

Literature Review on the Effect of Canine-Assisted Interventions on
Children Diagnosed With Attention Deficit Hyperactivity Disorder

Martina Bumgarner

Wake Forest University

Abstract

Attention Deficit Hyperactivity Disorder (ADHD), which affects 5.29% of children worldwide, is diagnosed in children before the age of twelve. It is marked by core symptoms of inattention, impulsivity, and hyperactivity. A variety of prescription medications available have been popular treatments for the symptoms of ADHD. Unknown long-term effects and unappealing side effects are prompting caregivers to find alternatives. Various counseling therapies, including CBT, are effective for children being treated for ADHD. Canine Assisted Interventions (CAI) have been used with great success in treating diagnoses comorbid with ADHD, but few studies specifically investigate any beneficial effects of CAI on children diagnosed with ADHD. This review looks into the application and complimentary use of animal-assisted interventions to the treatment of ADHD. Aspects of socializing, motivating, cognitive, and calming effects of animal-assisted interventions were explored. Each aspect was looked at in terms of how it could benefit the treatment of children with ADHD. These effects can have a positive effect on several core symptoms of ADHD.

Keywords: Pet Therapy, Animal-Assisted Therapy, Animal Assisted Intervention, Animal-Assisted Activities, Canine-Assisted Intervention, Attention Deficit Hyperactivity Disorder, ADHD, Therapy, Therapy Dog, Counseling.

Literature Review on the Effect of Canine-Assisted Interventions on
Children Diagnosed With Attention Deficit Hyperactivity Disorder

Introduction

The major symptoms associated with Attention Deficit Hyperactivity Disorders include an inability to self-regulate, not recognizing or responding to social cues, a low frustration tolerance, difficulty with anger management, difficulty accepting consequences, impatience with peers, and rejection by peers (Fung, 2017). Children who are thus diagnosed often are medicated to mediate these symptoms. Medications can include antidepressants and psychostimulants, which are effective in altering levels of neurochemicals responsible for sustained attention (Frodl & Skokauskas, 2012.) . Although popular stimulant medications may be effective in reducing some symptoms, their long-term benefits are unknown and their undesirable side effects can be a deterrent to use. While symptoms can be reduced with stimulant medications, functional impairment has been found to remain (Epstein et al., 2010). The average medical treatment lasts only one to three years and strict adherence to such treatment is poor. The cost of many prescription treatments are simply unaffordable to many families and there are a large number of children who do not respond to prescription treatment. An additional but lesser known concern is that adolescents with ADHD have been found to be at a greater risk to use and/or abuse illegal substances than typical peers, even if they used prescription medications as young children (Molina et al., 2013).

Alternative Treatment Options

Given these limitations of existing prescription treatment strategies, we must explore alternative treatment approaches. Families are understandably looking into nonprescription interventions due to medical side effects, a lack of available professional resources, and the high

costs associated with these. Cognitive Behavioral Therapy and social skills training have been found to be one successful, non-pharmacological intervention (Storebø et al., 2011). Behavioral interventions have proven to be effective in treating overall behavioral functioning, but not in treating the primary symptoms. Behavioral therapy can teach how to sustain attention, block out distractions, and improve basic social skills. Animal Assisted Interventions provide the additional treatments for bringing about the socializing, motivating, cognitive, and stress-relieving effects which address the core symptoms of ADHD, including inattention, hyperactivity, and impulsivity (Busch et al., 2016).

Methods

I conducted preliminary research using the Diagnostic and Statistical Manual of Mental Disorders–V. This provided a background for and definition of Attention Deficit Hyperactivity Disorder. The DSM-V explains the symptoms of the disorder, the associated features which support diagnosis, requirements for diagnosis, age(s) of onset and duration, prevalence, development, and course. Finally, risk and prognostic factors, culture-related diagnostic issues, gender-related diagnostic issues, differential diagnoses, and comorbidity are discussed.

Next, I used the counseling databases PsycINFO, ERIC (via ProQuest), and PubMed from the ZSR Library. I initially entered key words including “pet therapy,” “ADHD,” and “attention-deficit hyperactivity disorder,” using the Boolean operators “and” as well as “or.” From the articles which appeared, I found the key words “canine-assisted intervention,” “animal-assisted activities,” and “animal-assisted interventions.” With the help of the Wake Forest University counseling librarian, I entered “animal assisted therapy,” and ADHD, or “attention deficit,” “attention deficit hyperactivity disorder,” or ADD or counseling in one single search bar. I also performed a search using the key words counseling or therapy or psychotherapy

or “pet therapy” or “therapy dog.” When I wanted to keep a group of words together in the search, I surrounded them with quotation marks. From all of the articles which appeared, I kept only articles published from 2007 to present and then chose the best articles which seemed most relevant to my topic of inquiry, the use of therapy dogs in schools to help students diagnosed with ADHD. Finally, from those most valuable articles, studies, and books, I investigated their references as well as later studies that used these writings as references for their own.

Results

Diagnosis

According to the DSM-V, Attention Deficit/Hyperactivity Disorder is a “neurodevelopmental disorder defined by impairing levels of inattention, disorganization, and/or hyperactivity-impulsivity. Inattention and disorganization entail inability to stay on task, seeming not to listen, and losing materials, at levels that are inconsistent with age or developmental level. Hyperactivity-impulsivity entails over activity, fidgeting, inability to stay seated, intruding into other people’s activities, and inability to wait—symptoms that are excessive for age or developmental level. In childhood, ADHD frequently overlaps with disorders that are often considered to be ‘externalizing disorders,’ such as oppositional defiant disorder and conduct disorder. ADHD often persists into adulthood, with resultant impairments of social, academic and occupational functioning” (American Psychiatric Association, 2013). Symptoms are usually noticeable before the child enters elementary school and is characterized by impairments of personal, social, academic, or occupational functioning

Diagnosis for ADHD is confirmed after a child has six or more characteristics of inattention plus six or more symptoms of impulsivity or hyperactivity for more than six months, before the age of twelve. The inattentive and hyperactive-impulsive characteristics must occur in

more than one setting and “interfere with or reduce the quality of social, academic, or occupational functioning” (American Psychiatric Association, 2013). Worldwide, ADHD affects 5.29% of children (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007).

Definition: Animal-Assisted Interventions

There are many different terms and definitions found in professional literature, resulting in a lack of agreed-upon and shared terminology. Animal Assisted Interventions include both Animal-Assisted Activities (AAA) and Animal-Assisted Therapies (AAT) (Busch et al, 2016). Pet Partners, a non-profit organization which uses animals in therapy to improve patients’ well-being and quality of life, distinguishes between these two types of interventions as follows: Animal-Assisted Therapy (AAT) “is a goal-directed intervention in which an animal that meets specific criteria is an integral part of the treatment process. AAT is directed and/or delivered by a health/human service professional with specialized expertise, and within the scope of practice of his/her profession. AAT is designed to promote improvement in human physical, social, emotional, and/or cognitive functioning [thinking and intellectual skills]. AAT is provided in a variety of settings and may be group or individual in nature. This process is documented and evaluated.” Animal-Assisted Activities (AAA) “provide opportunities for motivational, educational, recreational, and/or therapeutic benefits to enhance quality of life. AAA are delivered in a variety of environments by specially trained professionals, paraprofessionals, and/or volunteers in association with animals that meet specific criteria”(“How Our Program Is Different | Pet Partners,” n.d.). Canine Assisted Intervention (CAI) is a label specific for to the use of dogs in AAA.

Available Research

A significant gap remains between the knowledge of the many psychological and psychosocial effects of animals and implementing animals into treatment or support services for children with ADHD. There is in fact positive research on how animals, including dogs, cats, fish, birds, rabbits, horses, and even dolphins, help individuals diagnosed with Down's Syndrome, the Autism Spectrum Disorder, depression, anxiety and social functioning. I found published only three controlled experiments which have investigated how contact with therapy animals affects children with ADHD (Fine, 2010; Schuck, Emmerson, Fine, & Lakes, 2015; Somervill, Swanson, Robertson, Arnett, & MacLin, 2009). The study by Somervill et al. seemed to be a poorly conducted study, however. From a school of 30 students with special education needs, only 17 participated in the study. These students were allowed to hold a dog for five minutes and their heart rate and blood pressure were monitored before, during, and after holding the dog. The study seems weak since the students were not told ahead of time that they were about to visit the dog. The time with the dog was short. No teaching, learning, or any other school work took place while the dog was present. The dog simply sat in the student's lap and was pet for five minutes. It seems obvious that for a child about the age of nine, being pulled out of class to sit in another room with a dog in their lap for five minutes would be exciting. Since Somervill et al.'s study did not look at the effect of a dog being present in a classroom where either education or therapy was actively taking place, I chose to disregard it for this literature review. Since the former studies show beneficial socializing, motivational, cognitive, and stress-reducing effects for other children whose diagnoses can be comorbid with ADHD, I thought it reasonable to apply those results to my research.

Socializing effects. ADHD is commonly expressed as problems between parents and children or teachers and children. These relationships are affected by the child's ADHD symptoms of regular noncompliance and excessive emotional behavior. Understandably, these relationships experience severe stress and conflict. These children also experience difficult sibling and peer relations due to the social impairments stemming from low frustration tolerance and impulsive, disruptive or aggressive behavior. Typically developing children therefore usually reject them (Busch et al., 2016).

Canine assisted interventions can address these difficulties. Dogs promote social interaction and facilitate learning in social situations. This enhances socio-emotional development, leading to improved social functioning. Being accompanied by a well-trained dog increases the frequency of social interactions. These animals can provide social support, comfort, and reduction of stress. Animals also teach children responsibility, values, empathy, and perspective taking (Busch et al., 2016). To receive these multitude of positive effects, a relationship with a dog should be tailored to the psychosocial characteristics of the person. Cats, too, can elicit attachments as strongly as dogs. The psychosocial benefits relate to companionship they offer (Fine, 2010). People speak to their animals. Having a great conversation partner offers children practice with social speaking. People talk about their dogs to other people, even when the dog is not present. They stimulate friendly conversation around a comfortable topic. A dog creates social opportunities, especially for children socially isolated as a result of ADHD symptoms. People will smile more at individuals when a dog is present than when not. "The dog normalizes the social environment for the person with a disability who might otherwise be ignored or treated awkwardly" (Hart, 2010). Children who have a strong attachment to their pets are more likely to exhibit these traits.

Motivational effects. Dysfunctions in motivational processes are other prominent symptoms of ADHD. They lead to poor behavior, cognitive performance, and social interactions. Children with ADHD are not moved by reinforcement as are typical children. Immediate and consistent reinforcement is necessary in improving task performance and the motivation to persist. Under-arousal of the catecholamine system might explain these deficits (Volkow et al., 2011).

Neuroimaging reveals deficits of the nucleus accumbens in children diagnosed with ADHD that lead to deficits in arousal and self-regulation. A lack of catecholamines from the nucleus accumbens leads to poor regulation of executive functions, attention, and emotional regulations (White, Helfinstein, Reeb-sutherland, Degnan, & Fox, 2009). There is a relationship between emotion, motivation, and attention/learning processes. Attention and emotion are connected. ADHD is seen primarily as a deficit in attentions and behavior regulation, though motivational deficits due to under arousal of the catecholamine system play a role. Therefore, it is very difficult for children affected by ADHD to pay attention in social settings, to exercise self-regulation, and to keep sufficient motivation to complete daily tasks. One must improve emotion to improve attention and engage in learning new concepts (Schuck et al., 2015).

Application of motivational incentives normalizes behavior and enhances cognitive control in children with ADHD (Botvinick & Braver, 2015). CAI can support motivational deficits in ADHD and provide significant motivation for children in schools. Children with a dog by their side were more focused and more aware of their social environments (Hart, 2010). Animals encourage interest and thereby increase motivation, which leads to enhanced focus and task perseverance in the presence of a dog. So a dog in the classroom improves positive attitudes and emotions toward school and learning. Even elementary school students using standard

self-reports, reported greater positive changes after having a dog in their classroom once per week for a year verses a comparison class who had no dog visits (Beetz, 2013).

CAI boosts motivation and is a valuable addition to ADHD treatment. When motivation increases, ADHD symptoms decrease. Therefore an animal in the classroom, specifically a dog, could help children afflicted with ADHD to better comply with therapy, to engage their attention, to increase task completion, and to successfully interact socially (Busch et al., 2016).

Cognitive and academic effects. Studies by Gee and colleagues revealed that children were better able to focus attention on cognitive tasks and have improved object categorization and recognition in the presence of a dog (Gee, Church, & Altobelli, 2010; Gee, Crist, & Carr, 2010; Gee, Gould, Swanson, & Wagner, 2012). In fact, the live dog improved cognitive task performance and attention better than a human or a stuffed animal. The researchers in these studies suggest that the dog is a source of motivation to children, encouraging them to be focused and to put greater effort into task performance. The dog is also a model for good behavior, which leads children to focus attention on specific tasks.

Research also shows the presence of a dog in the class positively effects cognitive functioning and attention as well as supports learning (Busch et al., 2016). Reading rates are recorded as significantly higher. Reading accuracy and comprehension were highest in the dog group verses control groups as well (Linder, Mueller, Gibbs, Alper, & Freeman, 2018). Not only do students pay better attention to the teacher, but positive attitudes toward school and learning increased with a dog present (Beetz, 2013).

Stress-reducing effects. Adequate stress regulation plays an important role in socio-emotional activities, cognitive performance and learning. The “executive functions” of concentration, impulse control, memory, cognitive flexibility, self-motivation, self-reflection,

problem solving, and strategic planning react to elevated levels of cortisol (Diamond & Lee, 2011). This is obviously an area of struggle for children with ADHD. The reduction of stress in children explains improvements in executive functions, performance on tests, which lead to good behavior, good impulse control, and ultimately to a better social classroom atmosphere (Beetz, 2013).

There is a great deal of evidence documenting the reduction of stress while in contact with friendly dogs (Beetz, Julius, Turner, & Kotrschal, 2012). Calmness may come from human biophilia, the interest in and attention to animals and nature, based on evolutionary history. Animals gave cues for safety or danger to our ancestors. Direct contact, such as petting a dog, likely activates the oxytocin system and reduces stress (Handlin et al., 2011). Increased levels of oxytocin are linked to stress reduction, increased calmness, reduced fear, depression, and aggression. Oxytocin release and the effects it produces require a level of relationship quality (Julius, Beetz, Kotrschal, Turner, & Uvnäs-Moberg, 2012). It increases social orientation, interaction, attention, and trust (Julius et al., 2012).

Stress reduction and calming effects are especially valuable to children suffering from ADHD. Using CAI in an educational setting, dogs were found to capture and hold children's attention, enabling them to direct their attention outward. Behavioral improvements were found to also generalize somewhat beyond the classroom (Hart, 2010). Animals calm children during a stressful physical exam, a social stress test, and in children with the autism spectrum disorder after placement of an assistance dog with their families (Beetz et al., 2012; Roux, Swartz, & Swart, 2014; Viau et al., 2010). Animals serve as effective distractors from anxiety.

Discussion

So does Canine Assisted Therapy work? Most of the available articles regarding CAI or AAA are based on samples that do not include children with ADHD. It does seem reasonable though that CAI can lead to calming effects in children diagnosed with ADHD. These children are quite likely to benefit from these effects, since impulsivity and hyperactivity are both recognized core symptoms of ADHD and a dog's presence seems to reduce or relieve these (Busch et al., 2016).

Many theories suggest animals have unique, intrinsic qualities associated with calming effects (Kruger & Serpell, 2010). First, stimuli with the ability to focus and capture attention have a calming effect on the body. Second, the biophilia hypothesis suggests animals increase alertness and attention in humans, which leads to enhanced concentration and task persistence in an animal's presence. Several studies show evidence of the positive effects of animals on human behavior (Gee, Church, & Altobelli, 2010; Gee et al., 2010; Gee, Gould, Swanson, & Wagner, 2012; Schuck et al., 2015).

Animals function as important attachment figures. Attachment theory claims that attachment behavior tries to get social support and protection from attachment figures, including pets. This is accomplished through physical proximity, it is a source of comfort and safety, can alleviate stress, and is social support. Petting an animal leads to better coping responses in reaction to stress (Busch et al., 2016).

The biopsychosocial model explains the calming, socializing and motivating effects of animals. Health comes from a combination of biological, psychological, and social factors. These are interrelated as such that improvement in one area affects the others. So positive physiological

changes due to CAI can reduce anxiety or behavioral stress, improving social and psychological well-being (Busch et al., 2016).

Child and canine interactions as a stimulus may prepare children for therapy, and by extension learning, by increasing arousal, emotion, attention, and engagement. Evidence shows that the chance to interact with therapy animals can motivate children to comply, productively engage, and motivate to participate in therapy (Fine, 2010). “Given the important role of emotion in learning, integrating animals into traditional psychosocial treatments for ADHD could provoke an emotional response beneficial to learning. This in turn could increase the effects of treatments, particularly on the increase of adaptive behaviors” (Schuck et al., 2015). Behavioral treatment goals often include increasing empathy and perspective taking, as these skills can be underdeveloped in individuals with ADHD. Regular interactions with therapy dogs could stimulate emotional responses and activate attentional networks during CBT and behavior modification interventions, which leads to an increase in learning during therapy. This can translate to classrooms with therapy dogs present as well. Introducing animals could act as a catalyst for learning (Schuck et al., 2015).

Most educators are unaware of the growing body of empirical support for using CAI to address academic performance, communication, attention, motor skills, behavior and socio-emotional functioning among other things. A majority of respondents polled felt that CAIs are worth pursuing, despite the potential drawbacks and challenges. Most of these same educators said CAI would be well-received by their district and that they agreed that it would provide valuable benefits to students (Comartin, 2018).

In fact, school dog-teacher teams are becoming a popular movement in Germany, Austria, and Switzerland. It is estimated that over 500 such teams exist in those countries, with a

teacher bringing his or her own dog to school one to five days per week. Over 400 similar teams are reported in The United States, where teachers report that their dog improves classroom atmosphere, is used as prompts for academic research, and is a calming influence that improves psychological well-being and enjoyment in school (Beetz, 2013).

To make this program work, ideally a dog would be selected who is individually tailored or trained to the psychosocial needs of the individual or classroom. Full-time contact has been shown to have a better impact than a part-time relationship. A special handler may or may not be involved, depending on if the dog “worked” in a specific classroom or traveled between classrooms while being part of an intervention therapy program. Finally, there are no standardized certification criteria legislated or regulated in the United States regarding assistance animals (Fine, 2015, p. 60).

As I mentioned earlier, research on the benefits of CAI for ADHD symptoms are scarce. After looking at how many benefits have been found for both typical children and those afflicted with Down’s syndrome or the Autism Spectrum Disorder, it appears that this subject is ripe for further investigation and research. Consideration for studies investigating the socializing, motivating, cognitive, and calming effects of animal-assisted interventions on children with ADHD is needed. Future research could also explore and specify the settings in which motivation could be enhanced through the contact with animals, as well as determine how the socializing, motivating, cognitive and calming effects can be assessed.

References

- American Psychiatric Association, & American Psychiatric Association (Eds.). (2013).
Diagnostic and statistical manual of mental disorders: DSM-5 (5th ed). Washington,
 D.C: American Psychiatric Association.
- Beetz, A. (2013). Socio-emotional correlates of a schooldog-teacher-team in the classroom.
Frontiers in Psychology, 4. <https://doi.org/10.3389/fpsyg.2013.00886>
- Beetz, A., Julius, H., Turner, D., & Kotrschal, K. (2012). Effects of Social Support by a Dog on
 Stress Modulation in Male Children with Insecure Attachment. *Frontiers in Psychology*,
 3. <https://doi.org/10.3389/fpsyg.2012.00352>
- Botvinick, M., & Braver, T. (2015). Motivation and Cognitive Control: From Behavior to Neural
 Mechanism. *Annual Review of Psychology*, 66(1), 83–113.
<https://doi.org/10.1146/annurev-psych-010814-015044>
- Busch, C., Tucha, L., Talarovicova, A., Fuermaier, A. B. M., Lewis-Evans, B., & Tucha, O.
 (2016). Animal-assisted interventions for children with Attention Deficit/Hyperactivity
 Disorder: A theoretical review and consideration of future research directions.
Psychological Reports, 118(1), 292–331. <https://doi.org/10.1177/0033294115626633>
- Comartin, K. P. (2018). *Is Man's Best Friend a Best Practice in Public Education?*
Animal-Assisted Interventions in Classrooms and School-Based Therapeutic Settings.
 ProQuest Dissertations Publishing.
- Diamond, A., & Lee, K. (2011). Interventions Shown to Aid Executive Function Development in
 Children 4 to 12 Years Old. *Science*, 333(6045), 959–964.
- Epstein, J. N., Langberg, J. M., Lichtenstein, P. K., Altaye, M., Brinkman, W. B., House, K., &
 Stark, L. J. (2010). Attention-Deficit/Hyperactivity Disorder Outcomes for Children

- Treated in Community-Based Pediatric Settings. *Archives of Pediatrics & Adolescent Medicine*, 164(2), 160–165. <https://doi.org/10.1001/archpediatrics.2009.263>
- Fine, A. H. (2010). 10 - Incorporating animal-assisted therapy into psychotherapy: guidelines and suggestions for therapists. In A. H. Fine (Ed.), *Handbook on Animal-Assisted Therapy (Third Edition)* (pp. 169–191). San Diego: Academic Press.
- <https://doi.org/10.1016/B978-0-12-381453-1.10010-8>
- Fine, A. H. (2015). *Handbook on Animal-Assisted Therapy: Foundations and Guidelines for Animal-Assisted Interventions*. Academic Press.
- Frodl, T., & Skokauskas, N. (n.d.). Meta-analysis of structural MRI studies in children and adults with attention deficit hyperactivity disorder indicates treatment effects. *Acta Psychiatrica Scandinavica*, 125(2), 114–126. <https://doi.org/10.1111/j.1600-0447.2011.01786.x>
- Fung, S. (2017). Canine-Assisted Reading Programs for Children with Special Educational Needs: Rationale and Recommendations for the Use of Dogs in Assisting Learning. *Educational Review*, 69(4), 435–450. <https://doi.org/10.1080/00131911.2016.1228611>
- Gee, N. R., Church, M. T., & Altobelli, C. L. (2010). Preschoolers Make Fewer Errors on an Object Categorization Task in the Presence of a Dog. *Anthrozoös*, 23(3), 223–230.
- <https://doi.org/10.2752/175303710X12750451258896>
- Gee, N. R., Crist, E. N., & Carr, D. N. (2010). Preschool Children Require Fewer Instructional Prompts to Perform a Memory Task in the Presence of a Dog. *Anthrozoös*, 23(2), 173–184. <https://doi.org/10.2752/175303710X12682332910051>
- Gee, N. R., Fine, A. H., & Schuck, S. (2015). Animals in educational settings: Research and practice. In A. H. Fine & A. H. Fine (Ed) (Eds.), *Handbook on animal-assisted therapy:*

- Foundations and guidelines for animal-assisted interventions.* (pp. 195–210). San Diego, CA, US: Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-801292-5.00014-6>
- Gee, N. R., Gould, J. K., Swanson, C. C., & Wagner, A. K. (2012). Preschoolers Categorize Animate Objects Better in the Presence of a Dog. *Anthrozoos*, 25(2), 187–198. <https://doi.org/10.2752/175303712X13316289505387>
- Handlin, L., Hydbring-Sandberg, E., Nilsson, A., Ejdebäck, M., Jansson, A., & Uvnäs-Moberg, K. (2011). Short-Term Interaction between Dogs and Their Owners: Effects on Oxytocin, Cortisol, Insulin and Heart Rate—An Exploratory Study. *Anthrozoös*, 24(3), 301–315. <https://doi.org/10.2752/175303711X13045914865385>
- Hart, L. A. (2010). 5 - Positive effects of animals for psychosocially vulnerable people: a turning point for delivery. In A. H. Fine (Ed.), *Handbook on Animal-Assisted Therapy (Third Edition)* (pp. 59–84). San Diego: Academic Press. <https://doi.org/10.1016/B978-0-12-381453-1.10005-4>
- How Our Program Is Different | Pet Partners. (n.d.). Retrieved July 17, 2018, from <https://petpartners.org/about-us/our-programs-different/>
- Julius, H., Beetz, A., Kotrschal, K., Turner, D., & Uvnäs-Moberg, K. (2012). *Attachment to Pets: An Integrative View of Human-Animal Relationships with Implications for Therapeutic Practice*. Hogrefe Publishing.
- Kruger, K. A., & Serpell, J. A. (2010). 3 - Animal-assisted interventions in mental health: definitions and theoretical foundations. In A. H. Fine (Ed.), *Handbook on Animal-Assisted Therapy (Third Edition)* (pp. 33–48). San Diego: Academic Press. <https://doi.org/10.1016/B978-0-12-381453-1.10003-0>

- Linder, D. E., Mueller, M. K., Gibbs, D. M., Alper, J. A., & Freeman, L. M. (2018). Effects of an animal-assisted intervention on reading skills and attitudes in second grade students. *Early Childhood Education Journal*, 46(3), 323–329.
<https://doi.org/10.1007/s10643-017-0862-x>
- Molina, B. S. G., Hinshaw, S. P., Eugene Arnold, L., Swanson, J. M., Pelham, W. E., Hechtman, L., ... Marcus, S. (2013). Adolescent Substance Use in the Multimodal Treatment Study of Attention-Deficit/Hyperactivity Disorder (ADHD) (MTA) as a Function of Childhood ADHD, Random Assignment to Childhood Treatments, and Subsequent Medication. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52(3), 250–263.
<https://doi.org/10.1016/j.jaac.2012.12.014>
- Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The Worldwide Prevalence of ADHD: A Systematic Review and Metaregression Analysis. *American Journal of Psychiatry*, 164(6), 942–948.
<https://doi.org/10.1176/ajp.2007.164.6.942>
- Roux, M. C. le, Swartz, L., & Swart, E. (2014). The Effect of an Animal-Assisted Reading Program on the Reading Rate, Accuracy and Comprehension of Grade 3 Students: A Randomized Control Study. *Child & Youth Care Forum*, 43(6), 655–673.
<https://doi.org/10.1007/s10566-014-9262-1>
- Schuck, S. E. B., Emmerson, N. A., Fine, A. H., & Lakes, K. D. (2015). Canine-assisted therapy for children with ADHD: Preliminary findings from the Positive Assertive Cooperative Kids study. *Journal of Attention Disorders*, 19(2), 125–137.
<https://doi.org/10.1177/1087054713502080>

Somervill, J. W., Swanson, A. M., Robertson, R. L., Arnett, M. A., & MacLin, O. H. (2009).

Handling a Dog by Children with Attention-Deficit/Hyperactivity Disorder: Calming or Exciting? *North American Journal of Psychology; Winter Garden*, 11(1), 111–119.

Storebø, O. J., Skoog, M., Damm, D., Thomsen, P. H., Simonsen, E., & Gluud, C. (2011). Social skills training for Attention Deficit Hyperactivity Disorder (ADHD) in children aged 5 to 18 years. In *The Cochrane Library*. John Wiley & Sons, Ltd.

<https://doi.org/10.1002/14651858.CD008223.pub2>

Viau, R., Arseneault-Lapierre, G., Fecteau, S., Champagne, N., Walker, C.-D., & Lupien, S.

(2010). Effect of service dogs on salivary cortisol secretion in autistic children.

Psychoneuroendocrinology, 35(8), 1187–1193.

<https://doi.org/10.1016/j.psyneuen.2010.02.004>

Volkow, N. D., Wang, G. —., Newcorn, J. H., Kollins, S. H., Wigal, T. L., Telang, F., ... Swanson, J. M. (2011). Motivation deficit in ADHD is associated with dysfunction of the dopamine reward pathway. *Molecular Psychiatry; New York*, 16(11), 1147–1154.

<http://dx.doi.org.go.libproxy.wakehealth.edu/10.1038/mp.2010.97>

White, L. K., Helfinstein, S. M., Reeb-sutherland, B. C., Degnan, K. A., & Fox, N. A. (2009).

Role of Attention in the Regulation of Fear and Anxiety. *Developmental Neuroscience; Basel*, 31(4), 309–317.