Spring 5-1-2006

Horse Saddles for Adaptive Riders

Mark Rogers

Follow this and additional works at: https://surface.syr.edu/honors_capstone

Part of the Industrial and Product Design Commons, and the Interactive Arts Commons

Recommended Citation
https://surface.syr.edu/honors_capstone/639

This Honors Capstone Project is brought to you for free and open access by the Syracuse University Honors Program Capstone Projects at SURFACE. It has been accepted for inclusion in Syracuse University Honors Program Capstone Projects by an authorized administrator of SURFACE. For more information, please contact surface@syr.edu.
Mark Rogers
Candidate for B.F.A. Degree
in Industrial Design with Honors
May 2006

Horse Saddles for
Adaptive Riders

APPROVED
Thesis Project Advisor: ________________________
(Don Carr)

Second Reader: ________________________________
(Michael McAllister)

Honors Director: ______________________________

Honors Representative: ________________________

Date: _____________________________

Mark Rogers
Candidate for B.F.A. Degree
in Industrial Design with Honors
May 2006
Abstract

“Hippos” is the Greek word for horse. “Hippotherapy” literally means treatment with the help of the horse. In this field specially trained, licensed physical therapists, occupational therapists and speech language pathologists use the special nature of a horse to help clients meet their therapy needs.

This project investigates the process of making therapeutic progress on horseback. It describes the field of hippotherapy and presents a new saddle design to make the process of therapy more effective.

My design process started out with broad user research. Video camera in hand, I went to observe a form of hippotherapy called Adaptive Riding at a local farm. Interviews with parents, patients, therapists and volunteers helped identify problems that could be better. This list ranged from a horse drawn cart that could seat wheelchairs to a stand up mailbox so therapists could use it as a prop during their sessions. Over time the need for a new saddle emerged and became the design direction for the entire project.

The horse saddle was chosen for redesign because most saddles have been developed for able-bodied riders doing specific jobs. Working cowboys had specific needs involving roping cattle and pulling loads. Their saddles were specifically designed to meet those needs. English saddles were shaped by a tradition of fox hunting which involves high speeds and jumping fallen objects. Today, adaptive riders do not rope cows nor chase after foxes. Their job is to make personal progress and they could benefit from a saddle designed to help them.

The walking motion of the horse moves the rider’s pelvis, ribcage and shoulder girdle in almost the same way as if they were actually walking. This type of movement is called the horse’s “three-dimensional swinging gait”. Because of it, a non walking person can experience a close approximation of what it feels like to walk. This is invaluable to adaptive riders with disabilities because they usually do not have access to this quality of exercise. For them the experience of riding can be like giving their system a whole new set of batteries.

The type, degree, and quality of the horse’s movements are important because it is these movements that simulate walking for the rider and provide all its associated health benefits. Horses must be trained to have great movements and are thus very expensive. Many therapy institutions do not wish to raise the cost of their services in order to purchase and train such special and expensive horses. Instead they use donated or older horses which have good but not great movements. This leaves a gap between the level of therapy riders get and the level of therapy riders could get if they had a great moving horse.

A saddle that is adjustable to provide great movement on a wide variety of horses could exist. A saddle like this would keep costs down for the institution (by not having to buy specially trained horses) and increasing the quality of the therapy for its clients by providing great movement. This thesis documents my design journey towards that goal.
Table of Contents

i  Acknowledgements

1  Hippotherapy
   2  Multidimensional
   3  3D movement
   4  Scientific Support
   6  Cost of horse training
   7  DVD Arise Inc. research
   8  Field research

11  Saddles
    11  History
    20  Design process

25  Sustainability
    25  Patagonia, Greenblue
    27  Dr. James Nakas

29  Design & Testing
    31  Sketch models
    35  Field Testing
    37  Prototype 4
    39  Prototype 5
    45  Final Solution

50  Future thoughts

54  Sources Cited

56  Appendices
Acknowledgements

Professor Glen Hougen of Syracuse University’s Industrial Design program for continuing a relationship with Arise Inc. which spawned this project.

Professors Rogan Kersch & Holly Greenberg teachers of CAS 300 who ignited my desire to become a scholar.

Professor Don Carr of Syracuse University’s Industrial Design program for being my thesis advisor.

Professor Michael McAllister of Syracuse University’s Industrial Design program for being my second reader.

Professor Anne Beffel of Syracuse University’s Time Arts department for being an invaluable mentor.

Beth Underwood, Anne Janson For letting me come and be a part of your program, and the staff, volunteers, parents and clients of Arise Inc. for sharing in the experience of Adaptive Riding, and spending time with me so I could learn.
“Hippos” is the Greek work for horse; therefore “hippotherapy” literally means treatment with the help of the horse (American Hippotherapy Association). In this form of therapy, specially trained professionals use the unique qualities of the horse to help their clients make progress. One of the main reasons the field of hippotherapy is experiencing growth is because, unlike other medical treatment methods, hippotherapy can be a lot of fun. Sessions take place at an interesting farm instead of a sterile and often intimidating hospital. Clients get to work with horses which do not prejudice like people do. They are fun to ride and immediately return kindness and affection.
As with other forms of pet therapy, connecting emotionally with an animal seems to increase attention span, memory, concentration and speech in impaired children and adults (Schwartz). These qualities transform the hard work of therapy into an adventure for many hippotherapy clients. As a result, gains come more quickly.

The power of hippotherapy is multifaceted. According to Danelle Kern, a physical therapist at the Kern Therapeutic Riding Centre in Colton, California, “hippotherapy can be used to treat a wide variety of neurological, skeletal, muscular and emotional disorders. Autism, cerebral palsy, multiple sclerosis and Down syndrome are all commonly treated conditions. Traumatic brain or spinal cord injuries, stroke, attention deficit disorders, learning or language disabilities and visual or hearing impairments are all issues that hippotherapy can be used to treat (Schwartz). Hippotherapy gets its versatility from the principle that the horse should be used as a tool to conduct activities that are meaningful to the client.

In every case, specially trained medical professionals use the horse as a prop to work with their clients in ways that make sense to them. For young children with speech problems this may mean putting them on a horse who responds to voice commands. The instructor may then ask the child to ride their horse over to a mailbox and bring back the mail. Eager to please, the child must work on pronouncing each command correctly in order for the horse to move and stop at the mailbox. In this way the tedious task of speech therapy is transformed into a rewarding event which eventually allows them to ride a horse hands free. The same can be done for clients with behavior issues or a wide range of other needs. The key is that fun and adventure mask the hard work of therapy.
3D movement

For those who have physical therapy needs, the horse provides an extra benefit: it can simulate walking. When a person rides a horse, the movement of the horse moves his or her body. This produces the classic swaying motion you might have seen in movies as cowboy heroes ride off into the sunset. Medically speaking, this movement is produced by the “three-dimensional swinging gait” of the horse as they walk. “This gait causes the rider’s pelvis, trunk and shoulder girdle to react in ways very similar to those produced by the normal human walk” (Engel 20). In effect, a wheel chair bound person can actually feel what walking is like without using their legs. This is invaluable to adaptive riders with disabilities because they do not usually have access to this quality of exercise.

“Hippotherapy is totally special and unique,” says Kern, who is on the physical therapy staff at Loma Linda University Medical Center and Children’s Hospital (Schwartz).
No machine has ever been invented to take the place of a horse’s muscle groups moving from side to side, forward and back and up and down.

-Danelle Kern, physical therapist at Loma Linda University Medical Center and Children’s Hospital

By trying to maintain balance in response to a horse’s motion, riders tone, stretch and strengthen the same muscle groups they would use in walking, sitting and reaching on their own. The warmth, smell, sound, sight and feel of a moving horse flood a rider’s senses, says occupational therapist Bethany Lee, executive director of the National Center for Equine Facilitated Therapy, a hippotherapy facility in Woodside, north of San Jose (Schwartz).

Riders who focus on strengthening their trunk muscles and straightening their posture will also see improvements in respiration and speech because the muscles are related. “This is the beauty of using the horse as treatment tool, these other changes occur although one is not focusing on them” (Engel 7). Gains like these illustrate how progress in hippotherapy sessions can directly relate to everyday activities, which is really the goal of any program.

Scientific Support

In 1992, a student named “Fleck” published a master’s thesis at the University of Delaware. Using 16 mm film, Fleck compared the pelvic movements of 24 normal children while walking on a treadmill and while riding a horse walking on an equine treadmill. She found the pelvic movements of the walking and riding children were almost the same (Wheeler 25). Even the walking cadences are familiar. The average adult human walks at approximately 110 steps/minute and a large horse walks at 100 steps/minute (Wheeler 25). All of these factors combine to simulate walking for the rider.
Movement trail of adaptive rider
Perhaps the best proof that hippotherapy works was reported in 1999 by Dr. Daniel Bluestone, a pediatric neurologist at UC San Francisco, who had been following the progress of children receiving riding treatment. By comparing MRI scans over time, Bluestone found that the repetitive movement of riding prompts physical changes in the brain.

“We think that hippotherapy is effective in helping rework networks within the cerebellum and within the motor system up in the cerebrum” he said in a Discovery Channel documentary. “The pathways within the brain that facilitate a particular movement become reinforced over time. “The more pathways you reinforce, the better the brain compensates and the better motor function can improve” (Schwartz).

Cost of Training

Unfortunately this movement comes at a high price. The type, degree and quality of the horse’s movement is what provides the feeling of walking for the client, and all the health benefits that go with it. If the horse’s gait is blemished it will transmit flawed movement responses to the client (Engel 67). Great moving horses are like world class athletes, both are highly trained and very expensive. Many therapy institutions do not wish to raise the cost of their services in order to purchase and train such special and expensive horses. Instead they use donated or older horses which have good but not great movements. This leaves a gap between the level of therapy riders get and the level of therapy riders could get if they had a great moving horse.
*Arise Research*

Attached to this document is a five minute DVD that summarizes my research and visually explains how the three dimensional swinging gate of the horse affects the human body. Please watch the DVD to see hippotherapy in action.
Field Research

Most of my discovery came from visiting therapy professionals and taking notes during their sessions. For several semesters I visited Arise Farms Inc, in Chittenango, New York where they conduct a type of hippotherapy called “adaptive riding.”

Once a week for several months, I drove over and observed their classes. I learned the most by interviewing the physical therapist after every session she conducted. I would observe her class, I asked her questions like, “Why did you have that young girl riding with her hands in the air?” She would explain to me that her client had muscular atrophy due to an injury and was working on mobility. To help her, volunteers walking beside her horse would hand her toys like a hula-hoop that she had to hold over her head for three minutes. Because the young girl was riding, she didn't mind holding the object and it became an exciting challenge to stay on the horse while doing it.

I learned that the horse was a great distraction tool and the client enjoyed coming to adaptive riding classes much more than traditional physical therapy classes, even though the exercises were the same.

I asked her questions about a young boy riding to a mailbox, opening it, and reading a letter he found inside. She explained to me that his goal was to improve speech and the letter was directions to the next task. By reading the letter out loud, everyone heard what he was going to do next. I learned that the art of distraction worked for many people who typically grew tired and frustrated with traditional methods of therapy.
The gestalt moment came when I asked the physical therapist about a gentleman I saw riding a horse that was bouncing him all around.

She explained to me that the three-dimensional swinging gait of the horse simulated walking for him. He had been riding so long that he needed more and more movement to challenge its muscles to grow. Luckily, Arise Farms had a horse with very bumpy movement that worked perfectly for him. I realized that horses like this don’t exist at all farms and clients who need them are limited in their therapy.

The next question I asked was “can everyone who needs the simulated walking motion ride this very bumpy horse?” “No” she replied, “some people aren’t strong enough yet to ride him. It became clear to me that each horse moves differently, and must be matched with a rider who will benefit from that movement. If at a particular farm, no horse’s movement fits a particular rider, then they will not progress well through their therapy.

Because the saddle sits between the horse and rider, I began to wonder if it could become a suspension system that could be tuned to provide a great ride on a variety of horses. With this idea in mind I turned my attention to saddles.
Saddles

A number of different saddle types exist for a number of different reasons. Some saddles are made for specific purposes, others simply mark points in technical innovation. During my research I was surprised to find that many of history’s greatest riders used no saddle. The ancient Greeks and Romans both rode bareback until the end of the Roman empire. The Native Americans of the Great Plains of North America also rode without saddles and were spectacular horsemen to say the least (Saddles). It is not clear how the modern saddle evolved but two of its components proved to be revolutionary.

The stirrup is believed to be from Assyria circa 850 B.C. At first it was little more than a small rope loop for a rider’s big toe and was of limited value for stabilizing and no real value as a mounting aid (Saddles). As it evolved, the stirrup became a spectacular way to get on a horse. In fact, the words for stirrup in Old High German, Old Saxon, and Old English are all derived from words for climbing. Its secondary use proved to be stability for the mounted warrior. The stirrup made it easy to balance and shoot a bow at full gallop. It also provided an anchoring for the feet when striking powerful blows with a sword, axe or mace (Old World Contacts).

The second major innovation in saddle history was a rigid structure placed inside the saddle pad to keep it from slipping side to side. This invention was called a “tree” because it was carved from wood. The tree and stirrup were such enduring concepts that most modern saddles use them just as they were 100s of years ago.
Charro saddle
Mexican ranch saddle
The cantle has evolved through a series of repeats. In medieval days the cantle was high and covered the back of the mailed knight or jouster very securely so that he could not be pushed backward off his horse. After the Span-


McClellan Calvary saddle and spoon cantle saddle
The English parade-type saddle is a small show saddle with flexible sidebars. The maker is unknown. Interestingly, the horn curves out from under an upswept seat. The silver back of the saddle is covered with 1930s Mexican coins and a small plaque noting the saddle was for a Mr. John Aggie from the Tripoli role.
Modern pleasure show saddle custom made
Modern roping saddle custom made

Mark Rogers 19
To understand how saddles were made, I bought four through E-bay and pulled them apart piece by piece. My first saddle dissection was a traditional English saddle. What I found inside it was a complex set of nails, tacks and hand stitches which held the many parts of the saddle together. The removal of an estimated 200 fasteners was required to completely disassemble the saddle. Each fastener has been put in by hand, making the manufacture of that saddle expensive and labor intensive.

Handmade saddles are great for people who only ride one horse. They simply find saddles that fit them, and they only need to buy one. The reason an expensive and handmade saddle is undesirable for hippotherapy is because one farm will typically have several horses which service many clients. This means that one horse will probably have to carry many people of diverse sizes throughout out the day. Ideally, a saddle should fit both the horse and rider. To make this happen with many riders, a large variety of saddles would have to be on hand. When saddles are handmade the cost is expensive. For this reason, it is difficult for Adaptive Riding programs to provide all horses and riders with great fitting equipment. While this may seem trivial, those who have spent an evening in poorly fitting shoes will know that a little discomfort can add up.

In an effort to change this, I analyzed the materials used in my recently deconstructed saddles. I found leather, wood, steel, string, and cotton made up 99% of all the materials. This meant that the saddle was heavy and bound to the restrictions of manufacturing techniques hundreds of years old. At this point I realized that new materials might allow me to make a saddle that could better suit hippotherapy riders.
Author at Patagonia headquarters in Ventura CA.
Sustainability

In order to find new, more suitable materials I began to look for companies with competency in outdoor goods. My favorite became Patagonia Inc., a manufacturer of high end outdoor gear and clothing. They have gained a worldwide reputation for environmental friendliness and non-toxic manufacturing, while upholding exceptional standards of quality. For these reasons I contacted them and explained my project. Wanda Weller, the company’s design director, invited me to visit them and speak to some of their design and manufacturing staff. Because they are located in Ventura, California, I applied for honors funding to pay for trip and travel costs. Honors provided me with a Crown Scholarship, which I used to fly out during spring break senior year.

When I arrived at their company, the staff was appalled to hear I came all the way from cold and snowy Syracuse only to do school work. They insisted I go biking in the mountains and surfing in the ocean. Having no choice, I obliged them and then got down to business. After a tour of their testing rooms, fabric areas, and design department, I began showing people my project and asking for feedback. I spoke to Amy Hess, a member of their environmental design team about seat cushion foams, which are high quality and made in an eco-friendly way. I also spoke to Wanda Weller about the design concept in general, and sourcing of fabric to cover the saddle.

While in California I visited sporting shops and observed current trends. Market researchers often release sports products in California first as a test to see if they are viable. I was hoping to glimpse some things which were not currently released in the Northeast. I was rewarded in terms of new automobiles and clothing fashions that could influence my design.

In an effort to research real materials farther I contacted Jason Pearson, executive director of GreenBlue, a company dedicated to bringing environmentally friendly manufacturing materials to market. He could not provide me with exact information but put me in contact with Kirk Mayer of Nike’s Advanced Materials Lab. He and I spoke by phone about his projects and my saddle. To my surprise, he could not give me exact materials either. I learned from this experience that the field of environmentally friendly design is still in its infancy. Despite all the current innovation in the field of green design, there are still many plastics and resins that manufacturers do not know how to make in environmentally friendly ways. Furthermore, Kirk Mayer of Nike pointed out that products made in green ways are not always of the quality necessary for performance sports like horse riding. This was a frustrating setback because I wanted my design to feature new thinking in materials.
One professional I met who could help me was Dr. James Nakas, director of the Center for Applied Microbiology at SUNY ESF. He has recently gained attention for his invention of a wood based plastic. An amazing discovery, it can take waste wood pulp from any of the Central New York paper plants, ferment it in the presence of special bacteria, and produce plastics of varying flexibilities. Best of all, if this plastic ended up in a landfill, it would decompose in less than thirty days, leaving no waste. Unfortunately, the ability to quickly decompose in the presence of heat and moisture makes it unsuitable for use in a horse saddle that would be exposed to sweat, heat and rain. While I was not able to use his plastic in my thesis, I learned a great deal from my conversation with Dr. Nakas and was encouraged to hear about his continuing research.

At this point I shifted my focus from materials to form and began investigating ways to meet Adaptive riders’ needs through design changes in an existing saddle.
Concept sketches for saddle designs
Solution

A breakthrough came when I found the inside structure of a western saddle for sale on E-Bay. I purchased it and brought it into my studio to examine how it worked. The saddle part was designed to lay on the two back muscles that surround the horse’s spine. As the horse walks, these muscles expand and contract, causing the side-to-side motion the rider experiences. It is this motion that enables riders to feel like they are walking.

Through sketching I developed several different saddles designs that utilized those muscles to transmit more movement to the rider. Spurred by a critique from advisor Don Carr, a second round of sketching explored ways that a saddle could be made more or less flexible depending on the needs of the rider and the attributes of the horse. These ideas coalesced into the final design concept. Sketch models were made to bring the design into 3D form. Once tangible, problems began to reveal themselves. New sketch models were made to correct those problems and test recently thought of features.
Sketch Model #1

Illustrates the concept of a removable seat. Each seat has an elastic webbing strung inside. The tension and elasticity of the seat determines how smooth or bumpy the horse will feel when riding. New riders would want a nice stable ride and thus choose the “smooth seat”. Advanced riders need more bounce to challenge their balancing muscles. They would choose an appropriate seat and snap it into the saddle before riding.

This prototype was developed and shown to designers at Patagonia. Their materials knowledge lead to the realization that this would not be a good route to go because of the unreliable nature of flexible rubbers used under these conditions. This feedback was valuable and lead to the next prototype.

Sketch Model #2

This model was made to copy existing saddle trees. I wanted to learn what was involved in making and shaping them. The traditional saddle tree I copied had complex curves on its underside to fit over the muscles and bones of the horse. Through copying those curves, I gained a strong sensitivity to the form of the horse’s back and the difficulty of making a saddle.

Sketch Model #3

This model explores the strongest concepts I developed through sketching. Because of its large, open channel down the center of the saddle, each side is free to flex with the horse’s movement. This flexation increases the amount of movement an experienced rider would experience, challenging patients in their therapy without having to find a new horse.

The seat is made by bending over strips of material which represent flexible plastic. To the rider, this seat would be quite bouncy because it acts like a spring when the horse walks. The amount of spring could be controlled by placing an insert inside the material rolls, inhibiting the flex and stopping the spring.

The main problem with this model was Breakability due to its thin walled design. It also proved to be very difficult to manufacture which was something I was looking to avoid.
Sketch Model #4

An evolution of the previous two models, this concept is much more sturdy and functional. Because the main structure is made from one sheet of plastic which is heated and then bend into shape, it needs no glue or screws which makes it strong. Because plastic has replaced traditional wood and metal parts, it is also much lighter.

Holes in the structure allow foam padding to be placed inside it. This padding is what rests against the horse, comfortably distributing the weight of the rider. Ideally, this padding would be manufactured in several different styles, each fitting a different range of horse breeds. A saddle like this would be quickly customizable to many different horses without the need to buy extra saddles. The result would be improved comfort for the horse and lower cost for the farm.

The most creative aspect of this model is the way the seat is made. The blue and pink foam represent an insert that locks the two sides of the saddle together, controlling how much the saddle can flex as the horse moves. For riders with strong muscles and good balance, a very flexible insert could be used, allowing each side of the saddle to flex a great deal. This would challenge the muscles of the rider and allow them to feel the three dimensional swinging gate of the horse in a deep way. If a rider was less experienced and needed a more quiet and stable ride, a hard and stiff insert could be used which would lock the two sides of the saddle together, making them inflexible and stable.

In this way, one horse and one saddle could challenge a variety of riders, from beginner to experienced. As riders practice and grow stronger with their balance, inserts can be changed to keep their muscles challenged and growing at a consistent rate.
Field Testing

Mock up #4 was taken to an adaptive riding program for evaluation on a real horse. While it was being fitted on Candy, a quarter horse mare, a small crowd of curious bystanders began to gather. Members of the crowd began to ask about the saddle and the concepts behind its design. This served as a valuable focus group where I could collect many different opinions at one time.

One parent asked me if the real saddle would be made out of plastic. His name was Dr. Philip Flarmo, a medical doctor from Syracuse. He and I talked about design and ergonomics. Dr. Flarmo has expertise in radiology where expensive equipment is used to read x-rays. He shared his thoughts on the new products his hospital uses and how they could be better. We talked about new designs in the surgery tools he uses, and advances in hospital bed pads which change shape to avoid bed soars. During the conversation, Dr. Flarmo listed his top priorities for any new product design.

1. No failure
2. Ease of use. Product cannot be too complicated
3. Ergonomic. The removable inserts must be easy to grab and fit the human body.

Sue, an employee of the hippotherapy program at Arise Farms Inc. noticed the pads on the underside of the saddle. She and I spoke about saddle fitting and the design of padding. During our talk, she showed me a Wintec close contact saddle which had specially designed pads which fit a wide variety of horses.

Anne Janson, Equine program manager for Arise Farms came over to inspect the saddle. Her years of experience in saddle fitting prompted her to ask me questions about the design of the structure itself.

She connected me with Katie Kole-Dike, a saddle fitter who graduated from Syracuse University with a degree in Engineering. We spoke on the phone and she agreed to look at the saddle with me. Her feedback will be incorporated into the final model.

Several other people gave me valuable feedback including Craig Polhamus, an architect, whose most recent project is a large exercise facility for the special needs clients of Arise Inc. We spoke about ease of use and cost issues and the business side of producing product.

All of this feedback was valuable in shaping the saddle’s next iteration.

The final model consists of a frame that accepts modular parts to fit both horse and rider. This allows riders to customize their levels of movement in order to maximize their therapeutic workouts. It also allows the farm to buy one saddle and snap in different pads to fit different horses, saving them money and providing a better fit for their clients.
Solution visualization
(1) **Rubber insert** which is responsible for controlling the movement of the saddle. When a flexible insert is used, the two sides of the saddle are able to flex and move. When a rigid insert is used, it slides into the back of the saddle and locks the two sides together, creating a very stable platform for new riders.

(2) **Seat**

(3) **Structure** it holds all the parts of the saddle together. Made from one piece of polycarbonate plastic, it is light and strong. Because it accepts different pads on its underside, it can fit a wide range of horses.

(4) **Removable pads.** Each set of pads is specifically molded to fit a particular breed of horse. These pads are inexpensive, injection molded foam (like running shoes) which keep the cost of a custom fit low.

(5) **Top view** showing how seating components slide into the back of each other
Phone Call

“ I don’t know how you would do it, but a saddle with a seat that rotates would really help our cerebral palsy clients. ”

-Lori, Speech therapist at Arise Inc.

Some riders have trouble keeping their back straight and hips underneath them when they ride.
Two days after field testing prototype 4, I received a phone call from Lori, one of the therapists at Arise. She called me to share her idea that cerebral palsy clients might get real benefit from having a saddle with an adjustable seat. In her classes, she has often observed riders who are unable to sit up straight, aligning their shoulders, spine and hip bones correctly with the horses movement (see picture at left). Lori desired a saddle that could be tilted forward or backward to correct the posture of the rider. “Currently” she told me, “there is nothing on the market that can do that. We try to use rolled up towels.”

Based on this feedback I developed prototype 5 which features a seat that rotates. This rotation allows therapists to put riders in the saddle, and then slide the seat until their hips are correctly aligned underneath them.
Further refinement: Saddle Fitting

“I think that from a therapeutic perspective, the saddle has some great qualities. From a saddle fitting perspective, this design incorporates a lot of things most saddle makers aren’t thinking about.”

-Kohl-Dyson, (certified Advanced Equine Body Worker)

Prototype 5 was taken back to Arise for more field testing. Karin Kohl-Dyson, certified Advanced Equine Body Worker lent her saddle fitting expertise in assessing the design. Her knowledge of equine anatomy helped determine where the saddle needed to be adjusted in order to comfortably fit most horses.

problems
1) Back wings are too flexible
2) Saddle extends well past the horse’s last rib which causes pain
3) Front of saddle slightly pinches horse’s withers
4) Light shows under saddle because it does not fit snug against the back
5) Saddle sits sloped on certain horses. More wither clearance needed
6) Wider wither clearance
7) Saddle extends past past rib, extra material not needed
8) Prototype 5
Making the final prototype
Collaboration

Collaborating with other specialists helped me design better and faster. Receiving feedback from the professionals at Arise, including medical doctors and therapists helped me incorporate knowledge that would have taken me weeks to find in books.

Similarly, enlisting the help of my friends with expert sewing skills enabled me to make a final product of much higher quality than would have been possible on my own. Because this project encapsulated so many different areas of specialty, collaboration became a necessity. The role of design was to understand what questions to ask, where to ask them, and how to arrange all the answers.
Final solution

- base with removable pads
- saddle and base assembly
- inserts to dampen movement of saddle
Design features

Modular Pads

designed as a removable component that pops in and out of a standardized base, these pads can be easily tailored to fit individual horses. Because they are low cost and easily modified, each horse can have their own set of pads, allowing one saddle to fit them all. This reduces equipment costs for the barn because fewer saddles are needed.

Adjustable Girth

A girth is a strap that wraps around the horse's stomach to hold the saddle on. Each horse has a different shaped stomach and sometimes a girth will connect to a saddle in a way that keeps it from fitting the horse well. Because therapy saddles are used on many different horses throughout a day, I used a girth attachment that is adjustable to many different horses.
**Removable knee pads**
Therapists at Arise requested a saddle with knee pads that were removable. They desired a way to help their clients keep good sitting posture. Different sized inserts would allow the therapists to add or subtract padding to correctly position the rider’s leg.

<table>
<thead>
<tr>
<th>leg flap</th>
<th>knee pad insert</th>
<th>velcro holds knee pad in place</th>
</tr>
</thead>
</table>

**Movement Dampers**
The swinging three-dimensional movement of the horse simulates walking for wheelchair bound riders. The center split in this saddle is designed to enhance that movement. Beginners may not have the muscle tone necessary to ride this type of saddle, so a series of dampers where created to smooth out the ride.

<table>
<thead>
<tr>
<th>no damper</th>
<th>medium flexibility damper</th>
<th>very stiff damper</th>
</tr>
</thead>
</table>
Final field test at Arise Inc.

"Excellent effort. Very few saddles exists for therapeutic riding, we can really use it."

- Doctor Marshall, veterinarian and donator of Arise Farm facilities
History of therapy saddles

past >

present >

future >
Chairs that move concept sketches
Future

Through this project I have learned that the three-dimensional swinging-gait of a horse can provide tangible health benefits for its rider. I would like to apply this concept of “healthy seating” to office chairs because they seem to be the source of many medical problems including back pain, muscle atrophy and poor circulation. As evidenced by the popular Aeron Chair®, Leap chair®, and Evo Chair®, the focus of current furniture designers seems to be on seating that provides health benefits through movement. The lessons I have learned from hippotherapy seem to directly apply.

In a lecture hosted by the Syracuse Center for Excellence, I got a chance to hear Franko Lagato speak. He is the new Vice President of Design Exploration and Development at Herman Miller, a major furniture manufacturer. His lecture was about taking the principles of nature and applying them to our design problems. Time did not permit me to speak to him about the natural principles of equine movement and their related health benefits for the seated person, but it seemed to be consistent with his vision of the future for Herman Miller. Mr. Lagato is opening a door for the core concepts of this project to enter the mass market and benefit a population far greater than those who participate in adaptive riding. The possibility of helping thousands of people become healthier at their desk excites me and I thank the honors department for allowing me to start that process.
Sources Cited


Appendices