1997

A Literature Review of the Fundamentals of Hippotherapy

Laura Weisberg
University of North Dakota

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A LITERATURE REVIEW OF THE FUNDAMENTALS
OF HIPPOTHERAPY

by

Laura Weisberg
Bachelor of Science in Physical Therapy
University of North Dakota, 1996

An Independent Study
Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
University of North Dakota
in partial fulfillment of the requirements
for the degree of
Master of Physical Therapy

Grand Forks, North Dakota
May
1997
This Independent Study, submitted by Laura Weisberg in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Peggy Mohr)
(Faculty Preceptor)

(Peggy Mohr)
(Graduate School Advisor)

(Thomas Mohr)
(Chairperson, Physical Therapy)
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Signature: Laura Weisberg

Date: 12-11-96
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Contraindications of Hippotherapy
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I am very grateful to the staff of the UND Physical Therapy Department for my education and for allowing me to be a part of this field. I am eternally grateful for my mother, Trudy Bell, who helped to make my dream of becoming a Physical Therapist a reality and without her support it would not have been possible.

Lastly, I would like to thank my loving husband Chris Weisberg, who gave me support and love throughout the entire program and writing of this paper. I am very grateful to him for his tolerance, understanding, and devotion.
ABSTRACT

For centuries, horses have been used to help rehabilitate people with neuromuscular disorders. However, not until recently has it been recognized as a treatment modality utilized in the practice of physical therapy. Hippotherapy is implemented by a licensed therapist who uses the multifaceted movement of the horse as a treatment modality to address a broad range of special needs in individuals with disabilities. Unfortunately, there is limited information provided on this subject.

In a review of the literature, I will discuss the history, the different theories, the treatment techniques, and the research that has been done on hippotherapy. The purpose of this independent study is to educate and inform the medical profession, third party payers, patients, and the public about the advantages hippotherapy provides to individuals with disabilities. This independent study will consist of a review of the literature and an educational package consisting of an informational handout, a video, and a power point presentation with slides. Upon completion of this independent study, I intend to demonstrate that hippotherapy will be an effective and alternative form of treatment for neuromuscular diseases.
CHAPTER I
INTRODUCTION

The term "hippotherapy" is foreign to most of the population and often evokes images of therapy on hippopotami. This type of therapy received its name from the Greek language where "hippos-" means horse.\textsuperscript{1,2} Hippotherapy is defined as a treatment modality implemented by a licensed therapist who uses the multifaceted movement of the horse as the basis for addressing neuromuscular deficits in children and adults.\textsuperscript{1-5} Hippotherapy uses a cohesive team of horse trainers, physical therapists, occupational therapists, speech therapists, horse handlers, side walkers, and volunteers to achieve functional goals.\textsuperscript{3,4} Each discipline is essential in providing the patients with the most effective therapy to meet their needs.\textsuperscript{2-5}

First, to understand hippotherapy, it is helpful to know the evolution and theories behind it. Individuals with disabilities were not considered appropriate candidates for horseback riding until 1952 when Liz Hartel, partially paralyzed from polio, won an Olympic medal in a riding competition.\textsuperscript{1,5-7} Her success inspired a rapid progression of using the horse as a treatment modality.\textsuperscript{1,2,5,6,7} Now, there are more than 300 working therapeutic riding programs in the United States.\textsuperscript{6,7,8} Many people have developed theories to determine what
components contribute to the effectiveness of hippotherapy, but because of its short history, there are few proven theories and even less research data available. A review of these theories as well as the evolution of hippotherapy will be discussed later in this document.

It is also important to review the significant components of hippotherapy, such as the gait of the horse and how the horse influences the rider both on a physical level and a psychological level. There are three distinct gait patterns utilized in hippotherapy; the walk, the trot, and the canter. Each gait pattern has its own unique effect on the patient, although little research has been published on how the movement of the horse influences the rider and exactly how that affects the patient.

The purpose of this paper is to provide a historical background of hippotherapy, to review the individual gait patterns of the horse, to review the current literature on the effectiveness of hippotherapy, and to review treatment strategies used in hippotherapy programs. This information will be compiled in a supplementary package containing a lecture handout, a video tape, and a powerpoint presentation for educational purposes.
CHAPTER II

THE EVOLUTION OF HIPPOThERAPy

The horse has been perceived in literature and in art as a beautiful, powerful, mysterious, and magical animal for centuries, and there is evidence to show that horses were used to treat medical conditions since the 5th century B.C. Evidence of use of the horse as a healing agent has been found in cave paintings. Paleontologists suggested that the paintings of horse in the Pech-Merle Cave in France symbolized early man's belief that the horse possessed magical powers to ward off evil spirits and protect against disease and danger. In 460 B.C., Hippocrates wrote about "natural exercise" and riding horses as a form of this. In 1670, Sydenham, wrote, "There is no better treatment for the body and the soul than many hours each week in the saddle." In 1780, Tissot wrote about the gaits utilized in riding for rehabilitation and concluded the walk to be the most beneficial gait. He also was the first to implement a list of contraindications and discuss the effects of excessive riding. In 1870, Brown wrote the first systematic, but subjective, review of the effects of riding on a disabled patient.

One of the most significant events in the evolution of hippotherapy occurred when Liz Hartel, disabled from poliomyelitis, won an Olympic silver
medal in 1952. The disorder had resulted in Hartel's paralysis from the waist down. However, she regained strength through her riding and, in 1952, won the silver medal on her horse, "Jubilee," in a riding event at the Helsinki Olympic games.\(^1,5,6,11,12\) Hartel's success inspired the foundation of hippotherapy centers throughout Europe during the 1960s.\(^1,6,11,12\)

By 1965, therapeutic riding was initiated in Toronto, Canada.\(^1,7\) Two years later, Hunter-Warfield\(^1\) established the first program for individuals with disabilities in the United States.\(^1,6\) This was followed by the formation of the North American Riding of the Handicapped Association (NARHA) in 1969. NARHA is currently associated with over 500 facilities and continues to grow annually.\(^6\) In 1993, the American Hippotherapy Association (AHA) was formed as a branch of NARHA. AHA is the medical model of therapeutic riding. As such, hippotherapy requires a doctor's referral and treatment must be given by a licensed therapist for reimbursement purposes.

Therapeutic riding and hippotherapy have been clinically used and researched in Europe since the 1960s.\(^3,5,6\) Hippotherapy is a recognized form of physical therapy covered by health insurance and is becoming a more accepted form of therapy in the United States.\(^4\) NARHA reported that more than 25,000 individuals have participated in hippotherapy programs.\(^13\) However, there is very little research on the effects of riding a horse on individuals with disabilities.

As a result of changes being made in health care, therapists have limited time for treatment. Treatment methods must be functional in an effort to gain the
patient's motivation to work toward therapy goals. Patients must be treated as a whole, not just specific areas, because a neurological deficit affects the patient both physically and psychologically. While conventional means can partially provide this type of treatment, the use of horses may be able to provide a functional, challenging, and fun form of therapy with the ability to treat the patient both on a physical and psychological level. With further research, it is hoped that therapeutic riding will be recognized as an important and effective new form of therapy.

The main purpose of hippotherapy is to retrain a patient's sense of balance or trunk stabilization. Balance comes naturally to a normally developed person but must often be learned by individuals who have a motor dysfunction. Although it is unclear exactly how therapeutic riding is beneficial as a medical treatment, there are numerous theories that attempt to explain the successes seen in patients with neuromuscular and psychological disorders. One of the most common theories focuses on the similarity of the human gait pattern to that of the three dimensional movement of the horse’s back. The three-dimensional movement of the horse’s back is thought to constantly challenge the patient’s mechanisms of balance, muscle control, and coordination by causing continual adjustments in the patient’s center of gravity thus improving the patient’s trunk control and mobility. This produces equilibrium righting reactions in the patient that are similar to those which occur during human walking, with the exception of the trunk stabilization provided by the horse. In
addition, the patient receives continual peripheral sensory input affecting proprioceptive and tactile systems, such as contact with the horse and weight bearing through the stirrups (if the therapist chooses to use stirrups). The sensation of weight bearing activities and proprioceptive input are important for normal neuromuscular development, especially in patient's who are unable to get into a standing position to receive this type of feedback.

A second theory focuses on the normalization of abnormal muscle tone by suggesting that the smooth rhythmical movement of the horse and warmth from its body promotes relaxation and decreases abnormally high muscle tone and spasticity. Bertoti completed a study on children with cerebral palsy and found noticeable improvements in hypertonicity in the subjects who rode without a saddle and concluded that the subjects benefited from the horse's body heat.

A third theory supported by Krashen's "input hypothesis" proposes that people with a disability involved in a horseback riding program gain communicative skills by learning in a functional capacity. Krashen's "input hypothesis" states that speech is learned as a result of the availability of input that the brain can understand and that the input is necessary to provide contexts that are meaningful to a developing child. During their development, children form a communication network from this functional stimuli. There are specific components necessary for effective speech training and functional application of speech: 1) a natural context in a functional environment, 2) a specific reason to say something (communicative intent), 3) activity implementation, and 4) natural,
positive reinforcement. These components all are present in a well structured hippotherapy program.

Lastly, Dr. S. Rosenthal proposed that riding a horse fulfills a "primal atavistic" need for man to engage in a high risk activity in order to release adrenaline or noradrenaline during the "fight or flight" response. These hormones influence the autonomic nervous system which controls all of the involuntary activities. Rosenthal admits that these studies on high risk activities are preliminary, but proposes that may explain why children with disabilities experience increased mobility, motivation, self-esteem, and courage during the therapeutic riding sessions.

Numerous studies, as well as personal articles written about hippotherapy, discuss the improved self-esteem seen in patients. Clinicians at the University of Pennsylvania suggested that riding a horse is often a sport of normal children and patients often feel equal to their peers when they are able to ride. Whether the unique movement of the horse, the psychodynamics involved, or the primitive instinct being fulfilled by experiencing uncontrolled risks result in improved patient mobility, self image, and self-esteem will require more research for an answer.
CHAPTER III

PATIENT APPLICATION

Hippotherapy uses the movement of the horse as a specific treatment technique.\textsuperscript{1,3,6} These movements are very precise and are used to gain specific balance reactions and responses. Hippotherapy differs from recreational horseback riding for the disabled in the following aspects: a therapist is involved, specific goals are set, and specific treatment techniques are used to reach these goals.\textsuperscript{3,6,20}

In most hippotherapy programs, the patient’s treatment session would consist of a series of steps.\textsuperscript{11,12,15} First, the patient would either walk up a ramp or wheel up the ramp. Then the patient would work on transfers from the ramp to the horse. Second, the patient will sit on the horse while a person assists by walking along each side of the horse to ensure safety. These assistants are called the sidewalkers.\textsuperscript{20,21} A treatment session will last anywhere from 10 minutes to 30 minutes. During this time, the therapist will have the patient perform certain activities and ride in certain positions to accomplish the treatment goals. In certain cases, the treatment requires a back rider to provide direct treatment. A backrider is either a physical or occupational therapist who is experienced in patient handling techniques as well as a skilled rider.\textsuperscript{8} Specific
exercises and handling techniques, such as NDT and PNF, are used by the backriding therapist and patient while on the horse. Backriding is most commonly used on patients with severely impaired balance or diminished head control.\(^5\)

A treatment session begins with a physician referral and the therapist performing an evaluation.\(^3,5,6,11\) The therapist must identify patient's physical and mental limitations and abilities so that an appropriate horse may be selected for the patient.\(^11\)

Activities involving risk promote exhilaration of the spirit.\(^1\) In hippotherapy, skilled aides must be ever present so that the risk to the rider is minimal but the rider still feels challenged.\(^6,11\) The exercises are used to promote balance, coordination, strength, posture, and rhythm. Treatment activities are performed at a standstill; at a walk, either with or without stirrups; at a trot, sitting or standing in stirrups; or at a canter. Sitting to the trot and rising to the trot require concentration and coordination. For these activities, the therapy team as well as the person controlling the horse must be especially alert. The person controlling the horse must carefully monitor the speed of the horse. With encouragement, perseverance, and a great deal of repetition, the rider eventually should show improvement in performing the exercises. Goals include that he/she will gain balance, flexibility, and the ability to influence a horse by the movement and rhythm of his/her body.\(^11\)
Many specific techniques have been used in hippotherapy including approaches by Rood, Bobath, and PNF.\textsuperscript{11,12} Rood based her system on the concept that various kinds of sensory stimulation are capable of facilitating desirable or undesirable motor activity.\textsuperscript{12} This sensory stimulation was generally applied to the skin, muscles, and tendons.\textsuperscript{12} An example of the application of Rood techniques would have patients positioned prone across the horse with instructions to: 1) bear weight on their elbows with the neck and trunk extended and lower extremities flexed, 2) work on hip flexion and extension alternately.\textsuperscript{12}

Bobath\textsuperscript{12} described the development of the neurological system, outlining an orderly sequence of motor activity development which is said to occur in normal children. According to Bobath, the use of specific techniques and activities will stimulate a child with cerebral palsy and will promote further development.\textsuperscript{12} Muscle relaxation techniques are important components of the Bobath techniques. A prime prerequisite for treatment is to normalize tone before attempting active motion.\textsuperscript{12} This is a key point in hippotherapy because the heat that is generated from the horse facilitates relaxation and helps to normalize the tone before the patient performs the exercises. Campbell\textsuperscript{22} studied NDT based hippotherapy used with biofeedback and inhibitive casting and found hypertonicity was reduced and postural control and stability were improved.

According to Proprioceptive Neuromuscular Facilitation (PNF) theory, motor activity is organized into patterns of combined movements such as flexion,
extension, abduction, adduction, and rotation. Movement in these patterns against resistance is done to facilitate motor control of weak muscles. Resistance is provided that is proportional to the strength of the muscles involved. For example, while the patient is sitting on the horse, with hands together, the patient reaches down to touch their right toe and returns to upright posture. The activity is repeated on the opposite side. Gravity provides the force of resistance for this activity.

There are certain conditions for which hippotherapy is not appropriate and thus contraindicated. The contraindications listed in Table 2.1 vary in different sources. Contraindications include a person with epilepsy whose seizures are inadequately controlled, a person who is so fearful of horses that he/she will be unable to relax and allow the movement of the horse to be beneficial, and a person who has had a fusion or a spinal stabilization surgery which will inhibit the pelvis and/or spine from moving with the horse.

It is important to understand how the horse moves in order to understand the theories and why it is proposed to work. The next chapter will discuss the three different gaits of the horse and how they influence the rider.
Table 2.1—Contraindications of hippotherapy\textsuperscript{1,3,4,23-25}

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<tr>
<th>Condition</th>
<th>Description</th>
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<tr>
<td>Vertigo</td>
<td>• the movement of the horse may increase the symptoms (dizziness, nausea, etc.)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>• the movement may cause stress to cardiovascular and respiratory systems depending on the positions and activities the patient is asked to perform</td>
</tr>
<tr>
<td>Fusion of the spine</td>
<td>• the movement of the horse is only beneficial if the patient has adequate ROM</td>
</tr>
<tr>
<td>Epilepsy (seizures that are uncontrolled)</td>
<td>• may not be possible to get patient off the horse if a seizure occurs, and horse’s reaction may be unpredictable</td>
</tr>
<tr>
<td>Fear of horses</td>
<td>• patient will be unable to relax and go with the movement of the horse</td>
</tr>
<tr>
<td>Osteogenesis imperfecta and other bone or joint abnormalities</td>
<td>• the impact of the horse’s gait may constitute a danger</td>
</tr>
<tr>
<td>Decubitus ulcers</td>
<td>• the friction of the movement of the horse on the rider’s body will aggravate pressure sores.</td>
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**Precautions**

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<td>Poor head control</td>
<td>• precautions must be taken to protect the patient’s head and neck; may require a back rider for support</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>• need to be aware of the temperature: many facilities are outdoors and are functional during the summer; heat has negative affects on a patient with M.S.</td>
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CHAPTER IV
GAIT AND RESEARCH

The similarity of movement in the pelvis during the human gait and movement in the pelvis of the patient while on a horse is well documented in the hippotherapy literature, but there has been little research on this relationship.\textsuperscript{3,8,12,13} According to this theory, the horse's back moves, the motion is transferred to the patient's pelvis and torso, causing a movement similar to the reciprocal movement of the human pelvis during normal walking.\textsuperscript{4}

Gait of the Horse

It is essential to understand the movement and different gaits of the horse in order to understand the theoretical basis of hippotherapy. Therapists will choose one of three different gaits of the horse that will best benefit the patient: the walk, the trot, or the canter.\textsuperscript{3,5} The trot and canter are utilized on patients who are more advanced and are able to stabilize their upper body.\textsuperscript{3}

The walk is a four beat gait and is executed in four time (Fig. 1).\textsuperscript{26} Harris\textsuperscript{26} described this gait as four distinct hoof beats as each foot strikes the ground in succession, thus four time. The sequence of the walk is left hindfoot, left forefoot, right hind foot, and right forefoot. When a horse begins walking, it appears as though one foreleg moves first. However, the power comes from the
Fig. 1 The Walk

A) First beat - left hindfoot
B) Second beat - left forefoot

C) Third beat - right hindfoot
D) Fourth beat - right forefoot
rear of the horse, which is known as the hindquarters. The average speed of a
normal walk is approximately four miles per hour, but this can vary depending on
the size of the horse and its stride length. This is important in hippotherapy
because it is this power that determines the effect on the rider and the degree of
stimulation the rider will feel. In an effective walk, the horse will move with a
swinging back in what is referred to as good engagement. Engagement means
the horse uses its hips and back legs to propel its body forward. With each
step, the stride of one leg overlaps the stride of the opposite leg by about half
the stride length as the horse places its hind leg in or beyond the track of its
front hoof print. The walk is the most common gait used in hippotherapy.
According to Johnson, the predictable rhythm and slow rate of the walk
produces a calming effect on the nervous system, which has been observed but
not proven.

The second gait used in hippotherapy is the trot. Harris described it as
a two-beat, diagonal gait with suspension which is executed in a two-beat time.
During this gait, a diagonal pair of feet strike the ground at the same time. Then
the horse pushes off and is suspended in the air for a moment before the
opposite diagonal pair of feet strike the ground for the second beat. During the
sequence of the trot, the right hind and left forefoot are to in suspension followed
by the left hind foot and right forefoot (Fig. 2). The suspension of this gait
gives the trot its characteristic spring or bounce. In hippotherapy, an effective
trot has noticeable engagement and the muscles of the horse’s back are relaxed.
Fig. 2 The Trot

A) Suspension
B) First beat- right hindfoot & left forefoot (left diagonal)
C) Support phase

D) Suspension
E) Second beat- left hindfoot & right forefoot (right diagonal)
F) Support phase
This causes the back to be round and springy, prevents the horse from tiring too quickly, and gives the patient more movement.\(^{26}\) The speed of the normal trot is approximately six to eight miles per hour. The ability to obtain a co-contraction is essential for a child or adult with very low tone to stabilize the trunk and perform functional activities such as reaching.\(^{27}\) The trot provides the greatest amount of proprioceptive input to the patient and may promote co-contractions throughout the trunk and extremities.\(^{9}\) Johnson\(^{9}\) proposed that the steady stimulation of the trot also increases the arousal of the central nervous system. In addition, the trot may satiate the nervous system of overstimulated patients and allow them to focus their attention on a specific task.

Even though the walk and trot are the two primary gaits of the horse that are used in hippotherapy, the canter can also be used but usually requires a backrider to support the patient for safety.\(^{1,5}\) A backrider is a person who sits behind the patient and provides support for the patient who may have poor head control.\(^{8}\) A patient who is at high risk of falling or is unable to sit alone may need a backrider.\(^{5,8}\) Sidewalkers are unable to be utilized in the canter as the gait is too fast for them to keep up. Consequently, a backrider is used to ensure safety.\(^{9}\) Harris described the canter as a three-beat gait with suspension. It is a very complicated gait because the horse’s body actually bends and the patient will experience a lengthening on one side of the lateral trunk muscles and shortening on the opposite side. The sequence of the canter is outside hind leg (first hoofbeat), diagonal pair of legs (second hoofbeat), inside fore leg (third
hoofbeat), followed by a brief period of suspension (Fig. 3).\textsuperscript{26} An effective canter will be smooth, light, and balanced with three clean beats in a steady rhythm. The patient will feel a little give in the horse’s back but not a great deal of movement. Cantering provides the greatest degree of vestibular input but less proprioceptive input than trotting.\textsuperscript{3} The canter may stimulate the central nervous system but may often be calming to patients with over-reactive systems due to the rocking motion felt.\textsuperscript{3,15} According to NARHA guidelines, both the trot and canter are reserved for more advanced therapy sessions and for patients who are able to stabilize their upper bodies.\textsuperscript{28}

Research on the Effects of Riding on the Patient

A review of the literature indicated that hippotherapy is used to treat the following disorders: cerebral palsy, multiple sclerosis, Down syndrome, and language disorders.\textsuperscript{7,14,17,19,29} Bertoti\textsuperscript{14} completed a study using eleven subjects with moderate to severe spastic cerebral palsy. Subjects were rated on a posture assessment scale developed by Bertoti to measure postural changes. The subjects were referred to the study by their physicians and were selected based on the following criteria: a medical diagnosis of spastic quadriplegia or diplegia; no other medical complications; and normal intelligence, spine, and hip x-rays. The program consisted of two groups. Group #1 was pretested on posture control followed by a 10-week period of traditional physical therapy but no riding and a pretest of group #2 followed by a 10-week period of hippotherapy. Both groups completed a posttest at the end of the program. The
Fig. 3 The Canter

A) First beat - right hindfoot

B) Second beat - diagonal pair: left hindfoot and right forefoot

C) Third beat - left forefoot (leading foreleg)

D) Pushing off

E) Suspension
20

results showed a statistically significant improvement in muscle tone, balance, and functional skills of group #2. These objective data provided evidence that supported the use of hippotherapy in the treatment of postural deficits in children with spastic cerebral palsy.\textsuperscript{14}

Makay-Lyons et al\textsuperscript{9} studied the effect of therapeutic riding on patients with multiple sclerosis and found that 3 out of 10 patients experienced an increase in spasticity. However, in this study, patients rode the horses with a saddle and were unable to feel the heat from the animal. Ten subjects met the following eligibility criteria: diagnosis of multiple sclerosis, physician referral, Kurtzke rating of neurological impairment that is between two and seven, ambulatory distance of a minimum of 10 meters, and no signs of an exacerbation in the past two months. Ten subjects were pretested and participated in a nine-week program of hippotherapy followed by a posttest.\textsuperscript{19} The therapeutic riding program was performed for 30 to 45 minutes, two times a week. The results showed that, in seven patients, free speed walking increased and severity of global psychological symptomatology was reduced. This study was limited by the small number of subjects and by the fact that they acted as their own controls.

Dismuke\textsuperscript{15} studied rehabilitative horseback riding for children with language disorders. The study consisted of 26 subjects who were diagnosed with a language disorder. The control group received therapy in a clinical setting and the second group received treatment in a structured hippotherapy
program. The experimental group showed an improvement in complex sentence structure, utterances, and other speech categories, while the control group showed no significant gains. These results lend support to the value of hippotherapy for the treatment of language disorders.

It is theorized that while riding, there is a multidimensional swinging rhythm of the horse’s walk that is transferred to the patient and moves the patient’s pelvis as the legs would do during normal walking. There are three distinct movements transferred from the horse’s back to the patient’s pelvis: lateral pelvic tilt, rotation, and anterior/posterior tilt of the pelvis. These pelvic movements serve as the treatment tools for physical therapy. The rider experiences an alternating anterior/posterior tilt movement on the pelvis as the horse drops one hip and then the other. The rotations and tilts of the human pelvis are reproduced as the horse advances its front leg and shoulder forward while one side of the rider’s pelvis moves forward then the other. For example, if the horse is moving its left front leg forward, the left front shoulder elevates causing the rider’s left anterior superior iliac spine (ASIS) to move upward. As the horse’s foot moves forward, the rider’s elevated left ASIS moves anteriorly and a slight rotation of the pelvis. Measurements show that during riding the rider’s pelvis rotates 8° in the transverse plane, laterally displaces 3.5-4.0 cm from midline and laterally tilts 5 cm.

Baumann et al studied the similarity of the pelvis movement during gait and while riding a horse. During normal walking, there is a fluctuation of
acceleration of the body during toe off and deceleration following midswing. Similarly, while on a horse, the patient will also experience a combination of alternating acceleration and deceleration movements. During walking there is a four degree pelvic obliquity, while a rider on a horse experiences a 3 cm lateral pelvic tilt. The rotation occurring in the pelvis and lumbar spine is found to be 40° during human walking and 35° during riding. When measuring lateral displacement of the pelvis, normal human walking shifts the pelvis laterally a total of 5 cm, while the rider experiences a total of 7-8 cm lateral displacement. The anterior/posterior tilt of the pelvis was approximately 1.5° but is more exaggerated at 5° during riding. It was concluded that the pelvic rotation and lateral displacement during riding and walking are very close; however, the anterior/posterior tilt is much greater on the horse than in normal human walking.

Lastly, Gottwald et al measured the vibrational and rotational components transferred to the human body during hippotherapy and determined that there were no detrimental effects on the intervertebral discs. This should be a consideration for patients with back problems and will not eliminate them from treatment.

Limitations of Research

There are definite limitations in the research presented above. Reide researched the pelvic movement in healthy males during walking but used a variety of subjects, both male and female, when measuring the pelvic movement of the horse. There were no studies found on hippotherapy that objectively
measured the effects on the spine, hip joint motion, or on the patient's center of gravity.\textsuperscript{5}
CHAPTER V
TREATMENT STRATEGIES IN HIPPOTHERAPY

Hippotherapy is a treatment modality that offers the therapist a unique environment in which to optimize his/her patients' functional abilities. According to Gold, there is no other treatment modality that can match the versatility of the horse and creative environment of hippotherapy. A particular strength of hippotherapy is that it is inherently transdisciplinary in nature, which means that many different types of therapy are occurring at the same time, with professionals acting as a team to treat the patient as a whole. It is used as a treatment by speech therapists, occupational therapists, psychologists, physical therapists, and special education teachers all in conjunction with one another. This chapter will discuss different therapies that use therapeutic riding as a method to treat patients.

Psychology

Although this is a relatively new treatment modality for psychologists, it has proven to be a possible form of treatment. There is a limited amount of objective research on this topic; however, in most of the research, clinicians and family note psychological benefits in patients who are involved in hippotherapy or therapeutic riding. Specifically, many patients display improved
motivation for therapy and increased self-esteem and improved body image.\textsuperscript{2,5,11,12,16-19,34,36,37} Haskin\textsuperscript{11} believed that the patient’s involvement with the care, grooming, and saddling the horse provided a source of self-confidence; riding decreased the immediate fears and uncertainties of a sport often performed by normal children and allowed patients to feel equal to or even superior to their peers. According to Ryan,\textsuperscript{16} when a person achieves the cooperation of the horse, a “whole host of life skills,” such as discipline, responsibility, self esteem, self control, and peer interaction skills are also learned.

Many children and adults have learned to relate to other people by first learning to relate to the horse.\textsuperscript{16} Barnard\textsuperscript{18} has used therapeutic riding for patients with emotional disturbances and found positive results in general coordination as well as improved interaction skills among peers. According to Henriken,\textsuperscript{2} the psychological benefit of being mobile and independent on the horse is one of the great advantages of riding for the disabled. Riding frees them from feeling handicapped. It is one of the few physical activities in which they can participate with able-bodied people.\textsuperscript{2} Mackay-Lyons\textsuperscript{19} identified a significant reduction in depression in patients with multiple sclerosis who underwent a nine-week trial of hippotherapy. Wingate\textsuperscript{17} found consistent improvements in self image and depression in children who participated in a hippotherapy program. The family reports showed that the children enjoyed the treatment sessions and did not feel like they were receiving therapy. In fact,
patient attendance was 96% with almost all of the parents being involved in the therapy sessions. This study was significant because it showed that there is a definite consistent improvement in self image and depression. However, there needs to be much more research done on the psychological benefits of hippotherapy.

Occupational Therapy

Hippotherapy and related horse oriented activities can provide a highly dynamic vehicle for occupational therapy. Occupational therapy uses therapeutic riding as a treatment to promote functional activity. Both sensory integration theory and neurodevelopmental theory are two major treatment approaches used by occupational therapists in a hippotherapy setting.

Sensory integration has been used for the treatment of learning disabilities. Sensory integration is defined as skill and performance required in the development and coordination of sensory input, motor output, and sensory feedback. Sensory intergration includes sensory awareness, visual spatial awareness, body integration, balance, bilateral motor coordination, visual-motor integration, praxis, and other components. Put more simply, sensory integration is the process by which the nervous system organizes sensory information for use in life situations such as the classroom, the playground, activities of daily living, and relationships with others. In addition to the information we receive from vision, smell, touch, and hearing, we also receive information from the vestibular system, the proprioceptive system, and the
kinesthetic system (combination of information from eyes, muscles, joints, and vestibular system) to form conscious awareness of one’s body in space. This information is combined to form the perceptual-motor skills which allows us to learn and perform difficult functions such as reading, writing, cognitive skills, behavioral control, and postural control. A problem at any one of the lower levels can affect the higher levels and functional abilities.

Riding a horse in a therapy setting provides the body with a stimulation encompassing the entire body of sensory-motor components. The three dimensional movement of the horse allows for simultaneous input through vestibular, tactile, proprioceptive, visual, auditory, and olfactory channels. Through close interaction with the horse handler and the therapist, the therapy environment can be manipulated to achieve desired effects or behaviors. For example, walking the horse in a circle with the child facing backwards and his hands on the horse’s rump, the child is able to feel the fur of the horse for tactile stimulation and the big circular movement helps to provide proprioceptive and vestibular input. In addition to the sensory input to the patient, hippotherapy is also thought to affect the limbic system, resulting in a greater sense of well-being and motivation to participate. The limbic system and emotional centers are heavily influenced by the primitive sensory systems of touch, movement, and smell.

Neurodevelopmental Technique (NDT) can be used to enhance the hippotherapy environment as the dynamic movement of the horse is unique to
This setting. Instead of using a mat, the therapist uses the horse as a moving platform to apply the NDT skills. The added sensory motor aspects provided by the horse will help to facilitate postural-motor gains. Horse related activities, such as tacking, mounting, dismounting, and learning basic horsemanship skills, provide additional treatment activities through which to address deficit areas. Many of the skills involved in caring for the horse and riding the horse duplicate skills needed for independent living. For example, part of grooming a horse is to brush its coat; thus, this is a functional exercise to facilitate personal grooming. The scope of the hippotherapy setting creates a framework for combining occupational therapy services with other treatment services.

Speech Therapy

Speech therapists have found that hippotherapy is very beneficial in the treatment of patients with speech disorders. In order to speak, a person must have normal postural tone, normal movement patterns, appropriate timing, correct positioning, normal respiratory control, and normal phonation. Dismuke-Blakley studied the combination of stimulating various sensory systems, stimulation of various cortical pathways, and concussive impact to the muscular system which has resulted in improved areas of speech. In treatment applications using hippotherapy as a primary modality, therapists maintain awareness of how the patient's communication skills are impacted at any point during the treatment session.
Douglas et al.\textsuperscript{44} found that after an eight-week hippotherapy program, listening skills increased by 80% in 15 children who were pretested for similar capabilities in speech, attention span, and learning capabilities. They also found that 76% of the students retained their new vocabulary, 60% improved their knowledge of physical orientation (the ability to tell up from down, left from right and near from far), and 93% improved vocalization and verbalization skills. In addition, the children's listening skills and ability to follow instructions were up 80%. Lastly, the interest in learning rose by 41% and self-confidence increased by 62%.\textsuperscript{44} It is important to understand that there may be significant limitations that skew the data discussed above. The tests that were given or the type of statistical test that was used to produce these results were not described.

Physical Therapy

Hippotherapy as a treatment modality for physical therapists has been discussed throughout this paper. Physical therapy is the primary discipline that utilizes this unique form of treatment to treat specific neuromuscular dysfunctions.\textsuperscript{45} Specifically, physical therapy uses it to treat abnormal tone, poor balance, stretch tight muscles, and increase proprioception, but most significantly to normalize gait patterns.\textsuperscript{2,3,37,44,46}
CHAPTER VI

CONCLUSION

Research to support the asserted benefits of riding as a therapeutic
regime is nonexistent with the exception of a few specific studies relating to an
increase in mobility, self esteem, and postural control.\textsuperscript{3,4,6} Since hippotherapy
does not have a reservoir of knowledge to sustain a rationale for the positive
results both physically and psychologically, it is the empirical reasoning and
clinical observation that has been its justification up to this point. However, the
field of hippotherapy is aware of the lack of research and is funding more and
more studies on the effects that patients are experiencing.\textsuperscript{1,47} As of the moment,
when people are asked if hippotherapy is effective, the answers from those
directly involved are so adament to their testimony that hippotherapy is
successful that the expansion of these programs should begin immediately.
Throughout this review of the literature, I have read numerous articles reporting
success stories from patients, parents, spouses, therapists, and
physicians.\textsuperscript{30,42,48,49} However, hippotherapy is a relatively new field and objective
data have not been made available to patients who would benefit from this form
of therapy.
The history and evolution of hippotherapy is very evident in the literature.\textsuperscript{1,8,15,18} The horse has been thought of as therapeutic for hundreds of years, but it was not until recently that the medical model was recognized. Currently, it is being recognized as a form of therapy by physicians and third party payers, which is a big step for the development of hippotherapy as a treatment modality. There are many theories as to what effects the horse presents to the rider. A consistent proposed finding is that there are combined physical and mental benefits.

The most significant finding in this literature review was the similarity of the movement of the human pelvis during the human gait and the movement of the human pelvis while on the horse. Personal testimony to this effect was made by Stine,\textsuperscript{21} paralyzed by a diving accident, who stated, "It's the closest I've come to feeling the sensation of walking since my accident."

From this review of the literature, it appears that hippotherapy is a form of therapy which has value in the rehabilitation of adults and children, which not only appears to bring about improved physical, mental, and social functions, but also provides an exciting and fun experience that separates it from traditional therapy.\textsuperscript{38} Lack of scientific documentation of the benefits of hippotherapy is a major obstacle that must be overcome.\textsuperscript{50} At the NARHA meeting in 1991, a five-year plan was developed in which the needs of the association were assessed.\textsuperscript{24} A top priority for the organization was the development of an equine facilitation therapy research program.\textsuperscript{50,51} The academic community is playing a major role
in the establishment of these research programs through networking and collaboration with hippotherapy professionals. The expertise of equine scientists, veterinarians, physicians, physical therapists, occupational therapists, speech therapists, and psychologists is a critical component in the development of scientific and valid research. Research is needed to quantify the relationship between the physical and emotional benefits of the hippotherapy environment. Applied field studies for determining the physical and psychological benefits of the use of horses as a therapeutic intervention are currently being developed at several colleges and universities. This research is critically needed in all aspects of hippotherapy. People who are interested in this area of research may contact the NARHA headquarters for assistance.
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