1998

The Effect of Hippotherapy on Lower Extremity Range of Motion in Children with Cerebral Palsy

Jim Pitman
University of North Dakota

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THE EFFECT OF HIPPOTHERAPY ON LOWER EXTREMITY
RANGE OF MOTION IN CHILDREN
WITH CEREBRAL PALSY

by

Jim Pitman
Bachelor of Science in Physical Therapy
University of North Dakota, 1997

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
1998
This Independent Study, submitted by Jim Pitman 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.

[Signatures]

(Gregg M. Mahr
(Faculty Preceptor)

(Gregg M. Mahr
(Graduate School Advisor)

(Chairperson, Physical Therapy)
PERMISSION

Title The Effect of Hippotherapy on Lower Extremity ROM in Children With Cerebral Palsy

Department Physical Therapy

Degree Master of Physical Therapy

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Signature

Date 12/15/97
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ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. Peg Mohr, for her advice and encouragement. I would also like to thank Sally Masilko for helping me select my subjects and continued support of my study, and to the Manely Riding Center for allowing me to conduct my study on their premises.
ABSTRACT

It has been postulated that hippotherapy will help increase range of motion (ROM), pulmonary function, balance, and muscle tone in children with cerebral palsy and, therefore, may be used as a physical therapy modality. The purpose of this independent study is to objectively measure lower extremity range of motion in children with cerebral palsy after an eight-week hippotherapy program.

Six children diagnosed with cerebral palsy initially participated in the experiment using a repeated measure design. Only two subjects completed the study. No control group was used for this study. A consent form was signed prior to measuring LE ROM.

It was concluded that children with cerebral palsy showed no significant improvement when hippotherapy was used as a physical therapy modality. It should be noted that none of the children lost any ROM in the time line of the experiment. Subjectively, the parents of the subjects stated that they believed there was an increase in their children’s ability to walk and sit.
CHAPTER I
INTRODUCTION

Classical European hippotherapy is a passive form of horseback riding in which the client benefits from the movements and warmth of the horse but does not participate dynamically.\(^1\) The American form of hippotherapy has become a more dynamic form of riding for the disabled. The American hippotherapy form also incorporates the use of physical therapists, occupational therapists, and speech therapists to help the clients achieve personal goals.\(^1\)

Hippotherapy has been postulated to help people with disabilities. The therapeutic benefits of using a horse to help improve the disabled is not a new concept and was reported by Hippocrates as far back as 460 B.C.\(^2,3\) But hippotherapy did not gain public interest until the 1950s when a polio survivor won the silver medal in Dressage at the Olympic Games in Helsinki.\(^4\)

It has been proposed that clients receive benefits from this treatment method due to the movements of the horse (which mimic human gait).\(^4\) Biery\(^5\) also suggested that hippotherapy stimulates righting reactions. The three-dimensional movement of the horse helps the patient control functional motor movements.\(^1\) When the patient is put into different positions, he/she must adapt to the movements of the horse automatically rather than using his/her thought...
processes. It is this non-cognitive portion that distinguishes hippotherapy or developmental riding therapy from other forms of riding programs.

With the other forms of riding programs, the patient controls the horse. With hippotherapy or developmental riding therapy, the patient is not controlling the horse but must react to the movements at the subcortical level. This means the patient reacts without thinking about it and without verbal cuing.

The movement of the horse and the position of the patient will stimulate different muscles. When the pelvis is in alignment and the body has a proper center of gravity, the horse’s movements stimulate human gait. Spink uses three components of the movement of the horse therapeutically. These are the static/dynamic control, simple weight-shift, and the rotational component. All three components work in different planes and each has a different purpose.

The static/dynamic control works in the sagittal plane to facilitate forward and backward patient control. When the horse moves in a straight line at low speeds and while the patient is sitting forward, the pelvis will have an anterior/posterior tilt. This will automatically cause a forward and backward movement of the client. This movement will aid in the forward/backward righting reaction and the trunk control for flexion and extension.

The horse’s haunches will dictate the level of pelvic displacement. In a balanced gait of the horse, the pelvis and lumbar spine of the patient mobilize simultaneously. According to Spink, dynamic variance is "used to describe the unique variable process that harnesses the horse’s movement character and scope within a chosen gait pattern." Using the dynamic variance component, the
patient's individual needs are met by changing the horse's stride. The horse's stride is composed of rhythm, tempo, and cadence.

By changing the horse's stride, different muscles will be activated.\(^1\) If the horse's stride is increased, the patient will have a flexor response. In order for the patient to remain erect, he/she must use the abdominal muscles. The opposite of the above principle is the stride length is shortened, resulting in an extensor response. By alternating short and long strides with an occasional stop, the patient will develop a better flexion/extension righting response.

When the horse is in a normal gait pattern, the horse's pelvis rotates and shifts from side to side giving the patient a weight-shift component.\(^1\) With this movement, the patient must automatically lengthen or shorten his/her trunk. The weight-shifting component causes the patient to increase lateral control in the frontal plane. If a therapist feels that the patient needs a more rigorous workout, the horse can be moved in circles of different sizes. Each different size of the circle will increase the amount of control the patient must use.

The rotational component of the horse's gait affects the patient's postural control within the transverse plane.\(^1\) It is an effective way to normalize patient muscle tone and improve the patient's equilibrium reactions.

The lateral movements of the horse, termed leg yield, cause a stronger rotational component to the horse's gait.\(^1\) The increased rotational component consequently increases the patient trunk rotation.

Subjective reports in the literature indicate that hippotherapy may have positive effects in the treatment of cerebral palsy, multiple sclerosis, traumatic
brain injury, cerebral vascular accidents, spinal bifida, and postural abnormalities. This study is focused specifically on children with cerebral palsy (CP). The definition of cerebral palsy, according to Styer-Acevedo, is "cerebral palsy is not a disease, but is, rather a category of disability including patients with one kind of problem: chronic nonprogressive disorders of movement or posture of early onset. The anatomic sites of involvement, degree of motor disability, associated dysfunction, and cause are heterogeneous." CP has also been defined as "a nonprogressive paralysis resulting from developmental defects in brain or trauma at birth." Not only do children with CP have trouble with musculoskeletal disorders, but many have multiple disabilities including retardation and visual problems. These children often need different surgical interventions that may include femoral osteotomy, arthroplasty, arthrodesis, resection of the femoral head and neck, and soft tissue transfers or releases.

According to Spink, hippotherapy is also used in conjunction with treatment methods based on the works of Rood and Bobath and incorporating proprioceptive neuromotor facilitation (PNF). Haskin, Bream, and William have suggested that using Rood, Bobath, and PNF techniques in hippotherapy with children who have spastic CP may produce a reduction in spasticity levels which should increase range of motion (ROM) accordingly. Rood believed that sensory stimulation of the skin, muscles, and tendons would facilitate desirable motor activity and could also inhibit undesirable motor activity. The Bobaths identified an orderly sequence of development in normal children and
implemented the use of specific motor activities to facilitate development in children with CP. The Bobaths also used muscle relaxation techniques and other methods to normalize tone.

PNF supporters propose that motor activity is organized into patterns of abduction-adduction, flexion-extension, and rotational components.\textsuperscript{11} Voss\textsuperscript{11} has also indicated that increased motor control of the involved muscles will result if maximal resistance is applied to the above patterns.

In the United States, clinicians sometimes incorporate the principles of developmental riding therapy (DRT) into their hippotherapy programs. DRT incorporates sensory motor skills, cognitive skills, and affective skills.\textsuperscript{1} According to DRT theory as developed by Spink, when physical therapists integrate all three components into a single treatment, the results may enhance patients' development.

DRT also uses a combination of Rood and Bobath theories to facilitate sensory motor skills. Spink\textsuperscript{1} designed a developmental progression to meet the needs of the children and adults using four stages for functional movement.\textsuperscript{1} The four stages are:

1. Uncontrolled mobility
2. Proximal mobility on distal stability
3. Distal mobility on proximal stability
4. Locomotion.
The use of these four stages above helps the patients control lateral side flexion and rotational flexion/extension of the trunk to achieve reliable and efficient upright movements.

Researchers have suggested that hippotherapy may result in increased (ROM), however, objective studies have not confirmed this fact. The purpose of this study is to test whether there is a significant difference in lower extremity (LE) range of motion after hippotherapy. I anticipate that LE ROM in children with cerebral palsy will show significant improvement using hippotherapy as a treatment modality. If the above statement holds true, then hippotherapy may be used as an adjunct or alternative to other physical therapy methods for improving LE ROM in children with cerebral palsy. The null hypothesis will be that no significant difference in LE ROM will result after hippotherapy. My independent study could benefit physical therapy by adding to the body of knowledge on treating children with cerebral palsy using hippotherapy.
CHAPTER II

REVIEW OF LITERATURE

Early records of hippotherapy, also known as therapeutic riding, date back to the writings of Hippocrates before the birth of Christ. Modern therapeutic riding came of age when a polio patient, Liz Hartel, won a silver medal in 1952 during the Helsinki Olympics. Therapeutic riding started in Europe and spread to the United States in the mid 1960s. Currently, there are approximately 400 therapeutic riding sites in the United States operating according to the principles of hippotherapy.\textsuperscript{2,3}

For the past 20 years, there have been two primary organizations in the United States that are associated with therapeutic riding: Happy Horsemanship for the Handicapped (HHFTH) and the North American Riding for the Handicapped (NARHA).\textsuperscript{4,5} The HHFTH and NARHA are both non-profit organizations that serve people with disabilities and support therapeutic riding as a physical therapy treatment method. The above organizations set the safety guidelines and standards for most hippotherapy programs.

Hippotherapy requires a riding instructor and a team of professionals, most commonly including a physical therapist, occupational therapist, and a speech therapist, to facilitate the proper therapeutic response from the patients.\textsuperscript{1} The proper horses must be selected for patients to ensure their safety and to
meet individualized goals. In addition, to ensure safety, it is necessary to have two people walk along each side of the horse (side walkers) to assist in stabilizing the rider. Side walkers also assist riders in the performance of the therapeutic exercises. For the safety of the patient, a helmet is worn while participating in the riding program.

There are no objective studies indicating that hippotherapy will increase LE ROM in children with CP. In the following paragraphs, I will explain what studies have been done with CP children using hippotherapy as a modality.

Cawley, Cawley, and Ritter studied improvement in self-concept utilizing hippotherapy with adolescents diagnosed with special educational needs. There were 29 subjects, ranging from 11 to 17 years of age, utilized for this eight-week study. There was no control group used and all the subjects were given a pretest and a posttest using the Piers-Harris Children's Self-Concept Scale. The study indicated there were no significant improvements in self-concept except for the behavior subtest; however, the study did indicate that the younger subjects scored higher overall. This may indicate that younger subjects may receive greater benefits with early treatment.

In 1988, Bertoti studied the use of hippotherapy with children who had CP. The purpose of this study was to measure postural changes in children with spastic CP after participation in a riding program. Each riding session stressed the reduction of postural compensation and spasticity. A repeated-measures design used a pretest 1, where there was no therapeutic riding at all, followed by another pretest 2, administered before hippotherapy began, and a posttest after
the eight weeks of therapeutic riding. With the use of a double pretest, the subjects acted as their own control group. Bertoti developed her own postural assessment scale. She had five pediatric physical therapists test this scale and it was found to be a valid measurement of posture in children with CP. The interrater reliability was determined by a Spearman rank-order correlation and found to be reliable ($r = .82$). It was reported that some of the subjects had a decrease in extensor muscle hypertonus and hip adductor muscle spasticity which improved the client’s ability to sit, stand, and walk.

In 1991, Bertoti studied a child with hemiplegic CP using therapeutic horseback riding to see if the therapy would increase weight-bearing and symmetry in the child. The child was a 2½-year-old male. The subject’s scapula/shoulder posture and functional movement were improved after the six-week riding program finished. But Bertoti admits that her case study falls short of being a single-subject study and that further studies, with a more rigorous design and measurement, must be used in order to verify her results.

MacKinnon, et al studied the effects of therapeutic horseback riding in children with CP using the Gross Motor Functional Measurement test, Bertoti’s scale for posture, Vineland Adaptive Behavior Scale, Child Behavior Checklist, and the Peabody Motor Developmental Scales (PMDS). The study had nineteen children with mild or moderate CP, normal intelligence, and the ability to sit independently for two minutes. In the study, the children were randomly selected to be either in the control group or the experimental group and were also divided into two groups consisting of mild or moderate CP. A pretest and a posttest
using two examiners was utilized in the study to check the progress of the children after the six months. The testers did not know which children they were testing. The results after the six-month study indicated that there were no significant findings with the exception of the grasping task on the PMDS test. This finding occurred only in the moderate-experimental and moderate-control group. Subjective findings by the riding instructors, therapists, and parents also indicated some overall improvement in the children’s abilities.

Wingate\(^{17}\) surveyed parents, caregivers, and PTs involved in a hippotherapy program for children with CP. Subjects attended two times per week for a total of five weeks. The parents of the children noted improvements in posture (sitting posture), head control, LE hypertonus, and self-care skills. Physical therapists also noted improvements in gait and decreases in knee and hip flexion limitations. In particular, the decrease in hip and knee flexion deficits supports this study.
CHAPTER III

METHODS

This study was conducted in cooperation with physical therapists employed at the Child Evaluation and Treatment Program (CETP) at Altru Rehabilitation Hospital, Grand Forks, North Dakota. Six males ranging from 51 to 117 months of age (mean = 86, SD = 25.36) participated in the independent study. The subjects were chosen according to the following criteria: 1) medical diagnosis of spastic quadriplegic CP or diplegic CP, 2) normal spine and hip x-rays, 3) no other medical complications, 4) hip abduction of 20 degrees or more bilaterally, 5) subjects available to participate two times per week. These criteria were written before an interview with the CETP hippotherapy coordinator, who informed me that most of the subjects would only participate one time per week. Consequently, five of the children were only able to participate one time per week. The children were chosen from the group of participants in the hippotherapy program. There was no control group utilized for this independent study. All of the subjects’ parents signed a consent form (Appendix A) prior to initial participation in the study. The study was approved by the Altru Institutional Review Board on June 19, 1997 (Appendix B).

The subjects had their normal time of riding and then continued therapeutic activities, such as stretching and individualized exercise program.
During the riding sessions, the subjects would sit in various positions and do numerous activities on the horse. They included the following:

1. Prone lying
2. Stretching exercises
3. Trunk rotation
4. Quadruped
5. Forward sitting
6. Backward sitting
7. Sideways sitting
8. Placing ring on poles using either hand
9. Throwing bean bags at targets
10. Shooting a small ball into a basketball hoop
11. Putting ring on sticks held by a volunteer
12. Tall kneeling

All of the exercises were done in different positions to achieve different results, depending on the subject. The therapeutic games also were designed to achieve different goals depending on the patient’s needs.

LE PROM measurements were taken either in the supine or prone position on a low mat. All subjects completed stretching exercises prior to measurement. Measurements were taken at the initial treatment session and following eight weeks of treatment. The measurements consisted of bilateral hip flexion and extension, bilateral internal and external rotation of the hip, bilateral knee flexion and extension, and bilateral ankle plantar flexion and dorsiflexion.
All of the children were measured using a universal plastic goniometer or an angle finder. The bony landmarks and positions used were established by Norkin and White. All PROM recordings were written in a form created for this study (Appendix C).

Each time data were collected, three measurements were taken and then averaged. The data were inserted into the form below.

Table 1.—Data Collection Sheet

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>DATE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT ADDUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT ADDUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT ABDUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT ABDUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT POPLITEAL ANGLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT POPLITEAL ANGLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT STAHELI'S PRONE HIP EXT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT STAHELI'S PRONE HIP EXT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT INTERNAL ROTATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT INTERNAL ROTATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT EXTERNAL ROTATION</td>
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<td></td>
</tr>
<tr>
<td>RIGHT EXTERNAL ROTATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT DORSIFLEXION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT DORSIFLEXION</td>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>RIGHT PLANTAR FLEXION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The data were analyzed using a repeated measure t-test to determine if a significant difference in LE PROM was observed after the eight-week study and to either accept or reject the null hypothesis.¹⁹
CHAPTER IV
RESULTS AND DISCUSSION

Out of the six subjects, only two finished the experiment. Subjects showed no significant improvements in LE PROM. The obtained t values were not extreme enough to fall in the critical region; therefore, I failed to reject the null hypothesis. I concluded that there were no significant differences in PROM between the pre and posttests (subject one: \( t (15) = 1.11, p > .05, \) two tail; subject two: \( t (11) = .01, p > .05, \) two tail). See Table 2.

Subjective improvements noted by the parents of the two boys included improvements specifically in coordinated standing balance. Overall, the parents responded that they were happy with the hippotherapy program provided to their children. Parents had difficulty participating in their children's hippotherapy program due to the flood of '97.

Discussion

I found limited objective studies on hippotherapy as a physical therapy modality in the literature review. Most of the improvements shown were subjective studies and were based on the observation of the people closest to the patients. From a review of the literature, it is apparent that more empirical data and objective studies are necessary to show that this form of treatment is beneficial to children with CP.
Table 2.—T-Test Values for LE ROM Results

### Subject One; t-tests for Paired Samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Pairs</th>
<th>2-tail Corr</th>
<th>Sig</th>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFTER</td>
<td>16</td>
<td>.924</td>
<td>.000</td>
<td>30.9375</td>
<td>22.514</td>
<td>5.628</td>
</tr>
<tr>
<td>BEFORE</td>
<td></td>
<td></td>
<td></td>
<td>33.9688</td>
<td>27.468</td>
<td>6.867</td>
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</tbody>
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#### Paired Differences

<table>
<thead>
<tr>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3.0313</td>
<td>10.903</td>
<td>2.726</td>
<td>-1.11</td>
<td>15</td>
<td>.284</td>
</tr>
</tbody>
</table>

95% CI (-8.841, 2.779)

### Subject Two; t-tests for Paired Samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Pairs</th>
<th>2-tail Corr</th>
<th>Sig</th>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFTER</td>
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<td>.739</td>
<td>.006</td>
<td>38.6667</td>
<td>12.346</td>
<td>3.564</td>
</tr>
<tr>
<td>BEFORE</td>
<td></td>
<td></td>
<td></td>
<td>38.6250</td>
<td>15.712</td>
<td>4.536</td>
</tr>
</tbody>
</table>

#### Paired Differences

<table>
<thead>
<tr>
<th>Mean</th>
<th>SD</th>
<th>SE of Mean</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0417</td>
<td>10.605</td>
<td>3.062</td>
<td>.01</td>
<td>11</td>
<td>.989</td>
</tr>
</tbody>
</table>

95% CI (-6.697, 6.780)
This experiment indicated that there were no significant differences in LE ROM measurements before and after an eight-week session of hippotherapy. However, it also should be noted that none of the children had a loss of ROM.

Affecting the resulting data, the following problems occurred during this study: 1) flood of 1997, which caused a lack of parental involvement, a decrease in subjects, a delay in subject participation, and a delay in study initiation; 2) the existence of confounding variables, such as additional treatments in each individualized program and surgical interventions; 3) miscommunications between a patient and therapist affecting participation in the research project and the fact that subjects were unavailable to participate two times per week which reduced the available data; and 4) a lack of motivation on the part of participants. These problems negatively affected the data by decreasing the duration of the study, the number of participants, and weakened the strength of the data. These design problems will be discussed further in the following chapter.
CHAPTER V
CONCLUSION AND RECOMMENDATIONS

The results of this independent study indicated that there was no significant difference in LE PROM after an eight-week session of hippotherapy for children with CP. However, numerous problems, as identified in the previous chapter, occurred which significantly influenced the results. Therefore, a definite conclusion cannot be made regarding the effectiveness of hippotherapy.

In a future experiment, I would suggest using a larger sample size. This could be accomplished by using a sample of at least 30 subjects from a single site, possibly using a multi-site design, changing the selection criteria to include a wider range of ages, or by having additional physical therapists at various facilities aid in gathering data. It would also be recommended that a longer duration of the study be utilized to allow a greater time period to show improvements. It is suggested that the study be conducted over a minimum of two years. It would also be recommended that confounding variables be eliminated when possible. Conducting a screening for possible interventions would identify subjects who may not be able to complete the study. In addition, results from subjects undergoing surgical interventions should be eliminated from the data. An incentive package may aid in subject participation and subject completion of the study.
APPENDIX A
INFORMATION AND CONSENT FORM


You are being invited to participate in a study conducted by Theresa Jurgens and Jim Pitman, physical therapy students at the University of North Dakota. The purpose of this study is to determine if there is a significant improvement in lower extremity range of motion consisting of hip flexion, extension, internal and external rotation, adduction and abduction, knee extension and flexion, ankle plantar flexion and dorsiflexion, timed sitting balance using the Gross Motor Function Measure in patients with CP after a six week hippotherapy program.

The children have been picked for this study by the following criteria: 1. medical diagnosis of spastic quadriplegia CP or diplegia CP. 2. normal spine and hip x-rays. 3. no other medical complications. 4. hip abduction of 20 degrees are more bilaterally. 5. subjects available to participate two times per week.

Your child will have passive range of motion in their lower extremities and timed sitting balance measured in a pretest and a post test.

The testing will be done at the Child Evaluation and Treatment Center (CEPT) riding center. There will be a CEPT therapist or a UND PT facility member present while measurements are taken during the pretest and the post test.

Your name or your child’s name will not be used in any reports of the results of this study. Any information that is obtained in connection with this study and that can be identified with your child will remain confidential and will be disclosed only with your permission. The data will be identified by a number known only to the investigator. The investigator or participant may stop the experiment at any time if the participant is experiencing discomfort, pain, fatigue, or any other symptoms that may be detrimental to his/her health. Your decision whether or not to participate or let your child participate will not prejudice your future relationship with the Physical Therapy Department, the University of North Dakota, or CEPT. If you decide to participate or let your child participate, you are free to discontinue participation at any time without prejudice.

The investigators involved are available to answer any questions you have concerning this study. In addition, you are encouraged to ask any questions concerning this study that you may have in the future. Questions may be asked by calling Theresa Jurgens (701-777-9866) or Jim Pitman (701-772-5469) or Dr. Peg Mohr (701-777-2831). A copy of this consent form is available to all participants in the study. Medical records related to this study may be made available to the Medical Park Institutional Review Board as they may need to inspect the study records.

If there are questions regarding patient’s study rights, I should contact Dr. Ricardo Alvillar, Chairman of the Medical Park Institutional Review Board, at (701)780-6161.
ALL OF MY QUESTIONS HAVE BEEN ANSWERED AND I HAVE BEEN ENCOURAGED TO ASK ANY QUESTIONS THAT I MAY HAVE CONCERNING THIS STUDY IN THE FUTURE. MY SIGNATURE INDICATES THAT, HAVING READ THE ABOVE INFORMATION, I HAVE DECIDED TO PARTICIPATE OR LET MY CHILD PARTICIPATE IN THE RESEARCH PROJECT.

I have read all of the above and willingly agree to let my child participate in this study explained to me by Theresa Jurgens and/or Jim Pitman.

____________________________________________________________________________________
Participant's Signature Date

____________________________________________________________________________________
Subject Signature Date
(If child is in 5th grade or higher)

____________________________________________________________________________________
Parent or Guardian Date

____________________________________________________________________________________
Witness (not the scientist) Date
**UNIVERSITY OF NORTH DAKOTA**
**HUMAN SUBJECTS REVIEW FORM**
**FOR NEW PROJECTS OR PROCEDURAL REVISIONS TO APPROVED PROJECTS INVOLVING HUMAN SUBJECTS**

**PRINCIPAL INVESTIGATOR:** Jim Pitman and Theresa Jurgens  
**TELEPHONE:** (701) 772-5469, (701)777-9866  
**DATE:** 1997

**ADDRESS TO WHICH NOTICE OF APPROVAL SHOULD BE SENT:** 2543 Glenwood Drive, Grand Forks, ND 58201 - 303 Stanford Road, ND 58203

**SCHOOL/COLLEGE:** School of Medicine  
**DEPARTMENT:** Physical Therapy  
**PROPOSED PROJECT DATES:** June 1, 1997 - August 15, 1997

**PROJECT TITLE:** The Effect of Hippotherapy on Lower Extremity ROM and Sitting Balance in Children with Cerebral Palsy

**FUNDING AGENCIES (IF APPLICABLE):**

**TYPE OF PROJECT:**
- [X] NEW PROJECT  
- [ ] CONTINUATION  
- [ ] RENEWAL  
- [ ] THESIS RESEARCH  
- [ ] STUDENT RESEARCH PROJECT

**DISCUSSION/THESIS ADVISER, OR STUDENT ADVISER:** Dr. Peg Mohr

**PROPOSED PROJECT:**
- [ ] INVOLVES NEW DRUGS (IND)  
- [ ] INVOLVES NON-APPROVED USE OF DRUG  
- [X] INSTITUTION

**IF ANY OF YOUR SUBJECTS FALL IN ANY OF THE FOLLOWING CLASSIFICATIONS, PLEASE INDICATE THE CLASSIFICATION(S):**
- [X] MINORS (<18 YEARS)  
- [ ] PREGNANT WOMEN  
- [ ] MENTALLY DISABLED  
- [ ] FETUSES  
- [X] MENTALLY RETARDED  
- [ ] PRISONERS  
- [ ] ABORTUSES  
- [ ] UND STUDENTS (>18 YEARS)

**IF YOUR PROJECT INVOLVES ANY HUMAN TISSUE, BODY FLUIDS, PATHOLOGICAL SPECIMENS, DONATED ORGANS, FETAL MATERIAL, OR PLACENTAL MATERIALS, CHECK HERE**

1. **ABSTRACT:** (LIMIT TO 200 WORDS OR LESS AND INCLUDE JUSTIFICATION OR NECESSITY FOR USING HUMAN SUBJECTS.)

   Hippotherapy is a passive form of riding in which the patient sits on the horse and allows the horse to move him/her. Since the late 1960s hippotherapy has grown at a rapid rate, with more than 500 centers across the U.S currently in operation. However, the body of literature that pertains to the therapeutic benefits of hippotherapy consists primarily of descriptive articles that contain the observation and subjective reports of observers and participants. While these descriptive articles have been helpful to identify the variables that need to be empirically studied, few investigators have objectively documented the proposed therapeutic benefits of hippotherapy.
The purpose of this 6-8 week independent study will be to determine if there is a significant improvement in lower extremity range of motion consisting of hip flexion, extension, internal and external rotation, adduction and abduction, knee extension and flexion, ankle plantar flexion and dorsiflexion, and/or timed sitting balance using the Gross Motor Function Measure (GMFM) in children with spastic cerebral palsy following participation in hippotherapy.

Human subjects are needed because animal subjects will not provide the necessary information.
PLEASE NOTE: Only information pertinent to your request to utilize human subjects in your project or activity should be included on this form. Where appropriate attach sections from your proposal (if seeking outside funding).

2. PROTOCOL: (Describe procedures to which humans will be subjected. Use additional pages if necessary.)

Subjects: Five children ranging from four to eighteen years old and diagnosed with cerebral palsy will be selected from Rehab hospital pediatric department in Grand Forks, ND, to participate in this independent study. The subjects will continue their normal hippotherapy exercise protocol designed by their physical therapists.

The criteria for this study includes the following: 1. medical diagnosis of spastic quadriplegia CP or diplegia CP. 2. normal spine and hip x-rays. 3. no other medical complications. 4. hip abduction of 20 degrees are more bilaterally. 5. subjects available to participate two times per week.

Experimental Design: A pre-test and post-test using a repeated measure design on the subjects above during the six - eight week study will be used. There will be no control group utilized for this study.

Procedure: Range of motion will be measured passively using a plastic goniometer. Goniometric measuring has been shown to be reliable and have validity in measuring passive range of motion (PROM).

Timed balance test will be assessed using the (GMFM) test consisting of Item B: Sitting - numbers 23, 24, 28, and 29. The GMFM has been found to be valid in measuring changes in gross motor function over time in children with CP.

Theresa Jurgens and Jim Pitman will work closely with the Child Evaluation and Treatment Program (CEPT) physical therapists and will also provide the necessary equipment to complete the testing, and will be responsible for performing the pre-test and post-test. The CEPT therapists will be responsible for recommending families to participate in the project, making the initial contact, and passing out the consent forms to the parents. Sally Masilko, director of the hippotherapy program, has approved the proposed project, please see attached letter.

Theresa and Jim will attend sessions of physical therapy with their subjects prior to initiating the study. They will observe therapy sessions and will discuss any precautions for specific subjects with the individuals’
physical therapist. All techniques will be reviewed and approved by a CEPT therapist. A CEPT therapist or a
UND PT faculty member will supervise the pre and post testing session.
3. BENEFITS: (Describe the benefits to the individual or society.)

If the null hypothesis can be rejected, hippotherapy could be considered an additional therapeutic intervention for children afflicted with CP. Physical therapy organizations could develop protocols and receive third party reimbursement which at present time is in question. Due to the nature of CP, many of the children will be in therapy many years and may become less motivated with the same routine. If hippotherapy can be assessed as better or at least as good as conventional therapy, it may be used as a modality which will assist in keeping the interest of the patient and improve compliance.

4. RISKS: (Describe the risks to the subject and precautions that will be taken to minimize them. The concept of risk goes beyond physical risk and includes risks to the subject's dignity and self-respect, as well as psychological, emotional or behavioral risk. If data are collected which could prove harmful or embarrassing to the subject if associated with him or her, then describe the methods to be used to insure the confidentiality of data obtained, including plans for final disposition or destruction, debriefing procedures, etc.)

- Information from this study will be anonymously coded to ensure confidentiality. The subject will not be personally identified in any publication containing the results of the study. All written material from this study will be kept in a locked cabinet in Dr. Peg Mohr office at the physical therapy department and will remain there for 3 years following the completion of the study. Then the data will be destroyed.

The risk posed to the children while assessing timed sitting balance are limited to falling over. Risks will be minimized by performing the assessment on a mat on the floor, and an assistant will also be positioned behind the patient to prevent injury should any loss of balance occur.

The risks are minimal to the subjects with proper use of the goniometer and goniometer measuring is an established evaluation procedure. The researchers have demonstrated competence in completing these measurements.
5. **CONSENT FORM:** A copy of the **CONSENT FORM** to be signed by the subject (if applicable) and/or any statement to be read to the subject should be attached to this form. If no **CONSENT FORM** is to be used, document the procedures to be used to assure that infringement upon the subject's rights will not occur.

Describe where signed consent forms will be kept and for what period of time.

Copies of resulting data and Consent Form will be kept in a locked cabinet in Dr. Mohrs office at the University of North Dakota at Grand Forks, Physical Therapy Department. The Consent Forms will be held from July 15, 1997 through July 15, 2000.

6. For **FULL IRB REVIEW** forward a signed original and thirteen (13) copies of this completed form, and where applicable, thirteen (13) copies of the proposed consent form, questionnaires, etc. and any supporting documentation to:

Office of Research & Program Development
University of North Dakota
Box 8138, University Station
Grand Forks, North Dakota 58202

On campus, mail to: Office of Research & Program Development, Box 134, or drop it off at Room 101 Twamley Hall.

For **EXEMPT** or **EXPEDITED REVIEW** forward a signed original and a copy of the consent form, questionnaires, etc. and any supporting documentation to one of the addresses above.

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THE EFFECT OF HIPPOThERAPY ON LOWER EXTREMITY ROM IN CHILDREN WITH CEREBRAL PALSY
REFERENCES


