REVIEW ARTICLE

Autism Spectrum Disorder and Pet Therapy

Caitlin Siewertsen; Emma French; Masaru Teramoto, PhD, MPH

ABSTRACT

Autism Spectrum Disorder (ASD) encompasses a wide range of social and mental afflictions that are difficult to treat. Due to a lack of established treatments for ASD, alternative therapies have been the primary form of intervention. One of these alternatives is pet therapy, a field that has experienced growing interest and has recently accumulated studies that investigate its efficacy. This article reviews and summarizes that effectiveness as well as the findings and limitations associated with pet therapy for ASD. The majority of research on ASD and pet therapy has examined children and has primarily used dogs and horses for therapy. Studies have shown positive effects for the therapy, including high satisfaction rates among the participants' families. Major limitations of studies in the current literature include the lack of control groups and small sample sizes. Future research should incorporate better study designs and large samples to validate pet therapy as an appropriate treatment for ASD. (*Adv Mind Body Med.* 2015;29(2):22-25.)

Caitlin Siewertsen and Emma French are students in the Department of Health Sciences at Drexel University in Philadelphia, Pennsylvania. Masaru Teramoto, PhD, MPH, is an assistant teaching professor in the College of Nursing and Health Professions, Department of Health Sciences, at Drexel University.

Corresponding author: Masaru Teramoto, PhD, MPH
E-mail address: masaru.teramoto@drexel.edu

Pasco[1] defines *autism spectrum disorder* (ASD) as a mental condition for which the signs include difficulty in communicating and forming relationships with others and struggles with language and abstract concepts. He indicates that this condition usually is detected in early childhood when a child is approximately 2 to 3 years old, with its signs varying in degrees of severity and encompassing a wide range of conditions, which makes it difficult to identify a specific etiology for the disorder. Pasco identifies gene mutations as a possible explanation for ASD and states that the condition affects various pathways and connections in the brain regardless of its etiology, causing a lifelong impairment with no apparent cure. Because of the incurable nature of ASD and a rapid increase in the cases of ASD that have been seen in the United States and Europe for the past 2 decades, Pasco stresses the importance of finding alternative treatments has become greatly magnified.

Such efforts are currently underway. In particular, experimentation with alternatives, such as pet therapy, has steadily increased.[2] Pet therapy uses animals in interactive activities with ASD patients that are geared toward improving their conditions. In fact, it has been proposed that pet therapy can "improve patients' social, emotional, or cognitive functioning."[3]

A handful of studies have been conducted to quantify the efficacy of pet therapy, yet many of these studies, including a systematic review by O'Haire,[4] accentuate the need for further research. For instance, it is essential to identify which animals are most effective for pet therapy. Primarily dogs and horses have been studied for this purpose, but other mammals, such as dolphins, may be effective as well.[5] The current article examines whether pet therapy can be a viable treatment for individuals with ASD. Because no established cure for ASD exists, validating alternative options for treatment, such as pet therapy, is of great importance. The authors of the current article hypothesize that improvements can occur in ASD patients' social and cognitive functioning when they experience pet therapy.

SIGNS AND ETIOLOGY

ASD involves "common neurodevelopmental disorders that occur along a broad continuum of severity, with impairments in social interactions, communication, and behavior."[6] Newschaffer et al[7] indicate no clear findings exist as to whether ASD is caused by genetics only or to environmental factors that affect gene development; further, the authors indicate that ADS is now a common developmental disorder, second only to

intellectual disability. Abrahams and Geschwind[8] concur, stating that no definitive evidence supports the idea that particular genes are solely responsible for the occurrence of ASD. They state that some molecules have been linked to the disorder but that no identified molecules can cause all types of ASD. Some parents believe that vaccines can cause ASD, but research has concluded that the thimerosal and measles/mumps/rubella vaccines are not the cause.[9] These findings illustrate how complicated the etiology of ASD is at this moment. Even now that a spectrum has been identified for the disease, it is quite challenging to link everything.

Parents are becoming more alert to the signs of ASD and are more likely to consult their physicians when they observe the signs, and the increased percentage of ASD identifications observed recently may involve the recognition of ASD signs in previously undiagnosed children.[10] After a child is diagnosed with ASD, many lifestyle changes occur within the child's family, and depending on the severity of the disease, these changes can affect quality of life.[11]

Because the severity of ASD and the way in which the disease presents in a child vary widely across the spectrum, it is important to take into account the different degrees of the disease.[12] Abrahams and Geschwind[8] state that "autistic disorder is the most severe end of a group of neurodevelopmental disorders referred to as autism spectrum disorders," and they introduce the idea of autism being a single continuum because of "a growing list of single genetic lesions, each of which seems to be largely sufficient to cause an ASD," indicating that this disorder involves impairments in social interactions, restricted or repetitive behavior, and language disabilities.

Although genetic advances have occurred, identifying the physical signs of ASD is much the same as it was in the past. Because those signs have become more commonly known, parents are often able to recognize them, triggering a visit to the child's primary care physician to obtain a diagnosis.[13] Those physicians generally are the first to communicate with parents about a child's ASD, and they use a set of criteria that allows identification of ASD and can offer resources to help the child, including specific medical clinics.[13]

Because a sign of ASD is the existence of impaired social interactions, researchers investigating autism and attachment have thought that children with ASD do not develop strong attachments or affectional bonds infants have for their mother figure.[14] Rutgers et al[14] indicate that observers often see impairment in reciprocal social interaction in children with autism that is related to lack of attachment; however, the researchers have concluded that children with autism do show attachment security. They state that more than one-half of children with autism display that trait, and as is the case with other children, children with autism prefer relationships with their mothers instead of strangers.[14]

CONVENTIONAL TREATMENTS

Treatments for ASD are scarce. According to Levy et al,[15] no source of unified knowledge is available regarding which treatments are effective, and multiple treatments that are effective are needed across the entire spectrum. Given that ASD encompasses such a wide spectrum of symptoms, Levy et al[15] indicate that a change must occur in how symptoms are classified to make early identification possible and to improve treatment effectiveness. Currently, the main focus of treatment is to address core domains of autism, including socialization, communication, and behavior, on a wider treatment basis.

According to Levy et al,[15] most interventions are carried out by families or schools and include comprehensive treatment programs, including special education classes in schools, developmental therapy focusing on improving communication, and treatments that target behavioral change and train parents on how to adjust their home and other settings.[15] All of those treatments can be used to improve the child's functionality and rectify shortcomings in his or her main skills. If needed, those treatments can be used together or separately. Most school systems have special education classes for children with disabilities, including children with autism. As of now, no treatments can permanently resolve ASD, and no biological treatments are available that can help all symptoms of ASD.[15]

When children have ASD, their lives change as they attempt to cope with the disorder. According to Burgess et al,[11] parents need to contend with these changes as well and must try to supply the children with the same experiences as other children have. Those researchers indicate that parents and medical practitioners must take into account some necessary outcomes of treatment to assure the future of children with autism (ie, the ability of these children to eventually have academic success, become employed, and live on their own).

Although research on outcomes is limited, Burgess et al[11] indicate that some longitudinal data have shown that people with ASD experience poor outcomes for the measures listed earlier. The researchers indicated that a movement is occurring to make treatments that improve quality of life more common and usable for children with autism, with these efforts potentially influencing the development of new treatments and providing new insight into ways to improve the lives of people with autism.

PET THERAPY

Individuals with ASD often suffer from difficulty in focusing, responding to sensory stimuli, and communicating with others, all of which have been shown to improve after the use of pet therapy.[16] A variety of studies support the concept that animals can be particularly effective with children who have ASD. For example, research has shown that such children tend to prefer pictures of animals to those of humans and are less responsive to the sound of the human voice as opposed to other stimuli.[17] According to a study by Berry et al,[18] introducing a dog to children with ASD can result in a reduction of stress, anxiety, and irritation and can also promote a more relaxed environment for those children.

Such findings were most likely the trigger for the first investigations on use of pet therapy for individuals with ASD. Presently, many trials have been conducted. Fourteen of the

trials were evaluated in a systematic review by O'Haire[4] on animal-assisted therapy when used for treatment of ASD. In that review, it was reported that the most commonly used animals for therapies were dogs and horses. Although indicating that further research was required to determine which species of animal is most effective, the review found no significant differences between the use of dogs and horses. All of the studies in that review showed improvements in 1 or more categories related to ASD and its symptoms.

A study by Ward et al[16] investigated the social and sensory benefits that therapeutic horseback riding could have on children with ASD. The study showed positive effects on participants' abilities to communicate and a reduction in the severity of their ASD as measured by the autism index (mean = 100; standard deviation = 15).[19] Moreover, the positive effect of the riding program was not only observed in the therapeutic setting but also by the children's teachers in a classroom setting, as found in progress reports from these teachers for the participants.

Grandgeorge et al[17] suggested that introduction of a therapy dog could be particularly effective for improving prosocial behavior in children with ASD. This study recorded data from a control group of families that had never owned a dog and an intervention group of families that had owned a dog since the birth of their children with ASD. Interestingly, the researchers found that the prosocial behavior between those families that had never owned a dog and those that had always owned a dog was approximately the same. Meanwhile, the group in which a dog was newly introduced showed a significant improvement in prosocial behavior. The researchers also performed a comparison of assessments of the children by parents versus those of trained professionals and reported that the listed improvements were nearly the same.

Most of past studies investigating the use of pet therapy for ASD focused on psychosocial aspects of ASD but not on physiological factors. In a research trial by Viau et al,[20] however, the researchers tackled the physiological factors by quantifying the effects of pet therapy on cortisol secretions. The cortisol level they primarily measured was the cortisol awakening response (CAR), a marker of life stress. After the introduction of a dog into families, parents stated that problematic behaviors from their children subsequently decreased. Also, a significant 48% decrease in CAR levels was observed among the children with ASD. Moreover, this large decrease did not occur as a spike in the initial weeks of the study but rather as a gradual decrease that accumulated with time. This finding of a gradual decrease in the CAR suggested that the change was most likely to have occurred as a result of the presence of the dog.[20]

Ward et al[16] have proposed that searching for further answers in the field of pet therapy for ASD is justifiable. According to Berry et al,[18] future research involving pet therapy in practice would be particularly invaluable because of the multiple, positive effects listed previously on participants as well as on their family members. For instance, those researchers concluded the use of assistance and therapy dogs can reduce the severity of ASD. Their study was significant not only because it provided further evidence that pet therapy can improve quality of life for those with ASD, but also because it found that therapy dogs can promote the comfort and happiness of the whole family by facilitating interactions. Those findings were gathered from questionnaires completed by parents during and after the study.

That study was not the only one that found a high level of satisfaction for all family members involved in pet therapy for ASD. In a prospective trial conducted by Kern et al[21] on the use of equine therapy for ASD, similar feedback was received from the study's participants. During and after that study, a high level of satisfaction and an increase in quality of life were reported by both children with ASD and their parents. Even in a less traditional form of animal-assisted therapy for ASD that involved patients' interactions with dolphins, families participating in the study noted that the experience was highly enjoyable and that the therapy had a positive effect on their children.[5]

Speculation has occurred that the inconveniences may outweigh the benefits of pet therapy (eg, when pet therapy entails integrating a dog into a family).[22] In a qualitative study by Burrows and Adams,[22] the difficulties were quantified regarding the issues that families faced when they took on a therapy dog for the treatment of their children with autism. The families noted some inconveniences that accompanied this form of therapy, but the overwhelming finding was that the families were highly satisfied despite any stress that having the dog had added and that they believed that the benefits largely outweighed the inconveniences.[22]

LIMITATIONS AND FUTURE RESEARCH

Current literature has exposed multiple challenges in studying treatments for ASD as well as the need for future research. After reviewing the literature, the authors were clear that the most common issues in past studies were the lack of control groups and the small sample sizes.[16-18, 20, 21] In addition, results were often drawn from subjective questionnaires that were often completed by parents. Therefore, researchers have identified the need for measurements to be less biased through quantification of results.[16,18,20]

Three of the studies also pointed out the lack of a standard method to assess children with ASD.[4,16,18] Moreover, a possibility exists that perceived positive results from pet therapy have occurred because of a child's exposure to stimuli that is different and exciting rather than because of exposure to an animal.[5,17,18]

Needs for future research should be addressed. First, it is essential to identify which form of pet therapy is most effective.[16] Also, the systematic review by O'Haire[4] indicated that a large gap of understanding existed as to whether animal-assisted therapy can be useful for adults with ASD because all 14 studies examined in the review were done with children only. In addition, in a study on therapy dogs by Berry et al,[18] the researchers discovered that hand flapping, a symptom of ASD, increased with the introduction of the dogs to the

children with autism. The researchers indicated that this symptom could be of concern because individuals with ASD often have amplified responses to sensory stimuli; therefore, the introduction of a dog might exacerbate that effect. They noted that further research was needed to determine if the introduction of animals could be a potential problem. More research should also be conducted to examine the effects of pet therapy on physiological variables, such as cortisol and ways in which the therapy is related to a decrease in stress.[20]

Because of the positive results of pet therapy for children with ASD reported in the literature, new technologies and ideas have emerged. For example, a research hypothesis by Altschuler[23] suggests the possibility of mimicking pet therapy by online play with virtual pets in which a child with ASD cares for a pet. This proposal calls attention to a deficit in individuals with ASD in the function of mirror neurons, which are responsible for identifying self-movement as well as for detecting and responding to the movement of another person. The paper discussed the fact that individuals with ASD tend to have difficulty with this active response to body language, affecting their ability to pick up on cues from others. Altschuler proposes that ASD children can develop these neurons by using a simulated game in which they adopt and care for a pet. By learning to respond to the movements and needs of the pet, Altschuler suggests that it could be possible that a child's response to others in a real-world environment could be learned.

Also, a technology to simulate the experience of equine pet therapy, with lower expense and more convenience, has been developed. The use of this technology, which simulates what it is like to ride a horse, was assessed for use with ASD patients in a trial by Wuang et al.[24] Because children with ASD suffer from sensory deficits and unusual postures and movements, the developers of the technology had postulated that the simulation of horseback riding could help to improve those functions.[24] The study found that a significant improvement in the children's gross motor functions occurred, both on the simulator and in other aspects of life.[24] The results also showed large improvements in the children's expression of emotions and behavior.[24]

CONCLUSIONS

Much speculation occurs on how ASD is caused and how it can be treated. ASD affects multiple functions controlled by the human brain, such as cognitive reasoning and social behaviors. Research has proposed that pet therapy could be an effective treatment for ASD, with the most common animals used being dogs and horses. Although no one therapy has been shown to be superior to any other, pet therapy has the potential to improve 1 or more functions affected by ASD.

Using therapy that involves animals could also have positive effects on a patient's life outside of the therapy setting. Improvements on psychological factors, including better social interactions and reductions in severity of ASD, also seem to improve when animals are introduced to patients. In addition, physiological changes, such as increased motor function and decreased physiological reactions to life stress, are possible. Although a handful of studies have suggested that the above improvements from pet therapy are possible, research has yet to validate whether the effects are indeed caused by the treatment (ie, are not placebo effects); whether the effects are temporary or permanent; and whether pet therapy is beneficial to adults with ASD as well as to children with autism. Future research should be conducted to address these questions and determine the exact mechanisms, together with the long-term effects, of pet therapy for ASD patients, including both children and adults.

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REFERENCES

1. Pasco G. The diagnosis and epidemiology of autism. *Tizard Learning Disabil Rev*. 2011;16(4):5-19.
2. Hanson E, Kalish LA, Bunce E, et al. Use of complementary and alternative medicine among children diagnosed with autism spectrum disorder. *J Autism Dev Disord*. 2007;37(4):628-636.
3. Janssen MA. Therapeutic interventions: animal assisted therapy programs. *Palaestra*. 1998;14(4):40-42.
4. O'Haire ME. Animal-assisted intervention for autism spectrum disorder: a systematic literature review. *J Autism Dev Disord*. 2013;43(7):1606-1622.
5. Salgueiro E, Nunes L, Barros A, Maroco J, Salgueiro AI, Dos Santos ME. Effects of a dolphin interaction program on children with autism spectrum disorders: an exploratory research. *BMC Res Notes*. April 2012;5:199.
6. Caronna EB, Milunsky JM, Tager-Flusberg H. Autism spectrum disorders: clinical and research frontiers. *Arch Dis Child*. 2008;93(6):518-523.
7. Newschaffer CJ, Croen LA, Daniels J, et al. The epidemiology of autism spectrum disorders. *Annu Rev Public Health*. 2007;28:235-258.
8. Abrahams BS, Geschwind DH. Advances in autism genetics: on the threshold of a new neurobiology. *Nat Rev Genet*. 2008;9(5):341-355.
9. Gerber JS, Offit PA. Vaccines and autism: a tale of shifting hypotheses. *Clin Infect Dis*. 2009;48(4):456-461.
10. Blumberg SJ, Bramlett MD, Kogan MD, Schieve LA, Jones JR, Lu MC. Changes in prevalence of parent-reported autism spectrum disorder in school-aged US children: 2007 to 2011–2012. *Natl Health Stat Report*. 2013;(65):1-11.
11. Burgess AF, Gutstein SE. Quality of life for people with autism: raising the standard for evaluating successful outcomes. *Child Adolesc Ment Health*. 2007;12(2):80-86.
12. Geschwind DH. Autism: many genes, common pathways? *Cell*. 2008;135(3):391-395.
13. Johnson CP, Myers SM; American Academy of Pediatrics Council on Children with Disabilities. Identification and evaluation of children with autism spectrum disorders. *Pediatrics*. 2007;120(5):1183-1215.
14. Rutgers AH, Bakermans-Kranenburg MJ, van Ijzendoorn MH, van Berckelaer-Onnes IA. Autism and attachment: a meta-analytic review. *J Child Psychol Psychiatry*. 2004;45(6):1123-1134.
15. Levy SE, Mandell DS, Schultz RT. Autism. *Lancet*. 2009;374(9701):1627-1638.
16. Ward SC, Whalon K, Rusnak K, Wendell K, Paschall N. The association between therapeutic horseback riding and the social communication and sensory reactions of children with autism. *J Autism Dev Disord*. 2013;43(9):2190-2198.
17. Grandgeorge M, Tordjman S, Lazartigues A, Lemonnier E, Deleau M, Hausberger M. Does pet arrival trigger prosocial behaviors in individuals with autism? *PLoS One*. 2012;7(8):e41739.
18. Berry A, Borgi M, Francia N, Alleva E, Cirulli F. Use of assistance and therapy dogs for children with autism spectrum disorders: a critical review of the current evidence. *J Altern Complement Med*. 2013;19(2):73-80.
19. Gilliam JE. *Gilliam Autism Rating Scale (GARS-2)*. 2nd ed. Austin, TX: Pro-Ed, Inc; 2006.
20. Viau R, Arsenault-Lapierre G, Fecteau S, Champagne N, Walker CD, Lupien S. Effect of service dogs on salivary cortisol secretion in autistic children. *Psychoneuroendocrinology*. 2010;35(8):1187-1193.
21. Kern JK, Fletcher CL, Garver CR, et al. Prospective trial of equine-assisted activities in autism spectrum disorder. *Altern Ther Health Med*. 2011;17(3):14-20.
22. Burrows KE, Adams CL. Challenges of service-dog ownership for families with autistic children: lessons for veterinary practitioners. *J Vet Med Educ*. 2008;35(4):559-566.
23. Altschuler EL. Play with online virtual pets as a method to improve mirror neuron and real world functioning in autistic children. *Med Hypotheses*. 2008;70(4):748-749.
24. Wuang YP, Wang CC, Huang MH, Su CY. The effectiveness of simulated developmental horse-riding program in children with autism. *Adapt Phys Activ Q*. 2010;27(2):113-126.