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## An Examination of Hippotherapy as a Tool to Deliver Physical, Occupational, and Speech Therapy

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An Examination of Hippotherapy as a tool to deliver Physical, Occupational, and Speech  
Therapy

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Honors Program

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**Abstract:**

This research paper aims to answer the following questions, 1) how is hippotherapy used as a form of speech, physical, and occupation therapy, and 2) is it an effective method of treatment. This will be done by describing each aspect of hippotherapy and how it can be an essential form of rehabilitation. Hippotherapy is broadly defined as the use of a horse's movement to facilitate physical, occupational, or speech therapy. While hippotherapy is becoming increasingly popular, it is not yet viewed as a mainstream form of therapy. There is still limited research on hippotherapy, and because it is not used on its own as therapy, it is considered an alternative form of therapy (Tinkham, 2017).

Research from various studies was compiled through a database search, and used to explain how hippotherapy is used for each therapy aspect, why it works, and why it is a valid form of therapy. It was found that hippotherapy has benefitted countless patients and can be a very effective tool when used in the right situation. Hippotherapy is most often used in addition to the more conventional methods of therapy, because while effective, hippotherapy cannot always address all of the patients therapy needs. It was also found that hippotherapy is not suited for every individual and its use must be evaluated on a case by case basis, like many other forms of therapy. Overall, hippotherapy can be a remarkable supplemental form of therapy, and can provide unique outcomes that aren't always possible through traditional therapy.

**Introduction:**

Hippotherapy first started as an adjunct to physical therapy in the 1960s, which is when therapeutic riding centers began to develop in Europe, Canada, and the United States (“What is Hippotherapy,” 2018). The meaning of hippotherapy is treatment using horses, with the Greek word for horse being hippos (“What is Hippotherapy,” 2018). The definition of hippotherapy, as defined by the American Hippotherapy Association, is “a term that refers to the use of the movement of the horse as a strategy by Physical Therapists, Occupational Therapists, and Speech-Language Pathologists to address impairments, functional limitations, and disabilities in patients with neuromusculoskeletal dysfunction. This strategy is used as part of an integrated treatment program to achieve functional outcomes.” (“What is Hippotherapy,” 2018). While riding, the patient responds to the horse’s movement and is forced to use an assortment of muscles to stay upright while the horse walks or trots. The patient can be positioned in a variety of ways including facing forwards, backwards, or sideways, and laying on the horse in all of these directions as well. In addition to the horse and the therapist, the patient has one to two volunteers called side walkers, and a certified therapeutic riding instructor or approved horse handler that handles and maneuvers the horse as directed by the therapist.

During a hippotherapy session, the role of the therapist is to focus on the patient and use the movement of the horse to help their patient achieve their treatment goals. The therapist will communicate with the horse handler about what type of movement the patient needs from the horse, and with the side walkers about how they need to support the patient. The therapist will often employ games or activities that involve reaching or stretching, changing positions, playing catch, and working on balance to make the session more interactive and

applicable to each patient based on treatment goals (“What is Hippotherapy,” 2018). The role of the horse handler is to adjust the horse’s movement to what the therapist wants to achieve for the patient. Their focus is on the horse and making sure that everything that the patient and therapist are doing is within the comfort level of the horse. The role of the side walkers is to interact with and support the patient in any way that the therapist designates; this may include doing a thigh or ankle hold on the patient, playing games with the patient, open and closing gates, and singing songs. Each member of the hippotherapy team has a very important role in making the hippotherapy session possible, successful, and safe.

Hippotherapy is used in addition to clinical therapy in order to better achieve the goals of the patient. Hippotherapy is often employed to improve patient’s balance, mobility, and posture (Koca & Ataseven, 2016). The slow, rhythmic movement of the horse engages and develops important muscles that play an important role in balance, mobility, and posture. The therapists alter and adjust each hippotherapy session for their different patients, ensuring that each ride is helping the patient move towards achieving their therapy goals that the therapist and patient have made together. In addition to physical goals, hippotherapy can also help patients reach sensory and motor planning, as well as self-regulation goals. Hippotherapy is an added tool that therapists can use to help patients achieve their physical and cognitive goals, often more quickly and efficiently through the use of a horse’s movement.

## **Physical Therapy:**

Hippotherapy is most commonly used as a form of physical therapy. The multidirectional movements of the horse are used to help patients with “gait training, balance, postural control, strengthening, and increasing range of motion” (Koca & Ataseven, 2016). Similarly to the human pelvis, a horse’s pelvis demonstrates a three axial movement pattern at the walk (Koca & Ataseven, 2016). The resemblance of the horse’s movement to the patient’s own movement helps stimulate, engage, and strengthen muscles that are required for the patient to be able to move on their own.

Cerebral Palsy (CP) is one of the more frequently researched diagnoses in regards to using hippotherapy. It is a condition that is caused by damage to the brain either before or during birth and often results in impaired muscle coordination (Cerebral Palsy Alliance, 2018). Cerebral palsy most commonly affects muscle tone, movement, and gross and fine motor skills, which is why patients with CP are often good candidates for hippotherapy, as their symptoms are what hippotherapy targets.

A 2007 systematic literature review investigated “whether horseback riding used as therapy objectively rehabilitates children with cerebral palsy by producing measurable improvements in gross motor function” and found that in five out of six studies, hippotherapy did measurably improve the patients’ gross motor function (Sterba, 2007). In the review it was noted that the dual sinusoidal frequency of the horse’s movement subjected the patients to a more complicated pattern of pelvic and truncal displacement than they would get walking by themselves (Sterba, 2007). This places greater demand on the patient’s automatic postural

response and forces them to compensate for the horse's movement using their core to stay in an upright position. To understand how the horse's movement displaces the rider and their consequent compensation, a study of the influence of hippotherapy on two children with cerebral palsy first investigated how a horse's movement affected two typically developing children with no known neuromuscular or musculoskeletal disorders (Haehl et al., 1999). They found that staying on the horse required a coordinated biphasic movement pattern that is out of phase with the horse's hindquarters (Haehl et al., 1999). This biphasic movement essentially requires the patient to engage their trunk and lean back when the horse's hindquarters are moving forward and for them to lean forward when the hindquarters are moving back. With this understanding of how the rider compensates and adjusts their bodies while the horse is moving, we can now better understand how hippotherapy can be applied to those diagnosed with cerebral palsy.

In a study that observed the effect of hippotherapy on ten children with cerebral palsy, it was found that hippotherapy overall had a positive effect on the children's functional motor performance. Based on previous studies, Casady and Nichols-Larson (2004) designed an experiment that measured the change in gross motor functions of the children, based on the Pediatric Evaluation of Disability Inventory (PEDI) and the Gross Motor Function Measure (GMFM). The GMFM was originally designed specifically to determine whether certain treatment approaches, including but not limited to hyperbaric oxygen, treadmill training, and Botox injections, were effective for children with cerebral palsy ("Gross Motor Function," 2018). The children were evaluated based on the PEDI and GMFM criteria by scorers multiple times before and after their ten, consecutive weeks of hippotherapy (Casady & Nichols-Larson, 2004).

The therapists, horse handlers, and side walkers all maintained their typical roles throughout the study. It was found that there was a significant treatment effect, improved mobility and gross motor skills, in the hippotherapy treatment phase and that there was no significant effect in the non-treatment phase that occurred after the hippotherapy treatments (Casady & Nichols-Larson, 2004). Four of the ten scores analyzed were significantly different after the hippotherapy phase, and a few of the insignificant scores only missed significance by a very small margin (Casady & Nichols-Larson, 2004). Overall, according to the post-treatment PEDI and GMFM measures, hippotherapy was very effective in producing a positive change, including improved mobility and gross motor functions, in the ten children with cerebral palsy that were studied.

A smaller study, evaluating the effect of hippotherapy on two children with cerebral palsy also found a positive impact of hippotherapy on the children; however, the results were not statistically significant. Both children were evaluated using the PEDI criteria before and after twelve weeks of consecutive hippotherapy, receiving one hippotherapy session per week (Haehl et al., 1999). While no significant gross functional changes were found using the PEDI criteria, the children's physical therapist noticed that there was apparent improvement in both subject's postural control and coordination (Haehl et al., 1999). It is possible that the subjects may have shown a significant improvement if the hippotherapy intervention frequency or duration had been increased. The author also commented that the PEDI may have not been a sensitive enough measure considering the subtle changes in postural control and coordination that occur over a short period of time (Haehl et al., 1999). Postural coordination appeared to be a more informative and discriminant measure than postural control. Both children adopted the



rhythmical biphasic movement pattern that is required to remain upright on their horse; they learned to adapt to the movement of their horse by coordinating their own muscles and body movements to that of the horse (Haehl et al., 1999). The movement that hippotherapy provides is variable and the instability in the movement allows patients to form new patterns. Being on a horse encourages the patient to problem solve and discover new ways to coordinate a postural response (Haehl et al., 1999). As children have likely never had to coordinate a unique response based on feedback from a horse's movement, this challenges them to move and support their body in a novel, therapeutic fashion.

Hippotherapy promotes postural control and coordination in a unique environment that provides instant sensory feedback to the rider's body. During a hippotherapy session, the rider's center of gravity is displaced which facilitates dynamic postural stabilization and recovery from imbalances caused by the horse's movement (Sterba, 2007). This recovery can be encouraged through variations in the horse's stride, velocity, gait, and direction. Furthermore, the rhythmical movement of the horse can do more than just facilitate greater postural control and coordination, it can also improve co-contraction, joint stability, weight shift, and equilibrium responses (Sterba, 2007). Hippotherapy targets and improves these individual factors and when they are combined, hippotherapy results in an overall improvement of gross motor function.

Hippotherapy has also been studied as a form of physical therapy used to treat spasticity in spinal cord injury patients. Spasticity is the uncontrolled stiffness or contraction of muscles, often a common side effect of spinal cord injuries ("Spasticity," 2011). Many patients

afflicted with spasticity find that it interferes with daily life and functioning, and sometimes causes pain (Lechner et al., 2003). A study evaluating the effect of hippotherapy on 32 spastic spinal cord patients found that hippotherapy had a positive effect on their spasticity (Lechner et al., 2003). On average, the patients received 11 hippotherapy sessions and their spasticity was measured before and after the completions of the sessions using the Ashworth scale, which measures the spasticity of specific limbs (Lechner et al., 2003). Hippotherapy is thought to help inhibit spasticity through the position promoting hip flexion and external rotation (Lechner et al., 2003). Additionally, the flexion, extension, and torsion of the patient's trunk was observed to have a beneficial effect on the patient's spasticity (Lechner et al., 2003). Hippotherapy also effects spasticity neurologically. It provides sensorimotor stimulation and positive psychosomatic influences, such as increased self-esteem and motivation, in addition to the physical effects (Strauss, 1995). This study found that hippotherapy does result in reduced lower extremity spasticity, as the Ashworth scale values were significantly lower after the hippotherapy treatment (Lechner et al., 2003). Similar to cases that study cerebral palsy and multiple sclerosis, hippotherapy helped reduce the muscle tone of the lower extremities, allowing them to relax and exhibit less spasticity. Hippotherapy commonly helps increase muscle tone in the trunk and neck area as discussed in regards to cerebral palsy, while also decreasing muscle tone in the lower extremities as discussed in this example with spinal cord injuries. In this study, hippotherapy was used in addition to conventional physical therapy and was noted to be a valuable supplement as it produced significant results seen in the patient's overall decreased spasticity.

Hippotherapy can also be used as a form of physical therapy to treat multiple sclerosis, a degenerative disease of the central nervous system. In a planned German study, 70 patients who have multiple sclerosis and limb spasticity will be randomly selected to receive standard care with the addition of one hippotherapy session per week, or just standard care, both for a total of twelve weeks (Wollenweber et al., 2016). They hope to find that the group who receives hippotherapy will have significantly improved balance and spasticity, less fatigue, and a higher overall quality of life when compared to the standard care only group (Wollenweber et al., 2016). The interesting part of this study is that the physical therapists will be blind as to whether each patient with multiple sclerosis is receiving hippotherapy in addition to their conventional therapy or not; however, due to the nature of hippotherapy as an intervention, patients are unable to be blinded (Wollenweber et al., 2016). This is one of the first potential studies about hippotherapy that has proposed that the physical therapists that are a part of the conventional therapy method be blind to if their patients are receiving hippotherapy or not. This is an essential next step in studying the effects of hippotherapy on patients, in this case, patients with multiple sclerosis. Because the patient knows if they are riding a horse or not, the study is unable to be a double blind experiment; however, having the conventional therapist be blind to the hippotherapy aspect and assess the patient using specific criteria will provide valuable information as to what effect hippotherapy has on patients with multiple sclerosis. Then, if successful, researchers can go on to investigate the effect of hippotherapy on patients with other diseases by recreating similar experiments where a specific party is blind to the hippotherapy aspect.

Hippotherapy has been found to be a unique and very successful adjunct to physical therapy when used for patients who have experienced a stroke. Strokes, more often than not, result in the loss of the ability to walk independently, which can greatly affect patient's everyday lives and decrease their quality of life. Hippotherapy can be immensely helpful in aiding the motor recovery of patients' lower limbs, one of the greater challenges of the rehabilitation process (Beinotti et al., 2010). Beginning to alternate steps and engage in bipedalism can be an almost insurmountable process for stroke patients and leaves them at greater risk for falls (Beinotti et al., 2010). Hippotherapy, as shown before, increases muscle strength, body awareness, and helps to develop balance and coordination, two elements that are essential to bipedal movement. Using the Fugl-Meyer assessment, a stroke-specific and performance based impairment index, Beinotti et al. (2010) found that the group that received hippotherapy once a week for 16 weeks, showed significant improvement in their impairments, especially in regard to their lower limbs, whereas the control group did not. Riding a horse removes the need to concentrate on walking and staying upright and provides a mechanism for the patient to solely focus on regaining their balance and coordination. Once the patients' muscles have been strengthened, and their balance and coordination have improved with hippotherapy, they tend to be more successful in learning how to walk than those receiving just conventional therapy (Beinotti et al., 2010). Overall, hippotherapy significantly reduced the stroke patients' impairments in balance and coordination, and helped the patients regain the strength they needed to walk.

While hippotherapy can be applied to multiple diagnoses as a form of physical therapy, it is clear that there are common themes found when evaluating its effectiveness. Hippotherapy

is largely successful in strengthening trunk and core muscles which aids in postural support, increasing balance and coordination which can then be applied when walking, reducing muscle tone in regards to spasticity, and providing increased body awareness to patients. The movement of the horse provides unique sensory input that allows all of these outcomes to be possible across diagnoses.

### **Occupational Therapy:**

Hippotherapy can also provide a unique environment in which occupational therapy can be delivered to patients. Occupational therapists use hippotherapy to develop their patients' fine and visual motor skills, bilateral coordination, attention span, and cognition (Eckersley, 2011). It can also be used to target motor planning, timing, and respiratory control, all things that occupational therapists traditionally work on in the clinic (Eckersley, 2011). Hippotherapy provides vestibular, proprioceptive, tactile, visual, and auditory input through the horse's movement, all of which the occupational therapist can modulate and channel into therapy that produces functional activity and helps the patient reach their goals (Eckersley, 2011). Occupational therapists can use hippotherapy and the horse's movement to influence the patient's emotional, social, behavioral, and communicative outcomes.

Hippotherapy as a form of occupational therapy has most commonly been researched in treating children with autism. Children with autism often express lower levels of engagement in conventional therapy settings which is shown through decreased interest, lack of motivation, and a lower ability to learn about the world in general (Restall & Magill-Evans, 1994). Hippotherapy helps to capture their interest in a new environment and improve their

motivation so that therapy sessions can be more productive and engaging for all involved (Taylor et al., 2009). Animal-assisted therapies, including hippotherapy, have been documented improving social interactions and overall happiness in those with autism (Taylor et al., 2009). Generally, in treating children with autism, hippotherapy has been shown to improve the patient's sensory motor, communication, and social interaction skills.

One study focused solely on the motivational changes noted in children with autism, over the course of a 16-week hippotherapy intervention program (Taylor et al., 2009). The study was conducted on three children between the ages of four and six and used the Pediatric Volitional Questionnaire (PVQ), an observational assessment tool that measures a child's motivation by evaluating the way they interact with their environment (Taylor et al., 2009). The key to PVQ is volition, defined as the child's inner drive to action which is influenced by what one finds important and enjoyable (Taylor et al., 2009). According to volition, motivation can range from exploration driven by curiosity and willingness, to competence which is reflected in pride and the efforts to solve problems, and to achievement which is shown in the willingness to take on new challenges (Taylor et al., 2009). The study was conducted with all parties involved carrying out their typical roles. Each session lasted for 45 minutes and occurred once a week for 16, consecutive weeks (Taylor et al., 2009). The PVQ was administered before the hippotherapy intervention began, at the 8-week midpoint of the hippotherapy intervention, and after the completion of the program (Taylor et al., 2009). Participant A showed relatively stable volition across the hippotherapy intervention according to the PVQ, while Participant B improved in volition across both subsequent measurements, and Participant C improved in volition from the baseline measurement to the mid-program measurement, but then remained

stable from the mid-program measurement to completion (Taylor et al., 2009). Overall, there seemed to be a generally positive change in volition across the participants, however, a much larger sample size would be needed to show significance in the changes observed.

Another study was conducted on three young boys between the ages of six and eight that were diagnosed with autism spectrum disorder, and focused on different dosages of hippotherapy. According to previous research, children with autism in riding programs showed “greater social motivation, sensory seeking, and reduction in sedentary behaviors, inattention, and distractibility” (Holm et al., 2014). Because of this, the authors were interested in how different amounts of hippotherapy would affect children with autism (Holm et al., 2014). To create a baseline, the participants of the study all had been receiving one session of hippotherapy per week for four weeks. The intervention phase of the study included one participant continuing with one hippotherapy session per week, the second participant receiving three hippotherapy sessions per week, and the third participant receiving five hippotherapy sessions per week for a total of four weeks (Holm et al., 2014). The withdrawal phase consisted of all three participants going back to just one hippotherapy session per week for another four weeks (Holm et al., 2014). The study used three standardized measures of change that were completed four times throughout the study by the participants’ parents (before the baseline, after baseline, after intervention, and after the withdrawal phase) (Holm et al., 2014). These measures included the Aberrant Behavior Checklist-Community, the Social Responsiveness Scale, and the Sensory Profile-Caregiver Questionnaire (Holm et al., 2014). It was found that increasing the dosage of weekly hippotherapy sessions did not impact the number of positive behavioral changes according to the measures; however, it did impact the

magnitude of the changes which were primarily for the better. All three boys had the common goal of increased verbalization (Holm et al., 2014). After the conclusion of the intervention phase and during the withdrawal phase, all of the parents reported consistent increases in verbalization at home and in the community (Holm et al., 2014). Overall, 70% of the target goals were better during the intervention phase and 63% of the goals remained better during the withdrawal phase, as compared to the baseline (Holm et al., 2014).

The effects of hippotherapy were examined in a larger study of thirty-four autistic children, comparing an experimental group where the children received hippotherapy to a control group that did not. This study focused on the effects that hippotherapy had on the children's social functioning and assessed their social functioning using the Social Responsiveness Scale and Sensory Profile (Bass et al., 2009). Nineteen of the children were in the treatment group and received one hippotherapy session with an occupational therapist per week for a total of twelve, consecutive weeks (Bass et al., 2009). Fifteen of the children did not receive hippotherapy and both the treatment group and control group continued with conventional therapy intervention during the experiment (Bass et al., 2009). During the hippotherapy sessions, the participants played games on the horse, learned a variety of riding skills, and participated in horsemanship activities after riding their horse (Bass et al., 2009). Participants in the experimental group that received hippotherapy improved greatly in many of the critical areas including sensory integration and directed attention when compared to the control group (Bass et al., 2009). The experimental participants demonstrated sustained focus and directed attention at levels that are not usually seen in autistic children. Significant improvements were found in seven of the nine domains that were tested, including social



motivation, decreased distractibility, and decreased sensory seeking behaviors (Bass et al., 2009). The three subscales that were found to be insignificant were fine motor/perceptual, social cognition, and social awareness (Bass et al., 2009). Overall, the intervention showed generally significant and positive results when compared to the participants in the control group.

Another study focused on exactly how the horse's movement can affect functional outcomes and applied this concept to helping children with autism achieve functional goals through hippotherapy. The authors acknowledge previous research that indicates that children with autism often have slower development of their postural control system and rely on external support when performing certain tasks, for example writing, and combine this with the idea that hippotherapy often increases trunk and postural support (Ajzenman et al., 2013). Postural control is associated with fine and gross motor abilities and motor planning, as well as language, social engagement, play skills, and academic abilities (Baranek, 2002). This can result in challenges for those with autism and can limit opportunities to acquire developmentally appropriate skills and increase social isolation and anxiety, often common among children and adults with autism (Ajzenman et al., 2013). Hippotherapy simultaneously uses the horse's movement to challenge the cognitive-sensorimotor systems leading to improvement in willingness to participate in activities, while challenging and improving postural stability which leads not only to greater confidence, but also an increased ability to reach functional goals.

In this study, occupational therapists or occupational therapy assistants treated the seven participants once a week for 45 minutes on the horse, for a total of twelve, consecutive

weeks. A specific treatment progression strategy was developed for this intervention and was based on five main domains, motor control, functional communication, cognition, social skills, and interactive play (Ajzenman et al., 2013). The strategy employed various mounted position, schooling figures that the horse performed, and treatment activities that were all used to promote motor planning and sequencing (Ajzenman et al., 2013). Additionally intermittent stopping and starting, alternating speeds, and the implementation of half halts challenged postural stability and attention skills (Ajzenman et al., 2013). After the twelve weeks of hippotherapy, the participants were reevaluated for postural control and the parents completed structured self-report assessments (Ajzenman et al., 2013). Significant improvements were seen in the receptive communication content categories of listening and attending, and following instructions including two-step directions and if-then instructions. Significant improvements were also observed in appropriate social skills; however, no significant differences were seen in the daily living or motor skills domains (Ajzenman et al., 2013). In regards to postural control and adaptive behaviors, the results suggest overall improvements among the participants. This could potentially lead to greater improvements in daily living and willingness to participate in the tasks of life if hippotherapy was received over a longer period of time and if the focus of the treatment was perhaps on this goal specifically.

The majority of occupational therapy research focuses on treating children with autism and shows generally significant improvement in at least some of the evaluation criteria. However, occupational hippotherapy is not just confined to children with autism, it can be used to treat many other diseases and disabilities, including but not limited to attention deficit disorder, obsessive compulsive disorder, and all the disabilities discussed in the physical

therapy session, as it improves the functional outcomes of the patient using the movement of the horse as a tool.

### **Speech Therapy:**

Hippotherapy as a form of speech therapy is the least common and least researched use of hippotherapy. The outcomes are not always as straightforward as the outcomes seen in hippotherapy as forms of physical and occupational therapy; however, hippotherapy can still be a very successful modality of speech therapy. Speech therapy in the realm of hippotherapy is becoming increasingly popular today and more research is being done in order to show its relevance and the positive impact that it can have on patient's lives.

One study compared the effectiveness of hippotherapy as a form of speech therapy to traditional forms of speech therapy for children with language-learning disabilities. Many children with language-learning disabilities have received treatment for most of their lives and may benefit from new and innovative treatments that are exciting and encourage them to engage (Gutierrez & Macauley, 2004). Hippotherapy stimulates the patient's sensory-motor system through the horse's movement and creates a nervous system template from which the patient can build their physical and cognitive responses (Gutierrez & Macauley, 2004). The study consisted of three participants, all boys ages nine, ten, and twelve, who were currently receiving speech and language therapy services and had been receiving services since the age of five (Gutierrez & Macauley, 2004). A client satisfaction questionnaire was used to gather data on participants; there were two versions, one for the participants and one for their parents (Gutierrez & Macauley, 2004). The participants received two, one hour, hippotherapy

sessions a week, for six, consecutive weeks (Gutierrez & Macauley, 2004). In examining the questionnaires, the average scores fell in the predetermined range of agreement that hippotherapy treatment was improving the child's speech and language abilities, compared to when they were just receiving conventional speech and language therapy (Gutierrez & Macauley, 2004). The parents of the children also noted that the children were excited to attend their hippotherapy sessions and talked about their therapy with their friends, something that children receiving therapy often are reluctant to do (Gutierrez & Macauley, 2004). Additionally, the parents reported that the children made not only great improvements in their speech and language abilities, but also in their motivation and self-concept following their hippotherapy treatment (Gutierrez & Macauley, 2004). Clearly, both the participants and their parents were in agreement that hippotherapy was more effective in improving the children's speech and language abilities than traditional methods of speech therapy.

Another study was conducted to evaluate the effect of hippotherapy on a 24 year old woman's speech, who had suffered a traumatic brain injury (TBI). Following a TBI, communication issues including aphasia, apraxia, and dysarthria often persist ("Traumatic Brain Injury," 2008). The study was specifically interested in the effects that hippotherapy has on the fine motor coordination of speech in people who have suffered a traumatic brain injury (Thrall & Moser, 2015). The speech coordination of the patient was measured using diadochokinetic rates for specifically determined syllables as well as the length of a sustained "ah" sound (Thrall & Moser, 2015). These measures were taken before and after each hippotherapy session to determine progress (Thrall & Moser, 2015). The diadochokinetic rate measures how quickly an individual can produce a series of rapid and alternating syllables (Rice, 2016). The faster the

sounds are produced, the more successful the communication (Rice, 2016). This study compared the diadochokinetic rates before and after hippotherapy to determine if the treatment had improved her speech. It was found that for all syllables measured, except the “ah” syllable, there was a strong negative correlation in the time it took to produce the sounds after the session, when compared to before the session (Thrall & Moser, 2015). The “ah” syllable had a positive correlation with the treatment and the time the patient was able to sustain the “ah” after each treatment increased (Thrall & Moser, 2015). The authors concluded that trunk control and core muscles are required for speech to be successful and hippotherapy has a positive effect on both (Thrall & Moser, 2015). Decreased time to pronounce the syllable indicates more normal sounding speech which the patient achieved. Additionally, the sustained “ah” shows increased lung capacity, which is imperative for successful speech (Thrall & Moser, 2015). Overall, hippotherapy had positive effects on fine motor coordination, trunk control, and lung capacity, all of which are essential for effective speech communication.

In addition to the few experimental studies that have been done on hippotherapy as a form of speech therapy, there are also a number of observational, qualitative studies that capture the essence of how hippotherapy can be an effective form of speech therapy. In one study, a child who was receiving speech and language therapy in both a clinical and hippotherapy setting was observed in each situation. Schricker (2010) noticed that in the traditional clinical setting, the patient would often say that he wanted to quit or go home and that when he did agree to work, it was with little interest and on activities that were easy for him. Alternatively, when the patient was observed in a hippotherapy setting, he was much more engaged and his body language indicated that he was focused (Schricker, 2010). He

followed instructions more successfully and his spontaneous language increased (Schricker, 2010). Overall, it was a much more productive and calm session. In this case, the change in environment was likely interesting to the patient, and because of this, he was more willing to engage in his therapy. Furthermore, the hippotherapy session tended to avoid typical clinical activities which he seemed to have grown bored of (Schricker, 2010). Overall, for this patient receiving traditional clinical speech therapy as well as speech hippotherapy, he was much more focused and willing to engage in speech during the hippotherapy session.

Similarly to what was discussed regarding hippotherapy as a form of occupational therapy, the sensory input transferred from the horse to the patient can also have a positive impact when applied to speech therapy. The horse's movement provides vestibular, proprioceptive, tactile, visual, and auditory input. For patients that are hyposensitive and exhibit sensory seeking behaviors, the horse can provide the extra input that they need to be able to focus on the task at hand (Eckersley, 2011). The rider experiences vestibular input when the horse walks or trots. Every time the horse takes a step, the rider experiences increased proprioceptive input and gains awareness of where their body is in relation to the horse (Kiley, 2015). Moreover, tactile input comes from touching the horse and interacting with the riding equipment, for example, the reins and the saddle (Kiley, 2015). Visual and auditory input comes from the horses' breathing and steps, as well as movement and sound from volunteers, therapists, and the surroundings (Kiley, 2015). Often in clinical settings, the patient receives visual and auditory input but lacks vestibular, proprioceptive and tactile input (Schricker, 2010). Patients, like the child in the previous observational study, can become bored when they do not receive an appropriate amount and variety of sensory input and can have difficulty progressing

past a certain point in their speech and language therapy (Schricker, 2010). Hippotherapy not only strengthens muscles necessary for speech production, but simultaneously provides the patient with a variety of sensory input. This can improve focus so that the patient is more willing to take part in the therapy and be a productive participant.

### **Conclusions:**

Clearly, hippotherapy is an effective and successful modality for the delivery of physical, occupational, and speech therapy. Most patients in the previously visited studies displayed positive results after their hippotherapy treatment, regardless of the field of therapy. Physical therapists use the horse's movement to stimulate, engage, and strengthen the muscles of their patients so that they are better able to move on their own. Hippotherapy as a form of physical therapy can be applied across many diagnoses and is especially helpful in strengthening core muscles, and improving balance, coordination, and postural support. Occupational therapists have paired the horse's movement with activities on the horse to produce functional outcomes in their patients and help them reach their goals in regards to gross motor function, motor planning, communication, and social interactions. The horse provides a new environment in which to practice social interactions and engages the patient in therapy through the sensory input provided by the horse. Speech pathologists also employ the sensory input that comes from riding a horse to their patients and use it to improve the focus of hyposensitive patients that exhibit sensory seeking behavior. Additionally, the movement of the horse strengthens the patient's core muscles and trunk support, both of which are imperative for speech and sound production.

While not all patients who receive hippotherapy benefit from it, many do. Most of the patients from the studies included in this paper showed positive improvements towards their goals. Those that did not improve also did not show a decline in their abilities, indicating that hippotherapy does not have negative effects on participants. For those that it did positively affect, hippotherapy tended to speed up the patients' progress when compared to traditional, clinical therapy (Gutierrez & Macaulay, 2004). Hippotherapy can be a very effective form of therapy and while it can help patients reach certain goals, it cannot be applied to all situations. It is most effective when used as a supplement to traditional methods of therapy. However, more research needs to be done, especially in comparing speech therapy and hippotherapy to draw more definitive conclusions about the effects that hippotherapy has on its participants. Overall, in the limited research that has been done on hippotherapy, it has made a positive difference in many lives and should be considered more often when looking for alternate deliveries of physical, occupational, and speech therapy.



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