limitations (weaknesses), for instance lack of a control group, a small experimental group (fewer than 10 people) or inability to examine long-term effects. Palley et al (2010) presented three ideas, implementation of which could improve research reliability: 1. Standardizing terminology within the broadly understood AAI 2. Creating a universal formula for collecting patient data 3. Determination of standard endpoints indicating the effectiveness of a method (e.g. a heart rate measurement should be the endpoint when indicating the effects of AAT on patients after myocardial infarction). It will help to determine whether therapy has a real impact on patients, excluding at the same time other possibilities, such as the placebo effect (Odendaal 2000).

In conclusion, animals can be great motivators during therapy or rehabilitation for both children and adults. There is a growing interest among parents, educators as well as therapists and clinicians in interventions with various species of therapeutic animals that are aimed at improving social and physical functioning. Reviews of the literature suggest that AAI are effective treatments for a variety of psychosocial and physical problems. The number of studies which investigate and confirm the effectiveness of AAI is increasing. However, more scientific research efforts will be necessary to overcome some weaknesses and improve the empirical basis of AAI.

References

Anderson S, Meints K. The effects of equine-assisted activities on the social functioning in children and adolescents with autism spectrum disorder. J Autism Dev Disord 2016;46:3344-3352. doi: 10.1007/s10803-016-2869-3.

Banks MR, Banks WA. The effects of animal-assisted therapy on loneliness in an elderly population in long-term care facilities. J Gerontol A Biol Sci Med Sci 2002;57A(7):428-432. doi: 10.1093/gerona/57.7.m428

Bass MM, Duchowny CA, Llabre MM. The effect of therapeutic horseback riding on social functioning in children with autism. J Autism Dev Disord 2009;39:1261-1267. doi: 10.1007/s10803-009-0734-3

Beinotti F, Correia N, Christofoletti G, Borges G. Use of hippotherapy in gait training for hemiparetic post-stroke. Arq Neuropsiquiatr 2010;68(6):908-913. doi: 10.1590/s0004-282x2010000600015

Berget B, Braastad BO. Animal-assisted therapy with farm animals for persons with psychiatric disorders. Ann Ist Super Sanita 2011;47(4):384-390. doi: 10.4415/ANN_11_04_10.

Berget B, Ekeberg Ø, 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. Clin Pract Epidemiol Ment Health 2008;4(9):1-7. doi: 10.1186/1745-0179-4-9

Borioni N, Marinaro P, Celestini S, Del Sole F, Magro R, Zoppi D, Mattei F, Dall' Armi V, Mazzarella F, Cesario A. Bonassi S. Effect of equestrian therapy and onotherapy in physical and psycho-social performances of adults with intellectual disability: A preliminary study of evaluation tools based on the ICF classification. Disabil Rehabil 2012;34(4):279-287. doi: 10.3109/09638288.2011.605919

Brensing K, Linke K, Todt D. Can dolphins heal by ultrasound? J Theor Biol 2003;225:99-105. doi: 10.1016/s0022-5193(03)00225-x

Charry-Sánchez JD, Pradilla I, Talero-Gutiérrez C. Animal-assisted therapy in adults: A systematic review. Complement Ther Clin Pract 2018;32:169-180. doi: 10.1016/j.ctcp.2018.06.011

Cherniack EP, Cherniack AR. The benefit of pets and animal-assisted therapy to the health of older individuals. Curr Gerontol Geriatr Res 2014;2014:1-9. doi: 10.1155/2014/623203

Chur-Hansen A, McArthur M, Winefield H, Hanieh E, Hazel S. Animal-assisted interventions in children's hospitals: A critical review of the literature. Anthrozoös 2014;27(1):5-18. doi: 10.2752/175303714X13837396326251

Cirulli F, Borgi M, Berry A, Francia N, Alleva E. Animal-assisted interventions as innovative tools for mental health. Ann Ist Super Sanita 2011;47(4):341-348. doi: 10.4415/ANN_11_04_04

Davis E, Davies B. Wolfe R, Raadsveld R, Heine B, Thomason P, Dobson F, Graham HK. A randomized controlled trial of the impact of therapeutic horse riding on the quality of life, health, and function of children with cerebral palsy. Dev Med Child Neurol 2009;51:111-119. doi: 10.1111/j.1469-8749.2008.03245.x

Delgado C, Toukonen M, Wheeler C. Effect of canine play interventions as a stress reduction strategy in college students. Nurse Educ 2018;43(3):149-153. doi: 10.1097/NNE.0000000000000451

Earles JL, Vernon LL, Yetz JP. Equine-assisted therapy for anxiety and posttraumatic stress symptoms. J Trauma Stress 2015;28:149-152. doi: 10.1002/jts.21990

Edwards NE, Beck AM. Animal-assisted therapy and nutrition in Alzheimer's disease. West J Nurs Res 2002;24(6):697-712. doi: 10.1177/019394502320555430

Every D, Smith K, Smith B, Trigg J, Thomson K. How can a donkey fly on the plane? The benefits and limits of animal therapy with refugees. Clin Psychol (Aust Psychol Soc) 2017;21:44–53. doi: 10.1111/cp.12071

Fine AH. Handbook on animal-assisted therapy. Foundations and guidelines for animal-assisted interventions, pp. 20, 54. 4th ed. Academic Press is an imprint of Elsevier, Pomona, CA, USA, 2015.

Gabriels RL, Agnew JA, Holt KD, Shoffner A, Zhaoxing P, Ruzzano S, Clayton GH, Mesibov G. Pilot study measuring the effects of therapeutic horseback riding on school-age children and adolescents with autism spectrum disorders. Res Autism Spectr Disord 2012;6:578-588.

Giagazoglou P, Arabatzi F, Dipla K, Liga M, Kellis E. Effect of a hippotherapy intervention program on static balance and strength in adolescents with intellectual disabilities. Res Dev Disabil 2012;33:2265-2270. doi: 10.1016/j.ridd.2012.07.004

Hunt MG, Chizkov RR. Are therapy dogs like xanax? Does animal-assisted therapy impact processes relevant to cognitive behavioral psychotherapy? Anthrozoös 2015;27(3):457-469. doi:10.2752/175303714X14023922797959

Kaminski M, Pellino T, Wish J. Play and pets: The physical and emotional impact of child-life and pet therapy on hospitalized children. Child Health Care 2002;31(4):321-335. doi: 10.1207/S15326888CHC3104_5

Kapustka J, Budzyńska M. Behavioural reactivity of alpacas during care procedures and training. Med Weter 2020;76(2):107-110. doi: dx.doi.org/10.21521/mw.6284 [in Polish]

Kern JK, Fletcher CL, Garver CR., Mehta JA, Grannemann BD, Knox KR, Richardson TA, Trivedi MH. Prospective trial of equine-assisted activities in autism spectrum disorder. Altern Ther Health Med 2011;17(3):14-20.

Kršková L, Talarovičová A, Olexová L. Guinea pigs - The "small great" therapist for autistic children, or: Do guinea pigs have positive effects on autistic child social behavior? Soc Anim 2010;18:139-151. doi: 10.1163/156853010X491999

Le Roux MC, Kemp R. Effect of a companion dog on depression and anxiety levels of elderly residents in a long-term care facility. Psychogeriatrics 2009;9:23-26. doi:10.1111/j.1479-8301.2009.00268.x

Lechner HE, Kakebeeke TH, Hegemann D, Baumberger M. The effect of hippotherapy on spasticity and on mental well-being of persons with spinal cord injury. Arch Phys Med Rehabil 2007;88:1241-1248. doi: 10.1016/j.apmr.2007.07.015

Lee JH, Yun CK. Effects of hippotherapy on the thickness of deep abdominal muscles and activity of daily living in children with intellectual disabilities. J Phys Ther Sci 2017;29(4):779-782. doi: 10.1589/jpts.29.779

Lundqvist M, Carlsson P, Sjödahl R, Theodorsson E, Levin L. Patient benefit of dog-assisted interventions in health care: a systematic review. BMC Complement Altern Med 2017;17:358. doi: 10.1186/s12906-017-1844-7

Malinowski K, Yee C, Tevlin JM, Birks EK, Durando MM, Pournajafi-Nazarloo H, Cavaiola AA, McKeever KH. The effects of equine-assisted therapy on plasma cortisol and oxytocin concentrations and heart rate variability in horses and measures of symptoms of post-traumatic stress disorder in veterans. J Equine Vet Sci 2018;64:17-26. doi: 10.1016/j.jevs.2018.01.011

Martin F, Farnum J. Animal-assisted therapy for children with pervasive developmental disorders. West J Nurs Res 2002;245(6):657-670. doi: 10.1177/019394502320555403

Mc Gibbon NH, Benda W, Duncan BR, Silkwood-Sherer D. Immediate and long-term effects of hippotherapy on symmetry of adductor muscle activity and functional ability in children with spastic cerebral palsy. Arch Phys Med Rehabil 2009;90(6):966-974. doi: 10.1016/j.apmr.2009.01.011

Motlová L. Felinotherapy in nursing homes. Journal of Nursing, Social Studies, Public Health and Rehabilitation 2018;3-4:101-110.

Muñoz-Lasa S, Ferriero G, Valero R, Gomez-Muñiz F, Rabini A, Varela E. Effect of therapeutic horseback riding on balance and gait of people with multiple sclerosis. G Ital Med Lav Ergon 2011;33(4):462-467.

Muñoz-Lasa SM, Bocanegra NM, Alcaide RV, Arratibel MAA, Donoso EV, Ferriero G. Animal-assisted interventions in neurorehabilitation: A review of the most recent literature. Neurología 2015;30(1):1-7. doi: 10.1016/j.nrl.2013.01.012

Odendaal JSJ. Animal-assisted therapy: magic or medicine? J Psychosom Res 2000;49:275-280. doi: 10.1016/S0022-3999(00)00183-5

Olsen C, Pedersen I, Bergland A, Enders-Slegers MJ, Patil G, Ihlebaek C. Effect of animal-assisted interventions on depression, agitation and quality of life in nursing home residents suffering from cognitive impairment or dementia: A cluster randomized controlled trial. Int J Geriatr Psychiatry 2016;31:1312-1321. doi: 10.1002/gps.4436

Palley LS, O'Rourke PP, Niemi SM. Mainstreaming animal-assisted therapy. ILAR J 2010;51(3):199-207. doi: 10.1093/ilar.51.3.199

Pedersen I, Nordaunet T, Martinsen EW, Berget B, Braastad BO. 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 Ment Health Nurs 2011;32:493-500. doi: 10.3109/01612840.2011.566982

Perkins J, Bartlett H, Travers C, Rand J. Dog-assisted therapy for older people with dementia: A review. Australas J Ageing 2008;27(4):177-182. doi: 10.1111/j.1741-6612.2008.00317.x

Sams MJ, Fortney EV, Willenbring S. Occupational therapy incorporating animals for children with autism: A pilot investigation. Am J Occup Ther 2006;60(3):268-274. doi: 10.5014/ajot.60.3.268

Shurtleff TL, Standeven JW, Engsberg JR. Changes in dynamic trunk/head stability and functional reach after hippotherapy. Arch Phys Med Rehabil 2009;90(7):1185- 1195. doi: 10.1016/j.apmr.2009.01.026

Souter MA, Miller MD. Do animal-assisted activities effectively treat depression? A meta-analysis. Anthrozoös 2007;20(2):167-180. doi: 10.2752/175303707X207954

Steiner H, Kertesz Z. Effects of therapeutic horse riding on gait cycle parameters and some aspects of behavior of children with autism. Acta Physiol Hung 2015;102(3):324-335. doi: 10.1556/036.102.2015.3.10

Sterba JA, Rogers BT, France AP, Vokes DA. Horseback riding in children with cerebral palsy: Effect on gross motor function. Dev Med Child Neurol 2002;44:301-308. doi: 10.1017/s0012162201002122

Trzmiel T, Purandare B, Michalak M, Zasadzka E, Pawlaczyk M. Equine-assisted activities and therapies in children with autism spectrum disorder: A systematic review and a meta-analysis. Complement Ther Med 2019;42:104-113. doi: 10.1016/j.ctim.2018.11.004

Authors

•Joanna Kapustka, Faculty of Animal Sciences and Bioeconomy, Department of Animal Ethology and Wildlife Management, University of Life Sciences in Lublin, ul. Akademicka 13, 20-950 Lublin, Poland; email: joanna.kapustka@up.lublin.pl

•Monika Budzyńska, Faculty of Animal Sciences and Bioeconomy, Department of Animal Ethology and Wildlife Management, University of Life Sciences in Lublin, ul. Akademicka 13, 20-950 Lublin, Poland; email: monika.budzynska@up.lublin.pl

Citation	Kapustka J, Budzyńska M. Does animal-assisted intervention work? Research review on the effectiveness of AAI with the use of different animal species. HVM Bioflux 2020;12(3):135-141.
Editor	Antonia Macarie
Received	15 June 2020
Accepted	24 June 2020
Published Online	31 August 2020
Funding	None reported
Conflicts/ Competing Interests	None reported