Fall 2016

The Effect of Therapeutic Horseback Riding on Balance and Self-Efficacy in Children with Developmental Disabilities

Alexandra Smola
ats36@zips.uakron.edu

Lauren Hurley
lmh114@zips.uakron.edu

The Effect of Therapeutic Horseback Riding on Balance and Self-Efficacy in Children with Developmental Disabilities

Lauren Hurley, Alexandra Smola

The University of Akron

Author Note

Lauren Hurley, Alexandra Smola. School of Nursing, College of Health Professions, The University of Akron. This paper is in partial fulfillment of the requirements of Honors Student Status for the Honor College and School of Nursing.

Abstract:

Therapeutic horseback riding (THR) has positive health related outcomes in children with developmental disabilities. The purpose of this study was to determine the effect of a 10-week THR intervention on balance and task-specific self-efficacy in children with developmental disabilities. Bandura's social cognitive theory and the physical stress theory guided the quasi-experimental study. A pre-test post-test design (N=20) was implemented with a 10-week THR class at a riding center in Midwest United States. The first research question was: In children with developmental disabilities ages 5 to 18, does one 10-week session of THR affect balance? With time 1 balance mean at 52.55 (*SD*=3.65) and time 2 balance mean at 54.15 (*SD*=1.63), a paired t-test revealed a significant difference in within-subject balance ($t = -2.43$, $p = 0.025$). The second research question was: In children with developmental disabilities ages 5 to 18, does a 10-week course of THR affect task-specific self-efficacy? With time 1 self-efficacy mean at 42.7 (*SD*=5.63) and time 2 self-efficacy mean at 48.10 (*SD*=2.19), a paired t-test revealed a significant difference in within-subject means ($t = -5.08$, $p < 0.001$). Therefore, both balance and self-efficacy were significantly increased after a 10-week THR intervention.

Introduction

The prevalence of developmental disabilities in the United States is a serious problem. A developmental disability can be defined as:

> A severe, chronic disability that is attributable to a cognitive, neurological or physical impairment or a combination of cognitive, neurological and physical impairments; that is manifested during the developmental period (prior to age 22); that is likely to continue indefinitely; and that results in substantial functional limitations in three or more areas of major life activity including self-care, receptive and expressive language, learning, mobility, self-direction, capacity for independent living, and economic self-sufficiency (Developmental Disabilities, n.d.).

Developmental disabilities are non-selective in that they occur in all races, sexes, ethnicities, and socioeconomic groups. Right now, statistics in the United States show that about 15% of children between the ages of 3 and 17 have at least one developmental disability. These disabilities range from attention deficit hyperactivity disorder (ADHD), autism, cerebral palsy (CP), hearing and visual impairment, and other developmental delays. The CDC has been tracking the numbers of children with autism and CP in the United States, and it estimates that the number of children with autism is about 1 in 68, and the number of children with CP to be about 1 in 323 (Developmental Disabilities, 2013).

Because children with developmental disabilities often lack balance and self-efficacy, researchers have examined interventions that may affect balance and self-efficacy in this population. An example is research examining Therapeutic horseback riding (THR), which has become increasingly popular over the last several years as a form of physical therapy for

developmentally disabled children (Ward, Whalon, Rusnak, Wendell, & Paschall, 2013). THR is a term that encompasses many elements of horse riding. It is taught by specially trained riding instructors and their assistants, and oftentimes has its own set of procedures and precautions to ensure safety and provide an environment conducive to learning and improvement specifically for children with physical handicaps. Instructors must carry a certification to conduct THR sessions. Certifications are available through several different professional associations that are all members of the Professional Association of Therapeutic Horsemanship International (PATH Intl.), formerly known as the North American Riding for the Handicapped Association (NARHA). Certifications have three levels: registered, advanced, and master; each level must be earned separately. The sessions themselves may be carried out with volunteers who follow the directions of the certified instructors while the instructors observe. Each rider may require up to four volunteers to ensure his or her safety: one leader who controls the horse, two side walkers, and one assistant (Path International, 2014). The rationale for using THR is that the movement of the horse combined with the connections the participant makes with the animal may contribute to muscle development and task-specific self-efficacy. Tasks such as directing the horse through several obstacles involving cones, jumps, and ground poles increase self-efficacy by allowing the participant to be in control of the situation. Prothman and Fine (2011) found that contact with horses can stimulate physiological, social, and psychological responses in children and adolescents. Other researchers have found that THR affects physical and psychological improvements such as: improved balance, strength, coordination, and self-confidence in children with disabilities (Drnach, O'Brien, and Kreger, 2010). Although there are many studies on THR affecting gross motor function, emotional status, and social function, there is a gap in knowledge about the effect of THR on balance and task-specific self-efficacy. This study aims to determine

if children with developmental disabilities, ages 5-18, that participate in THR show changes in balance and self-efficacy. The purpose of this study was to determine the effect of a 10-week THR session on balance and task-specific self-efficacy in children with physical disabilities ages 5 to18 years. Variables that may influence the study are the level of physical disability, age of the child, and how many times they have participated in THR. If an effect of THR on improved balance and task-specific self-efficacy can be determined in children with physical disabilities, perhaps THR can be identified as a form of physical and emotional therapy. This study answers the following research questions: In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect balance? In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect task-specific self-efficacy?

Review of Literature

The following databases were used to find literature determining the effects of therapeutic horseback riding in children between the ages of 5-18 years of age with some type of developmental disability: CINAHL PLUS, Health Source: Nursing/academic Edition, SPORTdiscus, MEDLINE, and OVID. Researchers have used a pretest-post test method to evaluate the effectiveness of THR (Drnach, O'Brien, and Kreger, 2010; Gabriels, Agnew, Holt, Shoffner, Zhaoxing, Ruzzano, Mesibov, 2011). In general, they have found that when THR is included in regular treatment programs, improvements occur for a period of time in social and emotional functioning as well as motor skills and coordination balance. Although emotional benefits may be lost over time, research supports that through reinstitution of therapy, functioning can be quickly regained (Ward, Whalon, Rusnak, Wendall, Paschall, 2013). Children who receive THR show greater sensory seeking, sensory activity, and social motivation, as well

as less inattention, distractibility, and sedentary behaviors (Bass, M., Duchowny, C., & Llabre, M., 2009).

Many researchers have studied the effect of THR in children with cerebral palsy (CP) (Cherng, Liaso, Leung, & Hawhg (2004); Whalen & Case-Smith, (2012); Zadnikar, & Kastrin, 2011). Overall, researchers have found that THR improves gross motor function, postural control and balance, and quality of life. Cherng, Liaso, Leung, and Hawhg (2004) found that in some children with spastic CP, improved gross motor function was exhibited following a 16-week session with forty-minute classes twice a week. These improvements were sustained for another16-weeks after therapy. THR also has a positive impact on gross motor function in children with cerebral palsy (Tseng, S., Chen, H., & Tam, K. 2013). Therefore, THR should be recommended as a source of therapy for children with CP because it may improve posture and balance as well as inspire increased functioning in activities of daily living and increased quality of life (Zadnikar, and Kastrin, 2011).

Researchers have also studied the effect of THR in children with other types of developmental disabilities. In general, they have found THR positively impacts the child's step length and stride length in Friedreich's ataxia (Gilliland and Knight, 2012). In children with Attention Deficit Hyperactivity Disorder (ADHD), research has found that THR produced positive changes in behavior, quality of life, and motor performance (Cuypers, De Ridder, and Strandheim, 2011).

There are many studies available on the subject of THR and its benefits, but a gap in the knowledge occurs in the information that we wish to explore. Gross motor functioning, emotional functioning, and social functioning are looked at frequently; however we want to look

directly at balance and task-specific self-efficacy.

Theoretical Framework

Self-Efficacy

Bandura's social cognitive theory proposes that behavior change is affected by environmental influences, as well as personal factors, and is associated with the behavior itself. Each of these may affect or be affected by the others (Grizelle, 2007). The theory proposes that self-efficacy develops from experiences as well as achieving goals, which is attained by perseverance, overcoming obstacles, and observing others succeed by achieving through a sustained effort (Banduras self efficacy, n.d.). The proposition that the more a person overcomes, the more he/she believes he/she is capable of is a central tenet of the social cognitive theory. Therefore, self-efficacy may be accomplished through observing the achievements of others and others observing the achievements of the participant. Self-efficacy may be general or task-specific; this study focused on task specific self-efficacy as it relates to horseback riding.

Researchers have found that children with developmental disabilities have no significant difference in levels of self-efficacy from their same-aged peers without a disability (Willoughby, King, Polatajko, 1996). However, there is a need to perform studies that show ways to increase general and task-specific self-efficacy in all children (Willoughby, King, Polatajko, 1996). Providing a form of group intervention, such as THR, has been found to increase task-specific self-efficacy by providing clear instructions and the opportunity for skill development and training. THR can also increase self-efficacy by providing subjects with a model for proper behavior, because when working with such large animals, proper behavior is important for the safety of both participants and therapy animals (Grizelle, 2007). Based on this theory, it is

anticipated that completing a 10-week session of therapeutic horseback riding will increase the level of task-specific self-efficacy in the study participants.

Physical Strength

The Physical Stress Theory, on the other hand, describes changes in biological tissue in response to differing levels of physical stress (Mueller & Maluf, 2002); we will define physical stress as a force or load acting on a given area of tissue. There are four main organ systems affected by this: the cardiovascular/pulmonary system, the integumentary system, the musculoskeletal system, and the neuromuscular system. The response to stresses on these systems is evidenced by the five different ways that the biological tissues react to physical stress; these measurable reactions include: atrophy/decreased ability to withstand stress, which can occur if the stress is lower than a prescribed maintenance range; maintenance, which results in no changes within the tissue; hypertrophy/increased ability to withstand stress, which occurs when tissue production happens more rapidly than tissue destruction, in other words it can cause an increase in tissue; injury, which is tissue damage caused by placing too much stress on a tissue and can result in pain or even impaired function; and death, which can happen if the capacity of change in a tissue has been fully exceeded or are left at below maintenance levels for too long of a time period. The theory guides not only the practice of physical therapy but also the associated research and education (Mueller & Maluf, 2002).

Physically handicapped children may be unable to use certain muscles effectively, depending on their disability. Researchers have found that the rhythmic movement of a horse as it walks similarly mimics the gait of a human being (Mueller & Maluf, 2002). Consequently, if a child is placed upon a horse, the movement of the horse may exert a certain amount of stress on

the tissues of the child, forcing the child's muscles to build a tolerance to that stress. Based on the theory, after several sessions of this sort of movement, the muscle may eventually begin to respond to the stressor and learn to adapt to the movement more naturally. Therefore, based on the Physical Stress Theory, we expect the study subjects to gain strength, i.e., experience hypertrophy, throughout their riding session due to the stress that therapeutic horseback riding exerts on their muscles; this in turn should help to improve their balance.

Methods

Design

This is a quantitative quasi-experimental study that uses a pretest-posttest design featuring one group. In order to safely perform the study and protect all participants who are involved with this study, the research team received approval from The University of Akron Institutional Review Board (IRB). To receive approval, the research group submitted a project proposal that was scrutinized and voted on to determine if the project could continue.

Setting and Sample

This single site study was conducted at a location that provides therapeutic horseback riding sessions and is located in the Midwest United States. The camp offers three separate 10- or12-week THR sessions per year. Each session is slightly different, allowing for participants to set and work toward new goals, which they demonstrate at a "Horse Show" following the end of every 10- or 12-week time period. Once the participant's original goals have been achieved, he/she may set new goals to build upon his/her skills in the next session. Their aim is to promote positive physical, motor, cognitive, and social development. Approximately forty children enroll in each THR session.

The target population for this study was children ages 5 to 18 with developmental disabilities. Data were collected from a convenience sample of participants meeting inclusion criteria once informed consent was obtained from the parents or legal guardians and assent was obtained from the children. Inclusion criteria included children ages 5 to 18 years with developmental disabilities and consent and assent verification. No one was excluded based on sex, race, ethnicity, or age, as long as they meet the inclusion criteria.

Sampling and Data Collection Methods

Enrollment in the study required parental consent (see Appendix B) followed by assent (see Appendix C) from each participant to proceed. The research team first received permission from the owners of the THR riding site to conduct the onsite study. In order to share information and receive approval, the research team provided an informational meeting onsite to owners and staff to explain the study. After obtaining approval from program owners, another meeting was held onsite by program directors to ask for participation in the study by parents and children. At that time, those who were willing to participate in the study were asked to fill out an informed consent (parents) and assent (children) to be officially considered as part of the study.

Data collection began prior to the first riding session of the season. This was to determine baseline values. Data were collected with a modified Bandura's task-specific self-efficacy test and a pediatric version of the Berg balance scale. The information was gathered through printed surveys and quantitative assignments, i.e. Bandura's Children's Self-Efficacy Scale and the modified Berg Balance Scale. In case the children had difficulty answering or filling out the questions, the research team and other unbiased volunteers were at their disposal for help, so that they may obtain the most accurate information possible. Completed surveys were stored in a

locked cabinet file of the sponsor's locked university office; the only individuals who had access to the information were the co-investigators and sponsors of the study. At the end of the study, all of printed surveys were destroyed, except for signed consent and assent forms, which will be kept for five years. Also, surveys were de-identified, and each participant was assigned a number to connect pre- and post-test data for analysis. A master list of participant names and numbers were kept and stored in the locked cabinet with the other data.

Measures

Self-efficacy was measured with a modified Bandura's task-specific self -efficacy scale (See Appendix D). Generally, a task-specific self-efficacy scale for children includes 10 questions. A 5-point Likert scale with: 5=I feel confident always, 4= I feel confident most of the time, 3=I feel confident only some times, 2=I rarely feel confident, 1=I don't feel confident was used to determine self- efficacy. Answers were recorded numerically and each participant was asked to respond to each item. Although the scale was constructed following guidelines advanced by Bandura (Bandura's, n.d), face content was determined by asking a project co-sponsor to review and evaluate the validity of the scale related to "does the scale measure horseback riding self-efficacy?" Task-specific scale reliability was determined by calculating inter-item reliability with Cronbach's alpha for this sample. The aim of this task-specific scale construction was to word questioning format to ensure measurement of efficacy and not esteem.

Balance was measured with a pediatric Berg balance scale (See Appendix E). The Berg balance scale was originally developed to measure balance in the elderly population. The scale can now be modified to fit any population, in this case, children with developmental disabilities (Berg Balance, n.d.). The scale includes 14-items designed to measure balance. Item scoring is

based on a 5-point scale from 0-4. Item ratings are summed, with accumulated points adding up with the possibility of 56. Numbers less than 56 show varied balance abilities (Berg Balance n.d.). Response options are: 0- needs moderate or maximal assist to complete the task, 1 – needs minimal aid to complete task, 2 – able to complete task after several tries, 3 – able to complete task with the aid of another limb, and 4 – able to complete task independently. The directions were read by research team members, and the participants were asked to complete the tasks to the best of his or her ability. When scoring items, the research team member recorded the lowest response category that applies to each item. Required equipment includes a watch, ruler, and chair of reasonable height (Berg Balance, n.d.). When tested against participants with varying neurologic disabilities for validity and reliability, it was concluded that the Berg Balance Scale was both a valid and reliable measuring tool for balance, independent of the etiology of the neurologic impairment (La Porta, Caselli, Susassi, Cavallini, Tennant, and Franceschini, 2012).

Demographics of the study included: age in number of years, sex, type of disability, severity of disability, and prior experience in therapeutic horseback riding.

Data Analysis:

The co-investigators entered data into a statistical analysis software program, SPSS 22. Outliers and missing data were identified, and decisions were made about how to deal with both. Descriptive statistics were used to determine the description of the sample, balance, and self-efficacy with percentages used for nominal and categorical data and means with standard deviations used for integer and ratio level data.

Research question #1 was: In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect balance? Paired t-tests were used to

determine balance difference in pre- and post-test data. Research question #2 was: In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect task-specific self-efficacy? Paired *t*-tests were used to determine task-specific self-efficacy differences in pre- and post-test data. All levels of statistical significance were set at *p*-values < 0.05.

Results

The sample was comprised of 24 subjects and 20 complete cases because four did not complete data collection at time 2. Fifty percent of the total sample was female (n=12). Age ranged from 5 to 16 years with a mean of 11 ±3.13 years with 68% of the sample between 7.87 to 14.13 years of age. Riding experience ranged from 0 to 11 years with a mean of 2.62 ±3.14. Seventy-one percent (n=17) were white, 13% (n=3) were black, and 8% (n=2) were Asian. Thirty percent (n=7) reported no medical diagnosis, 21% (n=5) reported attention deficit hyperactivity disorder, 8% (n=2) reported autism, with the remaining ten reporting over ten different diagnoses, including: obsessive compulsive disorder, Asperger's, cerebral palsy, prader willi, 22q11.2 deletion syndrome, growth hormone deficiency, hearing deficiency, fragile X, asthma, dyspraxia, dysnomia, developmental delay, failure to thrive syndrome, downs syndrome, and oppositional defiant disorder. Approximately 21% (n=5) reported two medical diagnoses, and 8% (n=2) reported three medical diagnoses.

The first research question was: In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect balance? Data collection time 1 balance mean was 52.55 ±3.65. Balance mean at time 2 was 54.15 ±1.63. A paired *t*-test revealed a significant difference in within-subject balance ($t = -2.43$, $p = 0.025$). Therefore, subjects had significant increases in balance after the therapeutic riding class, than before the class.

The second research question was: In children with developmental disabilities ages 5 to 18, does one 10-week session of therapeutic horseback riding affect task-specific self-efficacy? Time 1 self-efficacy of horse riding mean was 42.7 ±5.63, and time 2 self-efficacy horse riding mean was 48.10 ±2.19. A paired *t*-test revealed significant difference in within-subject task-specific self-efficacy ($t = -5.08$, $p < 0.001$). Therefore, subjects reported significant increases in self-efficacy in horseback riding after the therapeutic riding class than before the class.

Discussion

The purpose of this study was to determine the effect of a 10-week THR session on balance and task-specific self-efficacy in children with developmental disabilities ages 5 to18 years old. We found that both balance and self-efficacy significantly improved in the 10-week period. Therefore, our research supports that THR may, in fact, be an effective therapy for disabled children to increase balance and task-specific self-efficacy.

When comparing our study findings with those of the previous studies on the effects of therapeutic horseback riding, we found that our data supported typical outcomes identified in other studies. Many of the prior studies involved children with autism employing similar designs and interventions. For example, Bass, Duchowny, and Llabre (2009) used a pre-test post-test design and a 12-week intervention of THR. They found that those children who received the THR showed greater sensory seeking, sensory activity, and social motivation, as well as less inattention, distractibility, and sedentary behaviors. Our study included a 10-week THR intervention, and participants overall demonstrated significant increases in self-efficacy. In another study of children with autism, Ward, Whalon, Rusnak, Wendall, and Paschall (2013) discovered that if interrupted, the emotional benefits of the therapy would last for approximately six weeks. However, once THR was re-initiated, the children would regain the emotional

benefits acquired from the initial therapy. While our study did show an increase in self-efficacy in children with many different developmental disabilities (including autism), we have no way of identifying how long these positive effects lasted because our study was not an interrupted design.

When studying children with cerebral palsy, researchers (Cherng, Liaso, Leung, & Hawhg, 2004; Whalen & Case-Smith, 2012; Zadnikar, & Kastrin, 2011) found that THR positively affected gross motor function, postural control and balance, and quality of life. Similarly, we found that children with cerebral palsy, as well as multiple other developmental disabilities, were able to benefit from THR in the areas of balance and self-efficacy, which may ultimately enhance their quality of life. Our findings also agreed with previous research on children with ADHD. For example, based on their findings Cuypers, De Ridder, and Strandheim (2011) concluded that THR may be a worthwhile treatment regimen as part of a multimodal therapy because positive outcomes were observed in certain realms of behavior, quality of life, and motor performance, specifically in children with ADHD. Although we did not study children with Friedreich's Ataxia, Gilliland and Knight (2012) suggested that THR resulted in significant differences in step length and stride length in that population. Of all of our participants with other developmental disabilities, we did not specifically measure step length or stride length. Overall, previous studies as well as our study appear to support that THR results in positive outcomes in social and emotional functioning as well as motor skills and coordination balance (Drnach, O'Brien, & Kreger, 2010; Gabriels, Agnew, Holt, Shoffner, Zhaoxing, Ruzzano, & Mesibov, 2011). Our investigation helps to support the idea that THR is in fact a worthwhile and beneficial form of therapy in children with disabilities.

Bandura's social cognitive theory (n.d) describes that the more that a person overcomes, the more he/she feels that he/she is capable of, therefore gaining self-efficacy by achieving goals. Centered on the social cognitive theory, we anticipated that the children with developmental disabilities enrolled in the 10-week THR class would indeed show improvements in self-efficacy due to the new skills that they would be learning. After analyzing our data, it is clear that the children did in fact gain self-efficacy through this therapeutic experience of learning and accomplishing new tasks each week. Grounded in the physical stress theory, which describes how the body reacts when stress is placed upon the tissues, we anticipated that the physical stress placed on the children's bodies from the rhythmic movement of the horse would lead to positive outcomes, allowing the children to gain strength which would ultimately increase their balance. We found that the THR class did increase the children's balance significantly. Therefore, our findings support both the social cognitive theory and the physical stress theory.

Compared to the previous literature, we were surprised to find that many of the children who attended the THR classes at this site had a wide array of medical diagnoses, including many with multiple diagnoses. Seeing this firsthand helped emphasize how difficult daily life may be for these children, as well as emphasizing the importance of any positive progress in coping with their disabilities.

Conclusion

We found significant increases in both balance and self-efficacy after a 10-week THR session in children with developmental disabilities. The findings of this THR study have limitations. This study was a single setting study which limits the generalizability of the study. Also, our sample size was small at 20 participants, and it did not include a control group. Some

of the study participants had several sessions worth of riding instruction prior to the study. Since the study was pre and post THR session, the participants who had more riding experience may not have experienced as much of a difference in balance or self-efficacy from time baseline to post testing. This may have skewed the results since they may have been higher had the participants not had any prior riding experience. In addition, each riding session was divided by ability so the classes were not all held at the same time of day. The participants that had their sessions later in the day may have been more fatigued prior to completing the study altering the results both at baseline and post testing. Both researchers conducted the tests and evaluated the results, and although we tried to be as consistent as possible, it is feasible that due to the fact that we tested the children ourselves without a consistent type of machinery, some subjectivity may be involved. These limitations may have influenced the overall results of the study. However, the final outcomes strongly suggest that THR may be a beneficial therapy for any child living with a developmental disability. Thus, THR can and should be a therapy that is recommended by nurses and their respective facilities to any families facing developmental disabilities. We believe that future studies should be carried out over several different settings and explore the relationships that THR may have on other variables in addition to self-efficacy and balance.

References

Bass, M., Duchowny, C., & Llabre, M. (2009). The effect of therapeutic horseback riding on social functioning in children with autism. *Journal Of Autism & Developmental Disorders, 39*(9), 1261-1267. doi:10.1007/s10803-009-0734-3

Bandura's Self-efficacy Theory. (n.d.). Retrieved November 22, 2014, from http://nursingplanet.com/theory/self_efficacy_theory.html

Berg Balance Scale. (n.d.). Retrieved November 24, 2014, from http://www.aahf.info/pdf/Berg_Balance_Scale.pdf

Cherng, R., Liao, H., Leung, H. W., & Hwang, A. (2004). The effectiveness of therapeutic horseback riding in children with spastic cerebral palsy. *Adapted Physical Activity Quarterly*, *21*(2), 103-121.

Cuypers, K., De Ridder, K., & Strandheim, A. (2011). The effect of therapeutic horseback riding on 5 children with attention deficit hyperactivity disorder: a pilot study. *Journal Of Alternative & Complementary Medicine, 17*(10), 901-908. doi:10.1089/acm.2010.0547

Developmental disabilities. (2013, December 26). Retrieved November 3, 2014, from http://www.cdc.gov/ncbddd/developmentaldisabilities/

Developmental Disabilities. (n.d.). Retrieved November 3, 2014, from https://pa211sw.communityos.org/zf/taxonomy/detail/id/640871/

Drnach, M., O'Brien, P., & Kreger, A. (2010). The effects of a 5-week therapeutic horseback-riding program on gross motor function in a child with cerebral palsy: a case study. *Journal*

Of Alternative & Complementary Medicine, *16*(9), 1003-1006. doi:10.1089/acm.2010.0043

Gabriels, R., Agnew, J., Holt, K., Shoffner, A., Zhaoxing, P., Ruzzano, S., ... Mesibov, G. (2011). Author's personal copy: Pilot study measuring the effects of therapeutic horseback riding on school-age children and adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders, 5*(1), 578-588. Retrieved November 11, 2014.

Gilliland, K. J., & Knight, A. C. (2012). Friedreich's ataxia and gait changes through participation in therapeutic horseback riding. *Clinical Kinesiology (Online Edition)*, *66*(1), 1-6.

Grizzelle, J (2007, January 27). *Behavior Change Theories and Models.* Retrieved from http://www.csupomona.edu/~jvgrizzell/best_practices/bctheory.html#Social%20Learning%20Theory#Social%20Learning%20Theory

Guide for constructing self-efficacy scales. (2006). Retrieved November 24, 2014, from http://www.uky.edu/~eushe2/Bandura/BanduraGuide2006.pdf

La Porta, F., Caselli, S., Susassi, S., Cavallini, P., Tennant, A., & Franceschini, M. (2012). Is the berg balance scale an internally valid and reliable measure of balance across different etiologies in neurorehabilitation? A revisited rasch analysis study. *Archives Of Physical Medicine & Rehabilitation*, *93*(7), 1209-1216. doi:10.1016/j.apmr.2012.02.020

Mueller, M. J., Maluf, K. S. (2002, April). Tissue adaptation to physical stress: a proposed "Physical Stress Theory" to guide physical therapist practice, education, and research [Abstract]. *Phys Ther.*, 82(4), 383-403.

Path International. (n.d.). Retrieved November 3, 2014, from http://www.pathintl.org

Prothmann, A., & Fine, A. H. (2011). Animal-assisted interventions in child psychiatry. In P. McCardle, S. McCune, J. A. Griffin, L. Esposito, & L. S. Freund (Eds.), Animals in our lives: Human- animal interaction in family, community and therapeutic settings (pp. 143–162). Baltimore, MD: Paul H. Brooks Publishing.

Scialli, A. (2002). Parent perceptions of the effectiveness of therapeutic horseback riding for children with varying disabilities. Retrieved from equineassistedinterventions.org

Tseng, S., Chen, H., & Tam, K. (2013). Systematic review and meta-analysis of the effect of equine assisted activities and therapies on gross motor outcome in children with cerebral palsy. *Disability & Rehabilitation*, *35*(2), 89-99.

Ward, S., Whalon, K., Rusnak, K., Wendell, K., & Paschall, N. (2013). The association between therapeutic horseback riding and the social communication and sensory reactions of children with autism. *Journal Of Autism & Developmental Disorders*, *43*(9), 2190-2198. doi:10.1007/s10803-013-1773-3

Willoughby, C., King, G., & Polatajko, H. (1996). The importance of self-esteem: implications for practice. Retrieved from http://www.canchild.ca/en/childrenfamilies/selfesteem.asp

Whalen, C. N., & Case-Smith, J. (2012). Therapeutic effects of horseback riding therapy on gross motor function in children with cerebral palsy: a systematic review. *Physical & Occupational Therapy In Pediatrics*, *32*(3), 229-242

Zadnikar, M., & Kastrin, A. (2011). Effects of hippotherapy and therapeutic horseback riding on postural control or balance in children with cerebral palsy: a meta-analysis. *Developmental Medicine And Child Neurology*, *53*(8), 684-691. doi:10.1111/j.1469-8749.2011.03951.x

Appendix A

Research ROL Summary Table

APA formatted reference[1]	Problem. Research Purpose &/or Research Question[2]	Theoretical Framework What is it and how is it used?	Design of study, Site, Population, Sampling Method. Sample Size.	Variables and measures/tools. Reliability and validity of measures/tools	Findings Conclusions	Implications	Limitations of findings[3]
1. Ward, S., Whalon, K., Rusnak, K., Wendell, K., & Paschall, N. (2013). The Association Between Therapeutic Horseback Riding and the Social Communication and Sensory Reactions of Children with Autism.	Problem: children with autism experience social communication and sensory reaction deficits. 1 in 68 children in the US are diagnosed with autism. Most children with autism show deficits in socialization and repetitive	The authors did not use defined theories in their research. They used an advanced hypothesis from previous studies	Design: interrupted treatment. And ethnographic case study design. A mixed methods design was used Site: Therapeutic riding center in the eastern state of US.	Independent The therapeutic riding session was used as an intervention study and was interrupted with two 6 week breaks but was then reinstated. Dependent variables and tool: Social Communication was measured	Social Interaction scores for the six data collec- tion periods were submitted to a multivariate repeated measures analysis using IBM SPSS 20.0. The results indicated a significant	Social communication and sensory reaction may increase as a result of therapeutic horse riding in children with autism	The study considers a small sample all data from a single source and no control group. Also, The teachers who completed the tools were not blinded so responses could be biased.

[1]Indicate if primary or secondary source and if quantitative, qualitative or mixed methods.
[2]Construct purpose statement and research question is not stated in article. Identify independent variables, dependent variables, and population.
[3] List limitations related to validity and reliability of methods and applicability of findings. Consider strengths and weaknesses of study.

Journal Of Autism & Developmental Disorders, *43*(9), 2190-2198. doi:10.1007/s10803-013-1773-3 This is a primary source And uses an interrupted treatment design	behaviors prior to age 10 (2190). Purpose statement: investigate the effects of a 10-week THR intervention on social communication and sensory processin of children with autism in their school classroom" (p. 2191) Research question: In elementary aged children with autism what is the effect of a 10-week THR intervention on social communication		Population: kindergarten to fifth grade students with autism Sampling method: convenient Sample size: 21 children. 15males and 6 females in grade level from Kindergarten to fifth grade.	by Gilliam autism rating scale (GARS2) Validity and reliability of the tool is described as highly valid and reliable	multivariate effect for Time, F(20,190)=1.9, p\.05. The univariate analyses indicated that there were significant differences over time on the Autism Index, F(5, 60)=2.43, p\.05, and the Social Interaction, F(5, 60)=4.61,p\ .05, subtest. Sidak(1967) corrected comparisons indicated that both of these variables showed significant		

	and sensory processing skills? Does the effect of the intervention maintain after? Therapeutic horse back riding is the independent variable And Social Communication and Sensory Reactions Are the dependent variable				decreases over the study per- iod. The social interaction scale and autism index means decreased between Pre and Week 16. Levels were back to Pre by Week 23 when participants had no lessons or contact with the barn. The mean levels on both variables (p2195)		
2. Scialli, A. (2002). Parent perceptions of the effectiveness of therapeutic horseback riding for	Purpose: To study the effectiveness of human-animal interaction, specifically horseback riding, in children with varying	An environmental-biopsychosocial model serves as the theoretical basis for the assessment of effectiveness of horseback riding in	Design: Effectiveness is measured by parent assessment of improvement in 67 child behaviors resulting from child	Independent The independent variables include personal factors of demographics, type of	An environmental-biopsychosocial approach to study and understand disabilities is an appropriate model.	The literature as well as findings in this study lends support that therapeutic horseback riding may be an effective intervention in children with	Many parents of children with emotional-psychological disabilities other than autism may be underrepresente d. This is due to lower parent

children with varying disabilities. Primary source Qualitiative methods	disabilities. Effectiveness is assessed from the parent's perspective of improvement of child behaviors in five categories: independence-self care, physical-motor, psychological-emotional, cognitive-school, and social interaction. Behavioral improvements are indicators of adjustment to disabilities (p 10).	children with disabilities (p 10). This framework is used to relate the effect of psychological and social aspects of children with disabilities to horseback riding and the improvements it has on these areas.	participation in horseback riding, using a new Horseback Riding Survey. Behaviors are organized in five Likert subscales: Self-Care, Physical-Motor, Psychological/Emotional, Cognitive/School Learning, and Social Communication / Interaction. Internal consistency of each subscale is good using Coefficient Alpha and Split-Half tests for reliability. Criterion-related validity is established with 49 significant correlations of subscale behaviors with a single-item	disability, and environmental factors of therapeutic horseback riding background information and length of time and frequency in therapeutic riding participation. Dependent variables and tool: The dependent variable is the parent perceptions of the effectiveness of horseback riding on child behaviors (personal factors). Internal consistency of each subscale is	The animal-human interaction, AAT, and horseback riding may be therapeutically effective in improving behaviors in children with varying disabilities. Horseback riding for children with disabilities is important to the family. Improvement in child behaviors may be positively related to the length of time (in months) of participation in riding. Horseback riding for the disabled is liked by participating therapists,	disabilities. Children with co-occurring disabilities as well as those with either a physical, mental or psychosocial-emotional disability are well suited to participate in this therapy. There do not appear to be any kind of environmental impediments to limit participation in therapeutic riding.	participation and presence during therapeutic riding activities of children with these disabilities. Another weakness is the reliance on the parent's memory to recall child behaviors when they first began therapeutic riding, and changes that may have occurred as a result of riding today(80). Many variables could have intervened to affect the study findings including other therapies that children are receiving

			measure of overall horseback riding effectiveness. Site: 6 therapeutic riding facilities in south Florida Population: disabled children and their parents Sampling method: convenience sampling (p 58). Sample size: 64 parents of children aged 4-19, with varying disabilities	good using Coefficient Alpha and Split-Half tests for reliability. Criterion-related validity is established with 49 significant correlations of subscale behaviors with a single-item measure of overall horseback riding effectiveness.	families and children participants. Horseback riding (p 83).		

3. Gabriels, R., Agnew, J., Holt, K., Shoffner, A., Zhaoxing, P., Ruzzano, S., ... Mesibov, G. (2011). Author's personal copy Pilot study measuring the effects of therapeutic horseback riding on school-age children and adolescents with autism spectrum disorders. *Research in Autism Spectrum Disorders, 5*(1), 578-588. Retrieved November 11, 2014.	Purpose: To determine if children who have ASD who participate in THR can have positive effects on improving mood/emotion regulation, adaptive and social behaviors and awareness, and motor coordination / planning; however, research designs and measurement instruments have had significant limitations (4).	Theoretical Framework:	Design: Pre-test Post-test design Site: therapeutic horseback riding centers Population: Forty-two participants (36 male, 6 female) between the ages of 6 and 16years (mean age: 8.7years) and a nonverbal IQ (NVIQ) range of 44–139 (mean: 95.2) diagnosed with either autistic or Asperger's Disorder participated in the THR intervention aspect of this pilot study (p	Independent variable: Demographics; age, gender, level of disorder Dependent: The effects of therapeutic horseback riding on children with ASD	Conclusion: This pilot study provides preliminary evidence that a 10-week therapeutic horseback riding (THR) intervention with children diagnosed with an ASD can result in significant improvement. Specifically, participants in the THR intervention group made significant improvements from baseline to post-evaluations on measures of self-regulation (Irritability, Lethargy,StereotypicBehavior,a	Implications: Therapeutic horseback riding sessions help improve behavioral dilemmas in children with autism spectrum disorders (10).	Limitations: The use of caregiver report outcome measures, small sample sizes, a lack of comparative control conditions, and variability of equine intervention methods employed are all limitations that may interfere with the study.

Primary source Qualitiative measures			4). Methods: Participants were selected by study fliers, and television promotion adds. After a rigorous selection process, participants were accepted (4).		ndHyperactivity),adaptiveexpressivelanguageskills,motorskills, andverbalpraxis/motor planning skills (10).		
4. Zadnikar, M., & Kastrin, A. (2011). Effects of hippotherapy and therapeutic horseback riding on postural control or balance in children with cerebral palsy: a meta-analysis. *Developmental Medicine And Child*	Problem: Purpose statement: effects of hippotherapy and therapeutic horseback riding (THR) on postural control or balance in children with cerebral palsy	Theoretical Framework: The physical stress theory is used in this study, as evidenced by stating that the "rhythmical movement, combined with the warmth of the horse, is hypothesized to decrease hypertonicity and promote relaxation in the	Design: Meta-analysis Site: Centre for Education and Rehabilitation for Children and Adolescents with Special Needs (CIRIUS), Kamnik. And Institute of	Independent variable and tool: THR and hippotherapy V&R of tool: THR or Hippotherapy performed by trained personnel over a specific period of time	Conclusion: the review reveals that THR can be recommended for therapy in children with CP.	Implications: Postural control and balance may improve in children with CP who participate in THR, or hippotherapy	Limitations: This is not a primary source Only 8 studies were used in this review. It only observes one type of physical disability (CP).

Neurology, *53*(8), 684-691. doi:10.1111/j.1469-8749.2011.03951.x This is a secondary source of quantitative study designs	(CP). Research question: to present an overview of the effects of hippotherapy and therapeutic horseback riding (THR) on postural control or balance in children with cerebral palsy (CP).	rider with spastic CP. Adjusting to the horse's movements also involves the use of muscles and joint movements which, over time, may lead to increased strength and range of motion" (p. 685).	Medical Genetics, University Medical Centre Ljubljana, Ljubljana, Slovenia. Population: they started with 77 studies however only 10 met the criteria Sampling method: The preferred Reporting Items for Systemic Reviews and Meta-analyses (PRISMA) Sample size: 10	session length varied among studies. Dependent variables and tool: improvement in postural control and balance this was documented in 7 out of the 8 studies V&R of tool: 6 used a Brunel active balance saddle to measure the improvement of postural control and balance			Does not include information about self - efficacy

			studies				
5.Cherng, R., Liao, H., Leung, H. W., & Hwang, A. (2004). The Effectiveness of Therapeutic Horseback Riding in Children With Spastic Cerebral Palsy. *Adapted Physical Activity Quarterly*, *21*(2), 103-121. This is a quantitative, primary study	Purpose: This study looks to prove what the researchers say other studies are lacking, which is that that have not conclusively proven that THR is an effective therapy for children with CP.	Theoretical Framework: This study does not seem to use a theory however they seem to have an advanced hypothesis that they have formed from there review of literature, in which they believe that THR will be effective in improving the children's gross motor function and reduce muscle tone of hip adductors.	Design: a with-in participant repeated-measures Site: The study was carried out at the Taiwan Municipal Equestrian Training Center in Taiwan. Population: Children aged 3-12, with a diagnosis of spastic CP, able to follow instructions, interested in riding, with parental commitment to	Independent variable and tool: The effect of THR on the gross motor function scores and muscle tone of the hip adductors V&R of tool: THR performed under the direction/ supervision of the riding program instructor, performed by volunteers one horse leader and two side walkers Dependent variables and	Conclusion: Some children with spastic CP in this study showed improved gross motor function after a period of 16 weeks in duration, 2 sessions per week, for 40 minutes per session THR. And the effects seemed to sustain for 16 weeks. No effect was noted in the muscle tone of the hip adductors. The researchers conclude that THR may help some children with spastic CP.	Implications: THR may help to improve gross motor function and decrease muscle tone in children ages 3-12 with spastic CP.	Limitations: Sample size is small. Bias may have been present upon selection of participants. Population is narrow in its specificity to just spastic CP. Difficulty deciphering if age or severity played a role in the results.

			allow participation without changing current therapy or activity. Sample size: The study had a total of 20 participants.	tool: the gross motor function measure scores Dependent variables and tool: the tool being used is the GMFM test for gross motor function, and a modified Ashworth scale for the muscle tone of the hip adductors			
6.Whalen, C. N., & Case-Smith, J. (2012). Therapeutic Effects of Horseback Riding Therapy on Gross Motor Function in Children with Cerebral Palsy: A Systematic	Purpose: to examine the efficacy of THR and Hippotherapy on motor outcomes in children with CP through synthesis of research evidence.	Theoretical Framework: This study also uses the physical stress theory, explaining how the movement of the horse helps to improve balance, range	Design: systemic review Site: School of Allied Medical Professions, The Ohio State University, Columbus, Ohio, USA.	Independent variable and tool: the use of hippotherapy or THR V&R of tool: the horse and the PT or certified	Conclusion: Current literature is too limited and that studies need larger sample sizes and consistent protocols to really determine the effects of hippotherapy	Implications: children with cerebral palsy improve in gross motor performance as a result of hippotherapy or THR.	Limitations: Studies were limited to only studies available in English, and the study didn't consider the psychosocial benefits participants.

Review. *Physical & Occupational Therapy In Pediatrics*, *32*(3), 229-242 This is a quantitative study. Secondary source		of motion, posture, and coordination.	Population: (a) Subjects in study have a diagnosis of CP (all types), (b) hippotherapy or THR was the primary intervention, (3) mobility or gross motor outcomes were investigated, and (4) a physical therapist, occupational therapist, or an accredited therapeutic riding instructor implemented the intervention (pg 231) Sample size: 9 studies were reviewed	Dependent variables and tool: gross motor function and mobility Dependent variables and tool: Gross Motor Function Classification System (GM-FCS)	and THR on children with CP.		

7.Bass, M., Duchowny, C., & Llabre, M. (2009). The effect of therapeutic horseback riding on social functioning in children with autism. *Journal Of Autism & Developmental Disorders*, *39*(9), 1261-1267. doi:10.1007/s10803-009-0734-3	Problem: Children with autism experience social, communication, and motor skill functioning deficits, which causes lack of social awareness and communication, deficits in sensory integration, and inability to initiate directed attention (p. 1261)." Purpose statement: To evaluate the effects of a 12	This study uses a hypothesis, stating that after 12-weeks of a THR intervention, those in the experimental group will gain significant improvements in social functioning, whereas those in the control group will not.	Design: Pre-test/Post-test, and a 12 week intervention Site: Good Hope Equestrian Training Center (GHETC) in Homestead, Florida. Population: 34 children, 2 girls and 17 boys in the experimental group 5 to 10 years old; and	Independent variable and tool: 12, 1 hour therapeutic horseback riding sessions Dependent variables and tool: The affect of THR on social functioning in children with autism. The tool is The Social Responsiveness Scale (SRS) and the Sensory Profile (SP).	Autistic children in the experimental group improved in critical areas such as sensory seeking, $t(18) = 4.85$, $p < .001$; inattention/distractibility, $t(17) = 5.19$, $p < .001$; sensory sensitivity, $t(18) = 6.20$, $p < .001$; and sedentary, $t(18) = 4.93$, $p < .001$. However, the control group did not exhibit significant change from pre to post test: sensory seeking, $t(12) = 1.00$, $p = .337$; attention/distractibility, $t(12) = .001$, $p = 1.00$; sensory	"Future studies should increase the length and number of sessions in order to test whether a more intense form of treatment would result in greater improvement in social functioning. A more comprehensive assessment would be beneficial in understanding how treatment is directly affecting specific domains of social functioning (p. 1267)."	"There was no information about medication regimens; it is unknown whether parents of children in either the experimental or control groups were involved in any therapy or self-help classes; and the attrition rate (6 participants dropped out of the experimental group and 3 dropped out of the control group) (p. 1267)."

	week therapeutic horseback riding session on social functioning in children with autism. Research question: Will children exposed to therapeutic riding exercises exhibit improvements in social functioning compared to participants who did not receive the treatment?		15 children, 3 girls and 12 boys, in the control group 4 to 10 years old. All children were diagnosed with Autism Spectrum Disorder (ASD). Sampling method: random Sample size: 34 in the experimental group and 15 in the control group.		sensitivity, $t(13) = 1.47$, $p = .165$; and sedentary, $t(13) = 1.00$, $p = .336$.		
8. Gilliland, K. J., & Knight, A. C. (2012). Friedreich's	Purpose Statement:	Theoretical Framework:	Design: pre-test/post-	Independent Variable and Tool:	Findings/ Conclusions:	Implications: "Indicates the	Limitations of Findings:

Ataxia and Gait Changes through Participation in Therapeutic Horseback Riding. *Clinical Kinesiology (Online Edition)*, *66*(1), 1-6.	"To add to the current body of literature to assist in the understanding of the disease progression, and to describe potential benefits for individuals with FA through participation in therapeutic horseback riding; to provide therapeutic horseback riding instructors, or other individuals involved in a variety of movement therapies, guidelines to use when working with individuals with FA (p. 2)."	This study has an advanced hypothesis: If THR is therapeutic for cerebral palsy, muscular dystrophy, and MS, then it will be affective for FA as well. It also follows the physical stress theory, since "the specific part of the equine movement that replicates normal human gait includes hip and pelvic rotation, weight shift, and proprioceptive stimulation." (p. 2)	test case study; "it was designed to analyze the participant's walking gait both before and after each THR session, and to analyze any changes in gait that may have occurred over the course of two separate six week riding sessions, approximately 5 months apart (p. 3). Site: A horseback riding center Population: 1 39-year-old male with a clinical diagnosis of	Testing time (pre: before riding and post: after riding), and testing session Dependent Variable and Tool: Stride length (m), left and right step length (m), step width (m), and ankle, knee, and hip angles (degrees) at both heel strike and toe off. Tool: two Sony handycam digital camcorders, and Dartfish video solutions.	"There was no significant differences found in any of the joint angles. There was no significant interaction between step length and testing session or step length between the left leg and the right leg. There was a significant difference in step length between sessions. Also, there was a significant difference in stride length (p. 3)."	recommendation for a THR program for an individual with FA should be conducted for at least 30 minute sessions, but increase the frequency to two or three times each week, and should include short intervals of trotting (p. 5)."	"1. Measurement issues such as stride width, which was only measured during the second session, and therefore comparisons between the two sessions cannot be made. 2. The tool used, Dartfish, is a very useful tool for motion analysis, however it can only measure gait kinematics in two dimensions. 3. The participant had been involved in THR for seven years, but data was collected in only two of those years (p. 5)"

	Research Question: How does participation in therapeutic horseback riding affect gait changes in Friedreich's Ataxia?		FA. Sampling Method: Convenient Sample size: One male				
9. Drnach, M., O'Brien, P., & Kreger, A. (2010). The effects of a 5-week therapeutic horseback-riding program on gross motor function in a child with cerebral palsy: a case study. *Journal Of Alternative & Complementary Medicine*, *16*(9), 1003-1006. doi:10.1089/ac	Problem: Children with cerebral palsy experience gross motor function deficits. CP affects approximately 1 in every 323 children in the United States. Purpose Statement: to determine the outcome of a 5-	Theoretical Framework: This study has an advanced hypothesis: If longer THR sessions have positive effects, than shorter sessions are still bound to have positive effects.	Design: Case study; it has repeated measures of pretest-posttest, and 5 weeks intervention. Population: 1 male child, 10 years old, with CP, spastic diplegic	Independent variable: Five, one-hour therapeutic horse back riding sessions. The author states that all therapy was performed in accordance with the North America Riding for the Handicapped Association (NARHA).	Findings/ Conclusions: A 5-week session of THR appears to have beneficial effects on gross motor function in children with cerebral palsy.	This single subject/case study included statements about improvements but no statistics were described. Based on the limitations of the study, there are no implications at this point.	Limitations: Case study of one participant; no randomization, no control group. No statistics were provided about the validity and reliability of the dependent variable measure.

m.2010.0043 This quantitative study is a primary source.	week therapeutic horseback riding intervention on the gross motor function in a child with cerebral palsy		presentation. Site: Indoor riding arena. Sampling method: convenience	Dependent: Gross motor function The tool is the Gross motor function measure (GMFM). Authors describe V and R as: "(1) the clinical relevance and sensitivity of the test to change in motor function; (2) the element of time required to complete the test; (3) reliability of the GMFM, providing consistent scores when used repeatedly with the same subjects; and (4) the validity of the measure.[12]" (p.			

				1005).			
10 Cuypers, K., De Ridder, K., & Strandheim, A. (2011). The Effect of Therapeutic Horseback Riding on 5 Children with Attention Deficit Hyperactivity Disorder: A Pilot Study. *Journal Of Alternative & Complementary Medicine*, *17*(10), 901-908. doi:10.1089/acm.2010.0547 This study is a primary, quantitative study.	Problem: "Children with ADHD often follow a sustained negative developmental trajectory due to psychosocial risk factors, and impairments can continue into adulthood. Many children with ADHD have functionally motor performance problems, social problems, and problems with rhythm" (p. 901). Purpose	Theoretical Framework: This study has an advanced hypothesis: If a child with ADHD undergoes THR, he/she will have positive affects related to behavior, health-related quality of life, and motor performance	Design: A time series quasi-experimental design with two pretests and two post-tests conducted eight weeks apart. Population: Five boys ages 10-11 years old who with ADHD who reacted positively to a medicament called Concerta and who took the medicine for more than one year.	Independent Variable and tool: One 8-week THR session, with two riding sessions per week. Dependent variable: behavior, health-related quality of life, and motor performance in children with attention deficit hyperactivity disorder (ADHD) Tools: SDQ, Kindl-HQoL, MABC, MFNU	Findings/ Conclusions: "Therapeutic horseback riding could be a viable treatment strategy as part of a multimodal therapy for children with ADHD. The study assumes positive domains of behavior, quality of life, and motor performance" (907).	Implications: THR is a treatment plan that has numerous possibilities, from the equipment, selection of the horse, movement patterns of the horse during the treatment, and positional changes of the participant. The best combination for each participant was selected by the knowledge and experience of the researcher.	Limitations of Findings: Small sample size of only five children

	Statement: "The aim of this pilot study was to investigate the effects of therapeutic horseback riding on behavior, health-related quality of life, and motor performance in children with attention deficit hyperactivity disorder (ADHD)" (p. 901). Research Question: What is the effect of therapeutic horseback riding on 5		Site: A riding school in Levanger, Norway Sampling Method: Selective sampling				

	children with attention deficit hyperactivity disorder?						

Appendix B:

Consent

Title of Study: The Effect of Therapeutic Horseback Riding on Balance and Self-Efficacy in Children with Developmental Disabilities.

Introduction: You are invited to participate in a research project being conducted by Lauren Hurley and Alex Smola, nursing students in the College of Health Professions, School of Nursing at The University of Akron.

Purpose: The purpose of this project is to study therapeutic horse back riding, balance, and self-efficacy in children with developmental disabilities

Procedures: If you volunteer to participate in this study, your child will be asked to complete a short survey about him or herself. This survey should take approximately 20 minutes to complete, and we will be available to help your child answer questions, if needed. This survey will be conducted before the first riding session and then again after the end of the last session. Additionally, you will be asked to give some information about your child's age, gender, type of disability, and any previous horseback riding experience. Your child will also be asked to participate in a 20-minute test to assess balance. This test will include maneuvers such as sitting, standing (supported and unsupported), turning, retrieving items, and reaching. This test, too, will be performed before the start of the first riding session and then again after the last riding session. You will not be asked to give any identifying information at any time. Your child is eligible to participate in the study if you are enrolled in a session of therapeutic horse back riding. You are not eligible if your child is under the age of 6 or over the age of 18 or if they do not have a developmental disability.

Benefits and Risks: You or your child will not receive direct benefit from your participation in this study, but your participation may help us better understand the therapeutic benefits of therapeutic horseback riding in children with developmental disabilities. There are some possible risks involved in completing the survey because you are asked to answer questions about personal and other information. And although we hope you respond to every item on the survey, whether or not you do is up to you!

Right to refuse or withdraw: Whether or not you and your child take part in this study is completely up to you. Not participating or withdraw from the study at any time results in no consequences. Not participating in no way affects your standing or enrollment at the riding facility.

Anonymous and Confidential Data Collection: No identifying information will be collected. No one will have access to any study information unless they are a formal member of the research team.

Confidentiality of Records: Completed surveys will be stored in a locked cabinet file of the sponsor's locked university office. Only study co-investigators and the project sponsor (a faculty member at The University of Akron) will have access to the information of the study. At the end of the study, all of the information will be destroyed. Also, surveys will be de-identified and each participant will be assigned a number to connect pre- and post-test data for analysis.

Who to Contact with Questions: If you have any questions about this study, you may contact Lauren Hurley (lmh114@zips.uakron.edu), Alex Smola (ats36@zips.uakron.edu), or Christine Heifner Graor, PhD (Advisor) at (330) 972-6422 or graor@uakron.edu. This project has been approved by The University of Akron Institutional Review Board. If you have any questions

about your rights as a research participant, you may call the IRB at (330) 972-7666.

Acceptance & Signature: I have read the information and voluntarily agree to participate in this study. My signature below indicates my informed consent to take part in this study. I know I will receive a copy of this consent statement for future reference.

Parent or guardian signature:

_____

Date:

_____

Co-investigator:

_____

Appendix C:

Assent Form

Horseback Riding Study

Our names are Lauren Hurley and Alex Smola, and we students in the College of Health Professions, School of Nursing at The University of Akron.

We are asking you to take part in a research study because we are trying to learn more about how riding horses helps in children with developmental disabilities.

If you agree to be in this study, you will answer a few questions about how you feel about yourself and the abilities that you have. You will answer these questions before your first day at your therapeutic horseback riding session and again after your last day. Also, before your first day of riding, we will test your balance by having you sit down, stand up, twist and turn your body, pick things up, and reach for things. You will do these same activities after your last day of horseback riding, too.

Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take part in this study. But even if your parents say "yes" you can still decide to say "no."

If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to participate or even if you change your mind later and want to stop.

You can ask any questions that you have about the study. If you have a question later that you did not think of right now, you can reach one of us via e-mail:

Lauren Hurley (lmh114@zips.uakron.edu),

Alex Smola(ats36@zips.uakron.edu), or

Christine Heifner Graor, PhD (Advisor) at graor@uakron.edu or (330) 972-6422

Signing your name at the bottom means that you agree to be in this study. You will be given a copy of this form to keep.

_____ _____

Name of Subject Age

_____ _____

Signature of Co-investigator Date

Appendix D:

Children's Self-Efficacy Scale

Bandura, 2006

Rate your degree of confidence by recording a number from 1 to 5 using the scale given below.

Confidence (1-5)

1	2	3	4	5
I don't feel confident	I rarely feel confident	I feel confident some of the time	I feel confident most of the time	I feel confident always

Task Specific Self-Efficacy scale for Therapeutic Horseback Riding	**Confidence (1-5)**
I can find my horse	_____
I can groom my horse.	_____

I can lead my horse _____

I can get on my horse _____

I can make the horse move _____

I can make my horse stop _____

I can get off my horse _____

I understand what the instructor tells me to do _____

I believe I am able to make friends _____

I am able to ask for help _____

(GUIDE FOR CONSTRUCTING, 2006).

Appendix E:

Berg Balance Scale

Name: _____ **Date:** _____

Location _____ **Examiner:** _____

Item Description	**Score**	**Seconds**
	0-4	**optional**
1. Sitting to Standing	_____	
2. Standing to sitting	_____	
3. Transfers	_____	
4. Standing unsupported	_____	_____
5. Sitting unsupported	_____	_____
6. Standing with eyes closed	_____	_____
7. Standing with feet together	_____	_____
8. Standing with one foot in front	_____	_____
9. Standing on one foot	_____	_____
10. Turning 360 degrees	_____	_____
11. Turning to look behind	_____	
12. Retrieving object from the floor	_____	
13. Placing alternate foot on stool	_____	_____
14. Reaching forward with outstretched arm	_____	
Total Test Score	**_____**	

General Instructions

1. Demonstrate each task and give instructions as written. A child may receive a practice trial on each item. If the child is unable to complete the task based on their ability to understand the directions, a second practice trial may be given, Verbal and visual directions may be clarified through the use of physical prompts.

2. Each item should be scored utilizing the 0 to 4 scales. Multiple trials are allowed on many of the items. The child's performance should be scored based upon the lowest criteria, which describes the child's best performance. If on the first trial a child receives the maximal score of 4, additional trial need not be administered. Several items require the child to maintain a given position for a specific time. Progressively, more points are deducted if the time or distance requirements re not met; if the subject's performance warrants supervision; of if the subject touches an external support or receives assistance from the examiner. Subjects should understand that they must maintain their balance while attempting the tasks. The choice, of which leg to stand on or how far to reach, is left up to the subject. Poor judgment will adversely influence the performance and the scoring. In addition to scoring items 4, 5, 6, 7, 8, 9, 10, 13, the examiner may choose to record the exact time in seconds.

Equipment

- Adjustable height bench
- Chair with back support and arm rests
- Stopwatch or watch with a second hand
- Masking tape- 1 inch wide
- A step stool 6 inches in height
- Chalkboard eraser
- Ruler or yardstick
- A small level

The following items are not required but may be helpful during the test administration

- 2 child size foot prints
- Blindfold
- A brightly colored object at least two inches in size
- Flash cards
- 2 inches of adhesive backed hook Velcro
- Two 1 foot strips of loop Velcro

#1: Sitting to Standing

*** Special Instructions:** items #1and #2 may be tested simultaneously if, in the determination of the examiner, it will facilitate the best performance of the child.

Instructions: child is asked to "hold arms up and stand up" the child is allowed to select the position of his/her arms. Use the best of three trials.

Equipment: a bench of appropriate height to allow the child's feet to rest supported on the floor with the hips and knees maintained in 90 degrees of flexion.

( )4 able to stand without using hands and stabilize independently

( )3 able to stand independently using hands

( )2 able to stand using hands after several tries

( )1 needs minimal aid to stand or stabilize

( )0 needs moderate or maximal assist to stand

#2 Standing to Sitting

***Special Instructions:** items #1and #2 may be tested simultaneously if, in the determination of the examiner, it will facilitate the best performance of the child.

Instructions: Child is asked to sit down slowly, without the use of hands. The child is allowed to select the position of his/her arms. Best of three trials.

Equipment: a bench of appropriate height to allow the child's feet to rest supported on the floor with the hips and knees maintained in 90 degrees of flexion.

( )4 sits safely with minimal use of hands

( )3 controls descent by using hands

( )2 uses back of legs against chair to control descent

( )1 sits independently but has uncontrolled descent

( )0 needs assist to sit

#3 Transfers

Instructions: arrange chair(s) for a stand pivot transfer, touching at a forty-five degree angle. Ask the child to transfer one way toward a seat with armrests and one way toward a seat without armrests. Best of three trials.

Equipment: two chairs, or one chair and one bench. One seating surface must have armrests. One chair/bench should be of standard adult size and the other should be of an appropriate height to allow the child to comfortably sit with feet supported on the floor and ninety degrees of hip and knee flexion.

( )4 able to transfer safely with minor use of hands

( )3 able to transfer safely definite need of hands

( )2 able to transfer with verbal cueing and/or supervision (spotting)

( )1 needs one person to assist

( )0 needs two people to assist or supervise (close guard) to be safe

#4 Standing Unsupported

Instructions: the child is instructed to stand for 30 seconds without holding on or moving his/her feet. A taped line or footprints may be placed on the floor to help the child maintain a stationary foot position. The child may be engaged in a non-stressful conversation to maintain attention span for thirty seconds. Weight shifting and equilibrium responses in feet are acceptable; movement of the foot space (off the support surface) indicates end of the timed trial. Best of three trials.

Equipment: a stop watch or watch with a second hand, a twelve inch long masking tape line or two footprints placed shoulder width apart.

( )4 able to stand safely for 30 seconds

( )3 able to stand 30 seconds with supervision

( )2 able to stand 15 seconds unsupported

( )1 needs several tries to stand 10 seconds unsupported

( )0 unable to stand 10 seconds unsupported

_____ Time in seconds

If a subject is able to stand 30 unsupported, score full points for sitting unsupported. Proceed to item #6

#5 Sitting with Back Unsupported and Feet supported on the Floor

Instructions: please sit with arms folded on your chest for 30 seconds. Child may be engaged in non-stressful conversation to maintain span for thirty seconds. Time should be stopped of protective reactions are observed in trunk or upper extremities. Best of three trials.

Equipment: A stopwatch, a bench of appropriate height to allow the child's feet to rest supported on the floor with the hips and knees maintained in ninety degrees of flexion.

( )4 able to sit safely and securely 30 seconds

( )3 able to sit 30 seconds under supervision (spotting) or may require definite use of upper extremities to maintain sitting position

( )2 able to sit 15 seconds

( )1 able to sit 10 seconds

( )0 unable to sit 10 seconds without support

_____ Time in seconds

#6 Standing Unsupported With Eyes Closed

Instructions: the child is asked to stand still with feet shoulder width apart and close his/her eyes for ten seconds. **Directions: "when I say close your eyes, I want you to stand still, close your eyes, and keep them closed until I say open them."** If necessary, a blindfold may be used. Weight shifting and equilibrium responses in the feet are acceptable; movement of the foot space (off the support surface) indicates end of timed trial. A taped line or footprints may be placed on the floor to help the child maintain a stationary foot position. Best of three trials.

Equipment: A stopwatch or a watch with a second hand, a twelve-inch long masking tape line or two footprints placed should width apart, blindfold.

( )4 able to sit safely 10 seconds

( )3 able to 10 seconds under supervision (spotting)

( )2 able to stand 3 seconds

( )1 able to keep eyes closed 3 seconds but stays steady

( )0 needs help to keep from falling

_____ **Time in seconds**

#7 Standing Unsupported With Feet Together

Instructions: The child is asked to place his/her feet together and stand still without holding on. The child may be engaged in non-stressful conversation to maintain attention span for thirty seconds. Weight shifting and equilibrium responses in feet are acceptable; movement of the foot in space (off supported surface) indicates end of timed trial. A taped line or footprints may be placed on the floor to help the child maintain a stationary foot position. Best of three trials.

Equipment: A stopwatch or a watch with a second hand, a twelve-inch long masking tape line or two footprints placed together.

( )4 able to place feet together independently and stand 30 seconds safely

( )3 able to place feet together independently and stand for 30 seconds with supervision (spotting)

( )2 able to place feet together independently but unable to hold for 30 seconds

( )1 needs help to attain position but able to stand 30 seconds with feet together

( )0 needs help to attain position and/or unable to hold for 30 seconds

_____ **Time in seconds**

#8 Standing Unsupported One Foot In Front

Instruction: the child is asked to stand with one foot in front of the other, heel to toe. If the child cannot place feet in a tandem position (directly in front), the should be asked to step forward far enough to allow the heel of one foot to be placed ahead the toes of the stationary foot. A taped line or footprints may be placed on the floor to help the child maintain a stationary foot position. In addition to a visual demonstration, a single physical prompt (assistance with placement) may be given. The child may be engaged in non-stressful conversation to maintain attention span for thirty seconds. Weight shifting and equilibrium responses in feet are acceptable; timed trial should be stopped if either foot moves in space (leaves the support surface) and/or upper extremities support is utilized. Best of three trials.

Equipment: a stop watch or watch with a second hand, a twelve-inch long masking tape line or two footprints placed heel to toe.

( )4 able to place feet tandem independently and hold 30 seconds

( )3 able to place foot ahead of the other independently and hold for 30 seconds. Note: The length of the steps must exceed the length of the stationary foot and the width of the stance should approximate the subject's normal stride width.

( )2 able to take small step independently but unable to hold for 30 seconds, or required assistance to place foot in front, but can stand for 30 seconds.

( )1 needs help to step, but can hold 15 seconds

( )0 loses balance while stepping or standing

_____ **Time in seconds**

#9 Standing On One Leg

Instructions: The child is asked to stand on one leg for as long as he/she is able to without holding on. If necessary the child can be instructed to maintain his/her arm (hands) on his/her hips (waist). A taped line or footprints may be placed on the floor to help the child maintain a stationary foot position. Weight shifting and equilibrium responses in feet are acceptable; timed trial should be stopped if either foot moves in space (leaves the support surface) the upper limb touches the opposite leg or the support surface and /or upper extremities are utilized for support.

Equipment: a stop watch or watch with a second hand, a twelve-inch long masking tape line or two footprints placed heel to toe.

( )4 able to lift leg independently and hold 10 seconds

( )3 able to lift leg independently and hold 5 to 9 seconds

( )2 able to lift leg independently and hold 3 to 4 seconds

( )1 tries to lift leg; unable to hold 3 seconds but remains standing

( )0 unable to try or needs assistance to prevent fall

#10 Turn 360 Degrees

Instructions: The child is asked to turn completely around in a full circle, stop, and then turn full circle in the other direction.

Equipment: a stopwatch or a watch with a second hand.

( )4 able to turn 360 degrees safely in 4 seconds or less each way (total of less than eight seconds)

( )3 able to turn 360 degrees safely in one direction only in 4 seconds or less completes turn in other direction requires more than four seconds

( )2 able to 360 degrees safely but slowly

( )1 needs close supervision (spotting) or constant verbal cueing

( )0 needs assistance while turning

_____ Time in seconds

#11 Turning to look Behind Left and Right Shoulder While Standing Still

Instructions: The child is asked to stand with his/her feet still. Fixed in one place. "follow this object as I move it. Keep watching it as I move it, but don't move your feet."

Equipment: brightly colored object of at least two inches in size, or flash cards, a twelve inch long masking tape line or two footprints placed shoulder width apart.

( )4 looks behind/over each shoulder; weight shifts include trunk rotation

( )3 looks behind/over one shoulder with trunk rotation; weight shift in the opposite direction is to the level of the shoulder; no trunk rotation

( )2 turns head to look to level of shoulder; no trunk rotation

( )1 needs supervision (spotting) when turning; the chin moves greater then half the distance to the shoulder

( )0 needs assistance to keep from losing balance or falling; movement of the chin is less than half the distance to the shoulder

#12 Pick up Object From The Floor From A Standing Position

Instructions: The child is asked to pick up a chalkboard eraser placed approximately the length of his/her foot in front of his/her dominant foot. In children, where dominance is not clear, ask the child which hand they want to use and place the object in front of that foot

Equipment: a chalkboard eraser, a taped line or footprints

( )4 able to pick up an eraser safely and easily

( )3 able to pick up eraser but needs supervision(spotting)

( )2 unable to pick up eraser but reaches 1 to 2 inches from eraser and keeps balance independently

( )1 unable to pick up eraser; needs supervision(spotting) while attempting

( )0 unable to try, needs assist to keep from losing balance or falling

#13 Placing Alternating Foot On Step Stool While Standing Unsupported

Instructions: The child is asked to place each foot alternately on the step stool and continue until each foot has touched the step/stool four times.

Equipment: a step/stool of four inches in height, a stopwatch with a second hand.

( )4 stands independently and safely and complete 8 steps in 20 seconds

( )3 able to stand independently and complete 8 steps > 20 seconds

( )2 able to complete 4 steps without assistance, but requires close supervision(spotting)

( )1 able to complete 2 steps; needs minimal assistance

( )0 needs assistance to maintain balance or keep from falling, unable to try

_____ Time in seconds

#14 Reaching Forward With Outstretched Arm While Standing

General instructions and set up: A yardstick affixed to a wall via Velcro strips will be used as the measuring tool. A taped line and/or footprints are used to maintain a stationary position. The child will be asked to reach as far forward without falling, and without stepping over the line. The MCP joint of the child's fisted hand will be used as the anatomical reference point for

measurements. Assistance may be given to initially position the child's arm at 90 degrees. Support may not be provided during the reaching process, if 90 degrees of the shoulder flexion cannot be obtained, then this item should be omitted.

Instructions: The child is asked to lift his/her arm like this. "Stretch out your fingers, make a fist, and reach forward as far as you can without moving your feet." 3 trials then average the results.

Equipment: a yard stick or ruler, a taped line or footprints, level

( )4 can reach forward confidently> 10 inches

( )3 can reach forward >5 inches, safely

( )2 can reach forward >2 inches, safely

( )1 reaches forward but needs supervision(spotting)

( )0 loses balance while trying, requires external support

_____ Total Test Score

Maximum Score = 56