IUSM Department of Pediatrics

Pedal Power: An Operations Manual for Identifying and Securing Bikes, Teaching Bike Safety, and Evaluating Rehabilitation Progress for Children with Disabilities

Safety Education and Outreach

Developed by
The Safety Education and Outreach Department
Indiana University School of Medicine
in collaboration with
The Indiana District of Kiwanis International
Clarian Health Rehabilitation Services
The Indiana University School of Health and Rehabilitation Science
Occupational Therapy Department

Table of Contents

Introduction

There are few things that matter more in the life of any child than the chance to ride a bike. To ride a bike means everything: freedom, independence, ability to do something on one's own, and a chance to explore the world. How wonderful it is for every child to reach this milestone. All of us can remember the first time we rode a bike.

But many children never get that chance. Many children, because of special health care needs or disabilities, are not able to use conventional bikes and adapted bikes are out of reach possibilities, given the high cost of this equipment. And, for all of our efforts at Riley Hospital to provide children with the best of care to be able to return home, without the ability to fully participate in their community, we have not completed the job.

Adapted bikes are a very tangible step that can be taken to help put children with disabilities or special health care needs out into everyday life with friends and family. Why should a child who has left our hospital return home to sit on the porch to watch others ride by? This is the promise that Riley Hospital for Children tries to fulfill to every family, the promise of a life that is healthy, safe, and productive. Children with disabilities or special health care needs sometimes need tools to accomplish that goal and adapted bikes are a perfect vehicle for cultivating within a child independence, pride, control over one's life, friendships, and courage to explore new places. Yes, riding a bike can do that for *every* child. What a small investment indeed to transform a child's life into growth and possibilities.

When you read this operations manual, read it with the understanding that Riley Hospital's Adapted Bike Safety Program was built with one goal: to keep *all kids safe*. Our hospital's injury prevention programming through the Safety Education and Outreach Department (formerly Community Education and Child Advocacy Department) recognizes that injury prevention education is for all children. Sometimes, in the case of children with special health care needs or disabilities, you need to take one additional step beyond promoting a safety message; sometimes, you need to get the equipment directly into the child's hands.

We are forever grateful to our partners at the Indiana District of Kiwanis International and the Riley Children's Foundation who have nurtured the development of this program since its beginning. We are grateful to private donors who have believed in this program and through their support, made it possible for us to give children their first bike and helmet ever. We are grateful to our partners inside Riley Hospital, our colleagues at Rehabilitation Services and Clinical Engineering, who have helped us to identify children and who have assembled the bikes for kids ready and eager to ride and to our colleagues at the Indiana University School of Health and Rehabilitation Science's Occupational Therapy Department, long-standing friends and advocates for this work.

This operations manual can get you started in your community to offer an Adapted Bike Safety Program for children who would otherwise not have the chance. Some things in life always remain the same and the chance to ride a bike—properly and safely, of course—will always be an opportunity that should await every child.

Ora Hirsch Pescovitz, M.D.
President and Chief Executive Officer
Riley Hospital for Children

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Many people worked together to develop the Adapted Bike Project at Riley Hospital for Children. Their ideas, suggestions, valued support, and beliefs that all children should enjoy the opportunity to ride a bicycle are reflected in this manual. We thank all of them for their special roles in this project and for their continuing commitment to this work. Rebecca Waterman and Michael Graham were lead writers on this manual.

Community Education and Child Advocacy Department, Riley Hospital for Children
Kentin Gearhart, Michael Graham, Linda Hankins, Matt Iwamoto, Karen Stroup, Rebecca Waterman, Cheryl Wisdom

Riley Hospital for Children
Don Bledsoe, Tim Brei, Marilyn Bull, Connie Buran, Debbie Carter, Shelly Johnson, Kosmos Kayes, Gary Miller, Richard Schreiner, Maureen Schultz, Angie Tomlin

Department of Neurological Surgery, Indiana University School of Medicine
Richard Friedman

Occupational Therapy Department, School of Health and Rehabilitation Science, Indiana University
Janet Stout Everly, Cel Hamant, Thomas Fisher, Robin Janson

Riley Children's Foundation
Robert Baxter, Omer Faust, Kevin O'Keefe

Physical Education Department, Indiana University
Rafael Bahamonde, Katie Stanton

National Highway Traffic Administration
Cheryl Neverman

Indiana District of Kiwanis International
Marge Crouch, Thomas Dunham, Glen Hootman, James Redslob, Lonnie Steele, Dennis Yoder

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CHAPTER 1

A bike of my very own

Remember when you rode your bike for the very first time? Remember the feeling of new freedom and pedaling to move faster than ever before, and knowing *you* could decide when and where to go? That first ride, that first bike always will remain as one of the first steps in the life of any child toward independence.

But for many children with disabilities or special health care needs, riding a bike is an experience that is denied when conventional bikes cannot be used. For many families of children with disabilities or special health care needs, the cost of adapted bikes makes purchase impossible. Third party payers or insurance companies cannot make purchase of an adapted bike a reimbursement priority without a body of research that supports the value of this equipment as a part of a child's rehabilitation.

Unfortunately, little research currently exists that shows the physical and emotional gains that can be achieved by a child with disabilities or special health care needs who has a bike. At the same time, few resources are available in this country to teach children with disabilities or special health care needs about bike safety. Is bicycling only for children who are able-bodied? Do only children who are able-bodied get injured?

All children can enjoy the bicycling experience. And all children can learn how to prevent injuries and to be safe. At the Safety Education and Outreach Department of the Indiana University School of Medicine, research has been made possible through a grant award, from the National Highway Traffic Safety Administration, the Indiana District of Kiwanis International, and The Riley Children's Foundation to learn about the impact use of adapted bikes has on rehabilitation progress of children with special health care needs or disabilities. Through separate collaborations with the Indiana University School of Physical Education's Adaptive Mobility Department, and the Pediatric Rehabilitation Services Department of Clarian Health Systems, 40 children with special needs have participated in two different studies that have measured whether gains in self-esteem, strength, and physical function occur as a result of regular riding of an adapted bike.

Purpose of this manual

The primary intent of this manual is to encourage the connecting of adapted bikes to children with disabilities who are not able to use conventional bikes. Adapted bikes provide a much needed vehicle for helping children with disabilities associate with their peers, learn social skills, build self-esteem, and confidence in physical abilities. This manual introduces professionals to a program model for integrating adapted bicycles into a rehabilitation center, school or children's hospital setting.

Fundamental to the development of any program model for delivery of adapted bikes is an unwavering commitment to the basics in bike safety for all children: 1) bikes should be properly fitted to the needs of each child; and 2) all children require instruction that enhances skills at bike control and knowledge of bike and traffic safety.

All children can and should enjoy the bike riding experience with their friends and family. This manual provides a pathway for program development in appropriate settings where children and their families can access adapted bikes, information, and education to reach this goal.

CHAPTER 2

Pedal Power program history

The Safety Education and Outreach Department at Riley Hospital for Children has encouraged bike safety classes since 1995. The Racing for Safety program provides a resource guide to educators statewide who are interested in planning and presenting bike and pedestrian safety courses. This program received national recognition in 1997 from the Secretary of Transportation's Community Partnership Awards Program and was commended for connecting with many partners across the state to teach bike safety at the local level. But the program was not yet complete, since its focus at that time was only on reaching children who are able-bodied.

The idea for the adapted bike project began from a conversation that took place between a parent of a child with special needs and a staff member at the Safety Education and Outreach Department. The parent stated that although her daughter had made improvements through occupational and physical therapy treatments, the child was not included in bike riding with the other children in the neighborhood during the summer. Subsequently, the child spent much of the summer sitting on the porch by herself. Department staff began to think, "How could we create a situation where we can provide children with special needs an opportunity to be involved in bike riding with children who are able-bodied?" The answer: adapted bikes.

The first step was to research what type of adapted bikes were available to meet the needs of children with special needs. Most children who are unable to ride a bike cannot do so because of disabilities in their upper extremities, lower extremities, or a combination of the two. Other children cannot ride because of postural, visual or cognitive disabilities. The research resulted in a list of companies that specialize in providing adapted bikes that help children with disabilities ride bikes. Please visit racingforsafety.pediatrics.iu.edu to download this list of resources, which is updated periodically.

Although the research found that there are many companies that specialize in producing adapted bikes, these bikes typically are very expensive. The range in price typically is $1,500 to $2,000. Through conversations with parents of children with special needs, it was clear that few of these children had their own adapted bike. Some of these caregivers were not even aware that these bikes existed; others knew of the bikes, but could not afford them. One way to obtain these bikes is through insurance providers. But to do this, the physical and emotional benefits of adapted bikes would have to be documented. Unless we could get insurance reimbursement by documenting the physical and emotional benefits gained through bike riding, many of these families would not likely be able to own an adapted bike. A grant award from the National Highway Traffic Safety Administration and the Indiana District of Kiwanis International made it possible for us to

develop a study to examine the physical and psychological effects that these bikes have on the children, while also teaching them how to ride safely.

For this study, 10 children with cerebral palsy were recruited who had never ridden a bike. Participants were children between 7 and 16 years old. All but one child was at the functional cognitive level above age 7 years. Most of the children had the clinical diagnosis of spastic diplegia.

The 10 children agreed to participate in a nine-month study (February to October 1999). From the beginning, each child realized the incredible opportunity that he or she was given by participating in our study. One child summed it up best when he excitedly stated, "I have waited my whole life for this day!"

To validate data, functional tests were administered by researchers from the Indiana University School of Physical Education, who specialize in Adapted Physical Education. Initial, midpoint, and final tests of functional tasks, strength and self-esteem of each participant were recorded. In addition, the participants were required to ride their bike a minimum of 30 minutes three times a week during the study. Each week, participants filled out data collection sheets that documented the number of times and days that the child rode his or her bike.

After the comprehensive tests were administered, each child received his or her bike. Before the children were allowed to take their bikes home, they were required to attend a bike safety day. To enhance each child's safety it was imperative that the study participants learn bike safety. Studies show stark consequences for bike riders who are uninformed: Fewer than half of children ages 5 to 14 wear helmets when participating in any wheeled activities and more than a third of children who use helmets wear them improperly. Nearly half of children ages 14 and under hospitalized for bike-related injuries have traumatic brain injuries. It is estimated that 75% of fatal head injuries among child bicyclists could be prevented by the rider wearing a bike helmet. Wearing a bike helmet reduces the risk of head injury by 85% and the risk of brain injury by as much as 88% (Safe Kids Worldwide: "Facts about injuries to children riding bicycles," 2006).

All study participants, accompanied by their family and friends, attended the bike safety day. Each child was fitted with a helmet and instructed that it must be worn every time the child rides. In addition to helmets, the children were given a bell or horn, a water bottle, and pamphlets on safety information. The children learned about the importance of obeying street signs and how to use hand signals while riding. Props, such as a Jell-O mold of the brain, were used to show how fragile the brain is and why it must be protected.

Finally, the children with their families received their new bikes and proceeded outside to practice the skills that they had just learned. For the families and everyone involved, this was a special day to witness ten children experience an activity that all children

enjoy but has never before been available to them, bike riding! Family members were able to share a special moment, as this was the first time that they were able to ride bikes together!

The children continued to ride their bikes through the summer. Riding logs were completed by families to track bike use and document events while using the bikes. A home visit was completed at the beginning of the summer to check bike safety and maintenance. Physical and emotional gains continued to be measured during the riding period. The children participated in the continued testing until October 1999. *The original study proposal can be found in Appendix A.*

Grants and financial support

There are several areas to consider when seeking financial support for an adapted bike project like Pedal Power, or obtaining an adapted bike for a child.

To develop a program or study, both public/government and private institutions have monies available for research and philanthropic ventures. Some institutions to consider when looking for funding are large companies (both national and regional), hospitals, private foundations (i.e. Allstate Foundation, Ronald McDonald House Charities, Lowe's Home Safety Council, etc.), major employers in the local area, and service organizations (i.e. Kiwanis Clubs, the Lion's Club, Boy/Girl Scouts, etc.). Most of these institutions list grant funding on the Internet and in literary publications. Consult a library in your area for assistance with these searches.

Regional or national institutions typically fund research studies versus funding the purchase of an adapted bike for individual purposes. If your goal is to fund a bike for an individual child, local resources are a better source i.e. local churches, civic groups (i.e. Kiwanis, Boy/Girl Scouts, Lion's Club), or businesses. If you live near a university, college fraternities and sororities do fund raising and may be a source of financial support for obtaining bikes. Also, consider foundations such as the First Hand Foundation (www.firsthandfoundation.org) to support purchase of adapted bikes for individual children.

When contacting organizations for funding, a phone call is the first step. Most organizations will request further information, such as a letter of inquiry. If you are applying for a grant, follow the instructions on the grant application. Each grant contains a list of the criteria or requirements for eligibility. Depending on the particular grant, criteria range from specific to more general requirements. When attempting to obtain funding for an individual child, a letter describing why your child would benefit from the bike could be written by the parent and child. In addition, letters of support from the doctor or therapist could be added. Mark Schmeler wrote an article titled *Strategies in Documenting the Need for Assistive Technology: An Analysis of Documentation Procedures* (Technology Special Interest Section Quarterly, Vol. 7(3), September 1997, Published by the American Occupational Therapy Association, Inc.). This article could be a good guide for writing a letter of support. If the organization sponsoring the grant agrees, bring your child in for a meeting and have the child explain why he would like the bike. In addition, several templates for letters that have been prepared by therapists and/or families to approach local groups for funding are included as reference in the Appendix. Be creative!

Timeline for an adapted bike project

Depending on guidelines of your organization and funding organizations, your research proposal and grant funding need to be in place prior to the start of the project.

January
- Meet with research partners to plan dates.
- Prepare data collection sheets.
- Recruit study participants.

February
- Continue to prepare for study.
- Set testing dates.
- Plan bike safety day.

March
- Complete initial testing.
- Fit children for bikes.
- Order bikes.

April
- Complete 2nd testing.
- Hold bike safety day.
- Child begins riding at home.

May
- Complete home visit.

June
- Child riding at home.
- Make phone calls to remind families about riding logs.
- Set-up 3rd testing.

July
- Complete 3rd testing.

August
- Make phone calls to remind families about riding logs.

September
- Set-up final testing.

October
- Final testing.

November, December
- Analyze data.
- Write reports.

Identifying consultation partners

There are two separate but equally important goals to accomplish when obtaining consulting partners for an adapted bike project: 1) establishing research partners, and 2) monitoring the child's progress throughout the study to ensure safety and collection of valid data.

Research partners may be found at facilities that treat large caseloads of pediatric patients. These professions look to add research data to their respective fields and to learn new techniques for treating their patients. Validation of treatment has become more important as insurance companies strive for cost saving measures. Insurance companies require techniques or interventions that have been tested and validated as their criteria for reimbursement.

If the hospital has an affiliation with a university, there may exist a separate research laboratory. These research laboratories have access to the equipment needed to perform tests on children and are knowledgeable about conducting research studies. These facilities conduct research on a wide variety of topics and can provide support for establishing a research study. If the research laboratory is not a separate department, then the Occupational Therapy, Physical Therapy, or Physical Education Departments of universities or large hospitals often have the equipment and experience needed to complete the study.

For monitoring the child's progress throughout the study to ensure safety and collection of valid data, various topics need to be addressed when establishing this study. The child's health needs to be assessed before, during, and after the study; she needs to be taught bike safety; her physical abilities need to be recorded and monitored; and self-esteem tests need to be administered. Therefore, medical doctors, safety educators, physical education experts, psychological services, and rehabilitation professionals (occupational and physical therapists) are recommended partners for a study.

If a facility does not want to run a research study the partners listed below could still help to organize and select bikes for children participating in a project.

The child's **pediatrician or family doctor** needs to be involved in every step of the process. The medical doctor needs to approve of the child's participation in bike riding. The physician is also able to monitor all aspects of the child's health and is an excellent for the child's medical history.

Safety educators are needed to instruct the children on riding safely. Since the participants in the study may have no previous experience with bike riding, it is imperative that the children are taught bike safety. Emphasizing the use of helmets and pads needs to start at the beginning of the study. Since studies have indicated that an estimated 75%

of bike injuries are preventable (National Safe Kids Campaign, 12/98), education is the key to ensuring that these adapted bikes are used properly and safely. There are several resources for organizing bike safety courses. Local schools, hospitals, or youth organizations may have bike rodeo courses that teach riders the rules of the road. To obtain a copy of the Riley Racing for Safety course guide and other related materials for setting up a bike safety course for all children, including children with special needs, contact the Safety Education and Outreach Department or go to the website racingforsafety.pediatrics.iu.edu.

In addition, local police officials may be helpful in organizing a bike education course or speaking to the study participants on the various aspects of bike safety. Police officials should be consulted about what steps the families can take to minimize the possibility that the bikes will be stolen.

Physical education personnel are experts in the area of assessing and collecting data on a child's physical abilities. They are knowledgeable on the use of the equipment and the administration of tests that determine the physical abilities of the children.

Psychological services can assist in selecting self-esteem tests to be administered to the children. Since most tests have been developed for children who are able-bodied, special considerations may need to be made to collect valid data.

And finally, **rehabilitation services (occupational and physical therapists)** are needed to monitor the child for the duration of the study. Occupational and physical therapists work closely with children who have disabilities. Occupational therapists assist a child in functioning within his or her environment. They specialize in adapting the child's environment to fit her needs and in maximizing the child's abilities. They also are trained to administer and monitor self-esteem tests. Physical therapists work with the child to improve overall strength and gait. They specialize in determining the types of ambulatory assistive devices needed for the child.

CHAPTER 3

Data Collection

After research partners have been identified, methods for collecting data need to be determined. The following is a guide on how to duplicate the testing measures used in one study carried out by IUSM's Safety Education and Outreach Department and the Indiana University School of Physical Education's Adapted Mobility Department to evaluate the rehabilitation progress of children with cerebral palsy receiving an adapted bike. Before any testing began each child participated in a physical.

Testing measured the following specific areas:

1. Anthropometric data was collected, including height, weight, and skin fold measures.
    - Height and weight were measured using a standard scale. These measurements were also helpful when fitting and ordering a bike.
    - Skin fold was measured using Lange skin fold calipers. The measurements were taken on the arm, waist, and thigh.

2. The child participated in three functional tasks measuring heart rate. These functional tasks examined the child's mobility and simulated various aspects of transferring. Heart rate was monitored continuously throughout the functional tests using a Polar Vantage XL Heart Rate Monitor (Polar CIC, Inc. Port Washington, NY).
    a) The first task was transferring from a chair to the floor.
        - A chair with arms was placed on a mat. The child was asked to move from the chair, touch his head on the mat, then sit up in the chair again. The time this action required was marked and heart rate before and after the task was recorded.
        - This task was performed three times.
    b) The second task was transferring from chair to chair.
        - Two chairs were set, creating a 90 degree angle. Both chairs had arms. The child was asked to move from chair A to chair B. The time to carry out this movement was marked and heart rate before and after the task was recorded.
        - This task was performed three times. The second time the child went from Chair B to A. The third time from chair A to B.
        - **Suggested change when testing the child's transfers.** Have the child go from chair to chair three times in the same direction (i.e. from left to right three times, then right to left three times). This will ensure consistency when gathering the data and minimize confounding factors such as mild hemiplegia.
    c) The third task consisted of the child climbing a flight of stairs.

- The child was asked to climb one standard flight of stairs. The time required for the child to climb to the top was recorded.
- The child was allowed to use the railing. If they needed trunk support for poor balance, a spotter gave it. The spotter did not help the child lift her legs or move up the stairs.
- If a child could not climb all the stairs, the number of stairs the child could climb was noted.

3. A 2D-Gait Analysis was used to measure quality of walking patterns.
    - This measurement shows hip, knee, and ankle movement, which determines the muscle groups being used during the walking cycle. The gait analysis can reveal whether or not the child's participation in the bike project has caused any changes in the child's walking pattern.
    - If possible, using a 3D-gait analysis is recommended so that deviations in the child's gait pattern can be seen more clearly. Cerebral palsy affected each child differently and the 2D-gait analysis was not able to fully capture changes in gait patterns occurring during the course of the project.

4. A sub-maximal bike test.
    - This test measures heart rate recovery. The child was asked to ride a bike for two minutes non-stop. At the completion of two minutes, the child stopped and heart rate was recorded. After waiting one minute, the heart rate was recorded again.

5. Lower extremity strength was measured using a Kin-Com (Chattex Corp., Chattanooga, TN) isokinetic dynamometer.
    - Flexion and extension in the knee were measured.

6. Upper extremity strength was measured by pushing weights with a focus on elbow flexion and extension using a dip weight machine.

7. Self-esteem was measured.
    - The Pierce-Harris Self-concept Scale was administered orally to all participants. *A copy can be obtained from Western Psychological Services, 1-800-648-8857.*
    - The parent was given a parental report questionnaire on his perceptions of the child's self-esteem.
    - A questionnaire was used to ask the children additional topics related to self-esteem.

To complete the seven steps of our evaluations, the evaluation took approximately two hours. We found that over 100 hours were needed for data collection alone. Time also needs to be allotted for study design and development, analysis, scheduling, writing notes and documentation.

Bike riding logs

For this study, participants were required to ride their bikes 30 minutes three times a week. We chose to make two-week calendars that the participants filled out and mailed back bi-monthly. The participants were asked to mark in minutes on the days they rode their bikes. In addition, an area at the bottom was made for additional comments with the statement, "We want to know about experiences you have had with the bike. Please tell us in the space below." Since this area was not directed toward specific questions, many were left blank and information we wanted was left out.

To improve the response on the riding logs, we suggest questions be added to elicit the following information:

- Health problems that the child has had (i.e. changes in medication, recent illnesses, and injuries of any kind, especially those resulting from using the adapted bike).
- Problems with bike craftsmanship and general wear and tear on the bike.
- Problems with safety equipment such as helmets (i.e. fit, craftsmanship, etc.)
- Crash information, including the severity of the crash, the number of crashes that the child has had, if the helmet helped to prevent injury, if child needed medical attention, if the crash damaged the pads and helmet. *Example found in Appendix G.*
- Any event that took place at school or home that might have an effect on the child's mood or behavior, such as a death of a family member or friend, motor vehicle crash, witness to violent activity, family problems, etc.

Home evaluation

A home evaluation gives necessary feedback to researchers. It allows the researcher to check the fit of the bike and make note of necessary changes. It also provides an opportunity to check if the child is practicing safe riding skills and offers the researcher an opportunity to reinforce safe riding in the home environment. A checklist of safety issues assists the researcher in determining the level of safety in the riding area.

For our study, we completed a home evaluation two weeks after the child received the bike. Although we did not perform any additional evaluations, we recommend that another home evaluation be conducted at the six-week mark. Besides presenting the researchers with another opportunity to spot potential problems with the bike or rider, this evaluation will assist in conveying the importance of the project because it takes place at a time when the novelty of the bike begins to wear off. Taking this extra time to reiterate the requirements of the study can prevent problems from occurring, enhance the relationship between the study participants and the researchers, and encourage optimum participation in the study.

Additional form for future assessment

Create a form that asks the parents and teachers specific questions about the child's use of ambulatory assistive devices or wheelchair before the bike project. Include in the questionnaire assistance necessary to transfer, maximum distance that the child can walk with and without assistive devices, the child's endurance when walking (maximum time that the child can walk), and time that is spent in a wheelchair. These questions should be asked at each reevaluation and at the end of the study to produce more data on how the bike has influenced the child's mobility.

Identifying study participants

For our study, we recruited children with Cerebral Palsy; however any group of children with similar disabilities could be used to conduct a study. For example, individuals with Spina Bifida, traumatic brain injury, or spinal cord injury, would be excellent candidates for study participation.

To find participants, there are several different sources that can be used. Hospitals may be contacted for information on potential candidates. If you know what population of children you want to deal with talk to the appropriate hospital department. Contacting support groups for parents of children with disabilities is another option. Most support groups have Internet web sites; therefore, performing an Internet search will produce a listing of support groups for children with particular conditions. Many parents of children with disabilities look for ways that their child can become more active and increase interactions with peers. The study can provide the families with an opportunity to assist both parent and child.

Once participants have been identified, a researcher needs to thoroughly explain the requirements of the study to the family. The researcher needs to ask the necessary questions to determine if the child is able to participate in the study. Since the study will cover nine months, the child will be in school for at least a portion of that time. We found that some of our participants were in extracurricular activities, which reduced the days that the child had available to schedule for an evaluation. Communicating clearly to the parents the requirements and expectations of the study is imperative. The study is time consuming, but preparing the family by informing them of what the demands are during busier times of the year will be helpful. To reinforce the commitment, written material should be given to the family and a consent form should be signed before the study begins.

When creating partnerships with the families, the highest priority is to establish a clear line of communication. It is important to remember how busy the family of a child with

disabilities is in meeting the needs of the child. Therefore, the provider of the bike must take the initiative to contact the parents to keep the line of communication working. Writing a letter about two weeks in advance and placing a phone call a few days before the scheduled visit is the most efficient way to communicate when reminding parents of evaluation appointments. Although these measures are time consuming, the time needed for them pales in comparison to missed evaluations and rescheduling appointments.

Researchers should also take the time to get to know each family. Some of these children may be from single parent homes, while in other cases the child may live with grandparents. Knowing who attends to the child and speaking directly to them is one way to avoid miscommunication.

The researchers need to check state laws, which govern child abuse, because it is possible that a child may reveal incidents of potential child abuse during evaluations. To learn the proper way to handle reports of abuse in your state, contact the state's Division of Family and Children or the department of medical social work if you are affiliated with a hospital. There should be clear guidelines for each researcher to follow how these reports should be handled.

Selecting an appropriate bike

There are two major steps in determining the appropriate bike for the child. The first is consultations and the second is proper selection.

Consultations necessary before purchasing an adapted bike
Before purchasing a bike for an individual child, several consultations should be obtained.

1. Consult the family physician. The doctor needs to examine the child and approve the child's participation in bike riding. The doctor will also be able to monitor physical and emotional changes resulting from riding the bike.

2. Consult an occupational or physical therapist. These professionals have the knowledge to select a bike that will fit a child. In addition, these professionals can monitor physical and emotional changes and are able to incorporate the benefits of bike riding into the child's every day activities. The therapist must determine if the child's current rehabilitation status allows him to participate in bike riding. Be sure to take this information with you when discussing a bike for a child.

3. If the child wears leg braces, it is important to schedule an appointment with the child's leg brace provider, most likely an orthotist, physical or occupational therapist. These appointments are to ensure that wearing the braces while bike

riding is not causing any physical problems or discomfort to the child. This should be done before and after receiving the bike.

Once consultations are complete, a determination on the appropriate bike can be made.

Selecting an adapted bike

For most children who cannot ride a two-wheel bike, the best option is to purchase a three-wheel bike. From a basic three-wheel design, many options can then be added to fit each child's needs.

Upper extremity challenges: Hand straps for assistance while holding onto the handlebars and larger handlebars are two options for these challenges. Both adaptations assist the child with maintaining his grasp.

Lower extremity challenges: Foot straps or foot platforms can be added to a bike to hold the foot in place and assist with pedaling. Abductor wedges are available. This wedge is attached to the bike between the child's legs and assists the child in maintaining proper leg alignment. Tricycles also are built for persons who are not able to use leg motion but are able to use arm motion to propel the bike. The arm cycles can be propelled using a circular or a rowing motion.

Combination of upper and lower extremity challenges: For these children, models are created that incorporate both the hands and the feet in pedaling. Like the other cycles, these hand-powered cycles can add trunk and foot support.

Poor postural control: To aid in a child's sitting balance, a trunk support brace can be added to the bike. Safety belts also can be added to assist the child in maintaining balance and proper positioning. A padded head brace is available for a child with poor head control.

Visual or cognitive challenges: Tandem bikes (an extended bike in which one rider rides behind another) are one option. These bikes allow a person who is able bodied to ride with a child who has challenges to ensure that the child steers safely. Side by side bikes also provide options for persons who have one or more of the challenges mentioned above. These models give the child more steering control, which allows her to participate physically at a higher level of control.

If a person cannot ride a bike at all, there are options available to include the person in bike riding. One such cycle attaches to a wheel chair and allows the child to join others in a bike ride. Other options are pull behind carts, which are available in all sizes to include everyone in bike riding. These are hitched to a bike and allow the child to be pulled in a miniature trailer. Persons riding in tandem also need to wear a helmet.

For our study:

Six of the 10 children were fitted for a Rifton tricycle. All six of the children needed foot and trunk support. Four of the children required an abductor wedge. The bikes ranged in prices from $620 to $1,050.

Two of the children received Triaid TMX cycles. One simply required a strap to hold his feet in place, while the other required minimum trunk support and increased foot support. The bikes cost $857 to $942.

The remaining two children received a tricycle by Trailmate. Foot pedals with one strap were added to both bikes to assist the children in keeping their feet on the pedals. The bike cost $449.

These are just a sample of the types of bikes available today that can be adapted to meet the needs that the child may have. There are several resources that can be used to obtain the proper adapted bike to meet the individual child's needs:

1. There are national and local companies that specialize in their production. Using the attached bike company list, an individual can request catalogs, free of charge, for bikes of interest.

2. The best resource to select a bike for a child is the occupational or physical therapist. They can size bikes and recommend adaptations. However, since adapted bikes are a new product, many therapists may not be aware of the many bikes available commercially. By bringing the list to their attention and ordering catalogs, they will have the skills necessary to help you select a bike for your child.

3. Visit local bike shops. Local bike shops may have some models of bikes available. They also can size the bike that is appropriate for the child, and make minor adaptations. These stores also sell the necessary safety equipment that the child needs to minimize injuries from crashes.

CHAPTER 4

Safety education for children

Before any child begins riding a bike, it is important to invest time in the development of an understanding of bike care, control, and safety basics. All children, with and without special needs, require opportunities to develop and practice bicycling skills. A child with special needs may require additional time, repetition, and creativity to teach safety skills and information.

For our project, we provided each child with an adapted bike and a helmet that was fit appropriately to each child. The helmet is a necessary piece of equipment if a study is to be duplicated. Eight of the children in this study fell off their bikes and hit their heads. The children attended a bike safety day that was adapted to meet any special needs. If the child was unable to learn the correct rules, an adult was taught the safety rules so they could supervise the child.

Safety educators also should discuss loss prevention since the bikes are costly. Each bike needs to be registered with local police departments in case it is stolen. The serial number of the bike needs to be recorded and the child's name should be engraved on the bike. The parent's homeowners' insurance company should be contacted to see if the bike is covered in the event that it is damaged and/or stolen.

The following guidelines are meant to help program specialists to work with persons who have various disabilities. It is natural to be apprehensive when working with a person with a disability but one should never let that fear affect the relationship.

General guidelines:

1. Discuss with the person who you are helping what accommodations have helped in the past and/or are needed.
2. Allow extra time, if necessary, to learn new information and master skills.
3. Prevent distractions in the area you are working.
4. Give plenty of opportunities to practice skills.

Mental impairments:

1. Break tasks into smaller parts of help the person break them into smaller parts.
2. Help establish a mentor to guide the individual and provide assistance when needed. This person could be a peer who also is experiencing the activity.
3. Teach lessons in smaller parts and allow many opportunities for clarification.
4. Keep verbal directions clear and concise.
5. Be aware that attention span may be decreased, so change activities frequently.

Physical or Motor impairments:

1. Make sure the environment you are working in is accessible to the person. (ADA guidelines require no stairs, doors 32" wide, table height 27-34", pathways 36" wide, accessible restrooms)
2. Minimize the quantity of time required for moving around.
3. Sit at eye level if a longer conversation will take place.
4. Encourage participants to do as much as possible independently.

Hearing impairments:

1. Speak audibly, clearly, and at a slow to normal pace. Be careful not to talk too slow and don't exaggerate your speech.
2. Offer the person a seat near the front of the room.
3. Speak facing the person or class.
4. Make sure the area is well lighted.
5. Increase demonstrations by using pictures, charts, and role-playing.
6. Speak directly to the person and *not* to the interpreter, if present.
7. Provide written material as a supplement.

Visual impairments:

1. Have large print material available.
2. Give most of the information through oral communication.
3. Make sure the area is well lighted.
4. Give the person an orientation to the environment. This can be done verbally or through a tour of the room.
5. Be aware of hazards that will block a person's traveling area.
6. Offer the person a seat in the front of the room.

Speech impairments:

1. Speak in your normal manner.
2. Avoid finishing phrases for the person.
3. Ask the person to repeat what you do not understand and admit if you do not understand.
4. Patiently wait for the person to communicate with you.
5. Accept and respond to all appropriate attempts at communication.
6. Be alert to gestures and facial expressions.

Conclusions

Where do we go from here?

This study sought to contribute a new base of knowledge that supports methods for measuring rehabilitation progress and development of interventions that build strength and functional abilities in persons with disabilities. Bike riding was the means to measure changes in functional abilities. Bike riding was chosen because little is known about how this activity can contribute to the social, physical, and emotional maturation of children with physical disabilities. And although the Adapted Bike Project has helped to contribute new information in a variety of fields, it must be noted that more research needs to be done on this topic so that we may fully understand the benefits of the use of adapted bikes for children with disabilities.

For the rehabilitation professionals (occupational and physical therapies), the study has taken the initial steps in developing functional ability tests. These tests can be used for the assessment of functional independence of individuals with Cerebral Palsy. Continued research is needed to develop similar tests to include other disabilities such as Spina Bifida and spinal cord injury and to include other aspects of functioning. The field of rehabilitation will also will gain new information about how alternative bikes can be a useful therapy tool. And this data will assist therapists seeking reimbursement from third party payers.

To further knowledge in the field of physical education, this study also sought to determine if there is a relationship between physical measures of upper body strength and body mass and the ability to perform these functional tasks. These results could lead to the development and assessment of strength training programs for individuals with Cerebral Palsy, which could enhance their functional independence.

The field of child injury prevention will gain new information that helps educators teach children with disabilities about bike safety. For years, injury prevention primarily has focused on children who are able-bodied and often overlooks children with disabilities. As children with disabilities become more involved in bike riding, it is important that the necessary steps are taken to reduce the possibility for injury resulting from bike crashes.

Although adaptive bikes are expensive, use of these bikes has the potential to lower healthcare costs by reducing the need for return visits to rehabilitation professionals. With the supervision of occupational or physical therapists, adapted bikes can be an important tool in the rehabilitation process. Preliminary data shows that all children completing the study have all made gains in strength, endurance, functional tasks, and self-esteem.

This project began with the idea that no child should be excluded from the opportunity to ride a bike. And at the conclusion of this study, our findings affirm, that by riding a

bike, children with disabilities are able to use this technology properly and safely to interact with family and friends in a meaningful manner and can make improvements in physical and emotional health.

This adapted bike project is just the first step in allowing children with disabilities the opportunity to participate in bike riding by providing them the same opportunity as children who are able-bodied. We hope that our study serves as a pilot for communities and organizations to replicate and add data to this topic. More research needs to be conducted to fully understand the benefits that children with disabilities may gain through the use of adapted bikes. In addition, as we move to include children with disabilities in bike riding, we must emphasize the importance of safety and the use of bike helmets. One of the many benefits of this study is that we have another opportunity to reiterate the steps that can be taken to make bike riding safe for all riders. This opportunity must be used to ensure that we as educators and researchers are making every effort to reduce the number of injuries and death that result from bike crashes.

We would like information from you on the usefulness of this manual and related research you are conducting.

Please contact us:

By Mail:
Safety Education and Outreach Department
705 Riley Hospital Drive Rm 1407B
Indianapolis, Indiana 46202

Email:
Kids1st@iu.edu

Website:
safetystore.iu.edu

By being made aware of other projects, research, products, and ideas, we can work together to ensure that all children have the opportunity to participate fully in their communities! Let us hear from you and work that you are doing to help all kids enjoy an active lifestyle and to keep all kids safe.

Updated 03/2017

Appendix A

Original study proposal

Principal Investigator: Rafael E. Bahamonde, Ph.D., Assistant Professor of Physical Education, School of Physical Education, Human Performance & Biomechanics Laboratory.

Principal Investigator: Marilyn J. Bull, M.D., Medical Director, Community Education and Child Advocacy Department, Riley Hospital for Children

Co-investigators: Katie Stanton, Ph.D., Assistant Professor of Physical Education, School of Physical Education, Adapted Physical Education Program

Alan Mikesky, Ph.D., Associate Professor of Physical Education, Director of Human Performance Laboratories, School of Physical Education.

Karen Bruner Stroup, Ph.D., Director, Community Education and Child Advocacy Department, Riley Hospital for Children

Rebecca Waterman, Special Projects Consultant, Community Education and Child Advocacy Department, Riley Hospital for Children

Kentin Gearhart, B.S., Project Manager, Community Education and Child Advocacy Department, Riley Hospital for Children

Purpose and rationale of the study

Cerebral Palsy (CP) is primarily a chronic neurological disorder of movement and posture caused by a lesion of the immature brain. CP affects approximately seven in every 1000 live births. The 1990 census figures for the U.S. estimated that about 1,250,000 Americans have CP (Sherrill, 1998). The severity of the disorder varies from mild to severe and affects in many cases the person's ability to ambulate. As a result, a variety of lower extremity conditions such as spasticity, athetosis, and other musculoskeletal impairment are present in these individuals which require them to use a wheelchair.

Riding bikes is a normal part of childhood. The bike riding experience provides social interaction, an outdoor activity, and physical exercise. Yet, little is known of how bikes can contribute to the social, physical, and emotional maturation of children with physical disabilities. The current knowledge base on bike riding and bike safety does not recognize application of this technology for children with disabilities and little is known of the contributions toward rehabilitation progress that can be made for children with disabilities who engage in bike riding.

A review of the medical, rehabilitation, and child injury prevention literature indicates that no studies have been conducted to evaluate the potential application of alternative bikes toward the rehabilitation progress of children with disabilities. One article was found that discussed a school bike safety education program for children with learning disabilities (Wineberg-Hutchinson & Fairbairn, 1997). The proposed research appears to represent an invaluable first step that can contribute to a national knowledge base for how children with disabilities can benefit from riding adapted bikes.

Increasing the functional ability of non-ambulatory individuals with Cerebral Palsy (CP) is imperative in order to achieve a more independent lifestyle. Many individuals with CP who use a wheelchair for mobility need full or partial assistance to perform activities of daily living (ADL). The need for assistance can be time consuming and frustrating for the individual, especially if they are seeking to increase their independence.

In groups such as the older adults and/or the arthritic population, valid and reliable functional tests have been developed to assess their improvement in ADL (Mikesky et al. 1996; Topp et al., 1996). Very little research has been done with the development of functional tests in the disabled population. The most common test used with individuals with disabilities is the Functional Independence Measure (FIM) for motor function items. Recent research by Dickson & Kohler (1996) has questioned the validity of this test since it uses a uni-dimensional interval scale to measure the functional ability of a person. According to Dickson & Kohler (1996), this unidimensional interval scale implies that if a person can perform the most difficult item on the scale, then that person can perform the easiest item. For the FIM motor items, this will mean that the ability to climb stairs will imply the ability to eat normally, which is not necessarily true.

The variety and degree of disabilities (e.g., spinal cord, spina bifida, cerebral palsy etc.) have prompted the development of functional tests specific to the disability. Janssen et al. (1994) used percentage of heart rate reserve (%HRR) to measure the physical strain of participants with spinal cord injury during ADL. Their results showed that transfers elicited a greater %HRR (bathtub to chair 39.8% and entering a car 45.9%). However, Janssen et al. (1994) made no attempt to measure the reliability of their standardized tests.

Due to the lack of research available in this area, an informal survey was conducted over the Internet (User-groups: Our-Kids) to determine the most common problems limiting the independence in a population of children who are non-ambulatory. The most frequently reported source of trouble was teaching their children how to transfer from the wheelchair to an adult-size toilet, getting in and out of the bathtub and getting in and out of the car. Parents also reported troubles with climbing playground equipment and difficulties putting on and taking off clothes. Although no studies have been conducted to determine the strength and abilities needed for transfers, Sherrill (1998) reported that efficient transfers are the result of arm and shoulder strength (Perry et al. 1996; Pentland & Twomey, 1995), trunk control, weight, and type of disability.

Although several tests have been used to assess functional ability (e.g., FIM), many of them are questionnaire and/or there is no data as to their reliability. Little or no research has been done in the area of measuring the strength and function needed to pursue independent movement of non-ambulatory individuals with CP. The optimal performance of these motions requires the individual to have a certain level of upper body strength. Also, the degree to which the strength levels and the severity of the disability affect these functional tasks is unknown. Therefore, there are several purposes of this study: first, to develop functional tests that could be used to assess the functional abilities of individuals with Cerebral Palsy; second, to determine if strength measures of the upper-body and body mass are related to the performance of these individuals in basic functional tasks; third, to determine through functional and self-esteem testing if the use of adapted bikes by children in the study improve social and physical functions.

Significance of the Study

This study will develop functional ability tests (currently not available) that could be used for the assessment of functional independence of individuals with Cerebral Palsy. Further, similar tests could later be developed to include other disabilities such as Spina Bifida and spinal cord injury.

Recent studies with individuals with cerebral palsy, spinal cord injury, and Down syndrome have suggested that gains in muscular strength can increase the mobility of these individuals (Damiano, 1996; Sayers et al., 1996; O'Connell & Barnhart, 1995; Rimmer & Kelly, 1991). However, nothing has been done to demonstrate carry over of strength gains to functional tasks. This study will also be used to determine if there is relationship between physical measures of upper body strength and body mass and the ability to perform these functional tasks. The results of this study could lead to the development and assessment of strength training programs for individuals with Cerebral Palsy, which could enhance their functional independence. Finally, this study will serve as evidence of the gains made by children using adapted bikes. Health care providers can use this research to stimulate development of adapted bike and safety education programs across the country.

Methods

Ten to 15 children from ages 8 to 18 will be identified by a multidisciplinary team, including Riley Hospital physicians, occupational therapists, physical therapists, nurses, and child injury prevention specialists. Children selected will have Cerebral Palsy, which makes riding of a conventional bicycle impossible. A check sheet developed by the multidisciplinary team will be used to assess bicycle-riding readiness of children to participate in this study. Before receiving an adaptive bicycle, children will complete self-esteem and physical assessments.

Children then will be involved in the process of selecting an appropriate adapted bicycle for their needs and preferences. With the arrival of the adapted bike, each child and an adult family member completes an orientation to proper use of the adapted bike. Before the child takes the bicycle home, the Community Education and Child Advocacy Department of Riley Hospital tests the children for knowledge on bicycle safety, ability to ride and control the bike, and maintenance.

At the beginning and end of the project medical student residents from Riley Hospital will complete a standard physical on the children in the study. This will be done to monitor the health of the child.

The Adapted Physical Education Department of Indiana University will perform physical testing by using the method that follows. The participants will be tested on one week for three separate days at approximately the same time of the day and later one, three, and six months after the first week of testing. Each testing days will be scheduled at least 48 hours apart. Strength measures of the upper and lower extremity will be performed using a Kin-Com (Chattex Corp., Chattanooga, TN) isokinetic dynamometer. Grip strength will be measured using a hand held dynamometer. Strength measures will be collected the second and the third day of testing of week one and at one, three, and six months. Body mass and skinfold measurements will be taken to determine the percent of body fat.

Heart rate response during the performance of the functional tasks will be monitored on a continuous basis using a Polar Vantage XL Heart rate Monitor (Polar CIC Inc., Port Washington, NY.). Ratings of Perceived Exertion (RPE) (ACSM, 1991) and heart rate will be used to monitor physical strain during the functional activities and during a sub-maximal bicycle fitness test. During this test, the participants will be asked to pedal a bicycle at a predetermined resistance for a period of three to five minutes. Heart rate response will be measured to determine the participant's fitness level.

The participants will be asked to walk three times across a 10 m walkway. While they walk, they will be filmed using video for a computer analysis of their walking patterns.

Three functional tasks or transfers will be performed: transfer from floor to the wheelchair, from chair to chair, and going up and down a set of stairs. Three trials of each

task will be performed with approximately two minute rest between trials. Prior to each task, the tester will explain the instructions for each task. The participants will be allowed to use the handrails if necessary, and the order of the tasks will be randomized. The time required to complete each of the functional tasks would be used as a measure of performance. A stopwatch will be used by the tester to time the participants from the start to the end of each trial.

Intraclass correlation between trials and repeated measures ANOVA techniques will be used to determine the reliability of the functional tests and the physical measures. Multiple correlation techniques will be used to find the relationships between the functional tasks and the measures of strength, age, percent of body mass, and degree of disability.

A self-esteem assessment scale will be given initially, at one month, three months and six months. The assessment scale is, “The Way I Feel About Myself,” (Piers-Harris Children’s Self-Concept Scale). In addition, several open-ended questions will be asked to specifically relate to bicycle riding. The results will be compared at the end of the study using statistical analysis.

In addition to physical and self-esteem testing, the child will receive training on use of the adapted bicycle and he/she will attend a three-hour safety training class. The safety education class is a version of the Community Education and Child Advocacy Department’s Safety Smart Class for bicycle riding. Two weeks after the child takes the bicycle home, a researcher will visit the child’s hometown to: 1) assess child’s neighborhood environment for safety and adaptability; 2) observe the child’s use of the adapted bike; and 3) assess the child’s practice of bike safety basics. Finally, after completion of the three-month and six-month follow-up, the children will be discharged from the study and the bicycles used will be given to the children for permanent ownership.

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Appendix **B**

All children in the program have a diagnosis of Cerebral Palsy. Below is a brief description of each child and his or her bike.

Leonard is an 11-year-old male. He loves to go outside but his poor balance inhibits his ability to keep up with other children. The first time he saw a picture of the bike he asked, "Where is the water bottle?" Leonard received a blue (In honor of the Indiana Pacers.) adult tricycle made by Trailmate. He had to have pedals placed on the bike that included a strap across the top. His bike cost $449.

Jenna is a 13-year-old female. One of the physical tests requires the children to transfer from the chair to the floor. Her mother told us that she could not do it. Her response was, "Leave me alone mom, I can do it." She was successful in transferring to the floor and her mother was surprised. Jenna received the largest Rifton tricycle with trunk support, foot straps and an abductor wedge. Her bike cost $1,050.

Marcus is a 7-year-old male. He was very reluctant to participate and did not seem interested in anything we were doing. His grandparents told it was difficult to get him to participate in therapy sessions. On the day his bike arrived, he became extremely excited. He was quite upset when it was time to get off the bike. Marcus received a blue TMX Tricycle made by Triaid. His bike looks very much like a boy's BMX bike. His bike included pedals with a strap across the top. His bike cost $857.

Olivia is an 11-year-old female. She walks with crutches and is very independent. On the day her bike arrived, she wore a purple outfit to match her new bike. Olivia received a purple adult tricycle made by Trailmate. She had to have pedals placed on the bike that included a strap across the top. Her bike cost $449.

John is a 10-year-old male. John is nonverbal and often does not interact with other children. At the bike safety day, he blended right in and rode with other children all around. His parents could not express how important this was for them. John received the largest Rifton tricycle with trunk support, foot straps, and a guide bar. His bike cost $1,001.

Isaac is an 8-year-old male. The first time we met him he said, "Guess what, I am getting a bike!" He had lots of trouble transferring and could not climb many stairs. Isaac used self-talk to encourage himself, "I can do this. I need to get the bike." The month we did not see him he practiced transfers on his own. His parents reported that they caught him kicking his legs in his wheelchair. When the parents asked what he was doing, he said, "Exercising for my bike." When he arrived at the bike safety training, he greeted us with this, "I have waited my whole life for this!" Isaac received the medium size Rifton Tricycle with trunk support and foot straps. His bike cost $695.

Clinton is an 8-year-old male. He has the most positive attitude. Every time we ask him to do something, the response is "OHHHH YEAHHH.!" When he got in the car to leave after the bike safety day he buckled his helmet in the seat next to him. Clinton received the smallest Rifton tricycle with chest trunk, and foot straps. His bike cost $620.

Brittney is a 7-year-old female. She attends every session with her little sister. Whenever we ask her what her favorite thing to do is she responding, "Coming here." She is so excited that she will be able to ride with and help teach her little sister. This young lady lost her older sister in a car accident this past December. Her mom is thankful to give her this positive experience right now. Brittney received a pink TMX Tricycle made by Triaid. It was cool to see her and her sister with matching pink bikes. Her bike had trunk support and foot straps. Her bike cost $942.

Jennifer is a 16-year-old female. She is an intelligent teenager that problem solves how to accomplish transfers and getting on the bike. She has full leg braces and much difficulty moving her legs. She is determined to gain movement in her legs. She has a friend from school that will be leaving her bike at Jennifer's house all summer so they can ride together. Jennifer received the largest Rifton Tricycle with trunk support, foot straps, guide bar and an abductor wedge. Her bike cost $1,076.

Kelly is an 11-year-old female. She is a very independent young lady who does not want her mother watching what she does. She was often saying, "I can do it myself." She was telling everyone at the bike safety day, "Look at my new bike, I'm so excited!" Kelly received the largest Rifton Tricycle with trunk support and foot straps. Her bike cost $975.

Every child received a helmet, which cost around $18. These were donated by Wal-Mart. In addition, the children received a bell or horn, which cost about $5. The total cost for bikes, helmet, and horns for 10 children is $8,344. In addition, we purchased a medium size Rifton Tricycle for testing and demonstration. It cost $695, bringing the total to $9,039.

Fitting Your Bike Helmet

Buy it. Fit it. Wear it. EVERY RIDE!

The Proper Helmet Fit

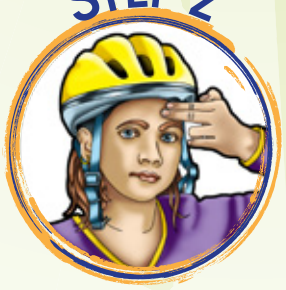
Helmets come in various sizes, just like hats. Size can vary between manufacturers. Follow the steps to fit a helmet properly. It may take time to ensure a proper helmet fit, but your life is worth it. It's usually easier to look in the mirror or have someone else adjust the straps. For the most comprehensive list of helmet sizes according to manufacturers, go the Bicycle Helmet Safety Institute (BHSI) Web site at: www.bhsi.org/.

STEP 1

Size:

Measure your head to find your size. Try on several helmets in your size until one feels right. Now put the helmet level on your head and adjust the sizing pads or fit ring until the helmet is snug.

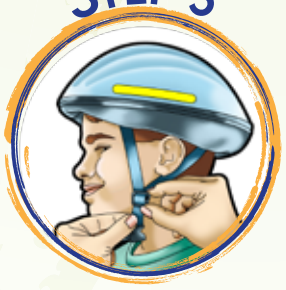
STEP 2



Position:

The helmet should sit level on your head and low on your forehead—one or two finger-widths above your eyebrow.

STEP 3



Side Straps:

Adjust the slider on both straps to form a "V" shape under, and slightly in front of, the ears. Lock the slider if possible.

STEP 4

Buckles:

Center the left buckle under the chin. On most helmets, the straps can be pulled from the back of the helmet to lengthen or shorten the chin straps. This task is easier if you take the helmet off to make these adjustments.

STEP 5

Chin Strap:

Buckle your chin strap. Tighten the strap until it is snug, so that no more than one or two fingers fit under the strap.

STEP 6

Final Fitting:

A. Does your helmet fit right? Open your mouth wide…big yawn! The helmet should pull down on your head. If not, refer back to step 5 and tighten the chin strap.

B. Does your helmet rock back more than two fingers above the eyebrows? If so, unbuckle and shorten the front strap by moving the slider forward. Buckle and retighten the chin strap, and test again.

C. Does your helmet rock forward into your eyes? If so, unbuckle and tighten the back strap by moving the slider back toward the ear. Buckle and retighten the chin strap, and test again.

D. Roll the rubber band down to the buckle. All four straps must go through the rubber band and be close to the buckle to prevent the buckle from slipping.

Replace a Helmet.

Replace your helmet when it has been in a crash; damage is not always visible.

Buy/Fit the Helmet For Now.

Buy a helmet that fits your head now, not a helmet to "grow into."

Ensure Helmet Comfort.

If you buy a helmet that you find comfortable and attractive, you are more likely to wear it. Readjust as necessary to ensure the helmet fits properly each ride.

Cover Your Forehead.

Adjust the helmet fitting based on your helmet first being in the correct position, level on the head and low on your forehead.

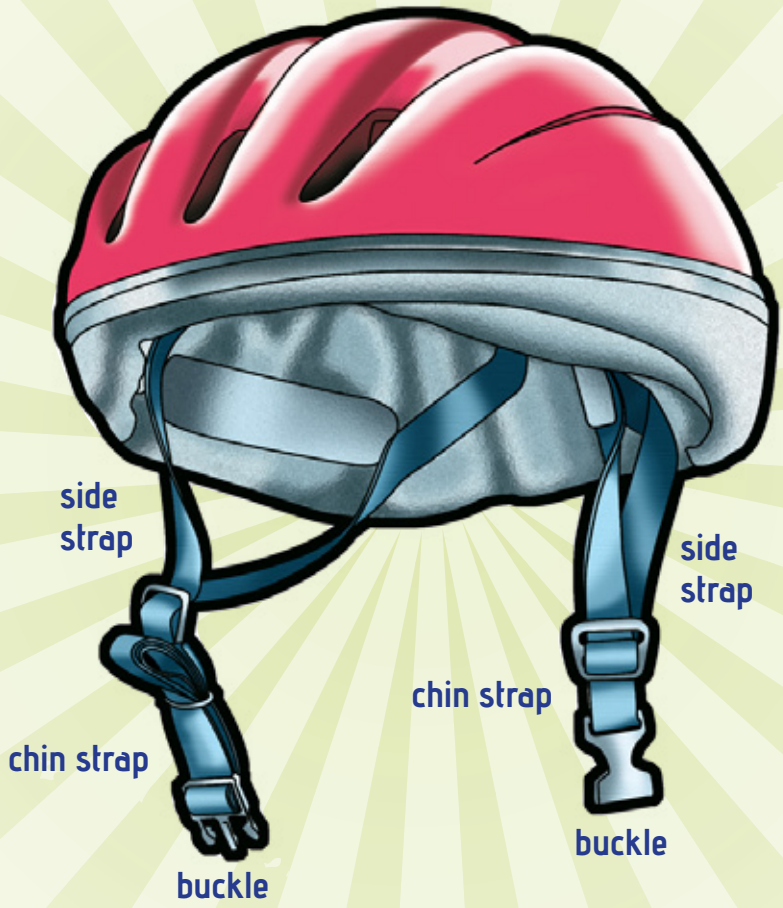
Adjust Straps Until Snug.

Both the side and chin straps need to be snug.

Avoid Helmet Rocking.

Your helmet should not rock forward or backward, or side to side on your head.

If your helmet rocks more than an inch, go back to step 6, and readjust.



Be a "Roll" Model for Safe Behavior

Everyone — adult and child — should wear a bicycle helmet each time they ride. Wearing a helmet each ride can encourage the same smart behavior in others.

Helmet Certification

Bicycle helmets sold in the U.S. must meet the standards issued by the U.S. Consumer Product Safety Commission (CPSC). Look for the certification label inside the helmet.

Helmet Laws

More children ages 5-14 go to emergency rooms for bicycle-related injuries than with any other sport; many are head injuries. As a result, many States and local jurisdictions have child bicycle helmet laws to increase and better ensure the safety of children when bicycling. See: www.helmets.org/mandator.htm.

Like car crashes, bicycle crashes can happen at any time, involving not only children, but adults, many of whom are skilled riders. In fact, middle-age adults represent the average age of bicycle riders killed and injured.

Helmets are the single most effective piece of safety equipment for riders of all ages, if you crash. Everyone should choose to wear a helmet; it just makes sense!

For more information on bicycle safety, visit the National Highway Traffic Safety Administration Web site at:
www.nhtsa.dot.gov/bicycles

ROLL MODEL

NHTSA
www.nhtsa.gov

DOT HS 811 568
April 2012

8019-050212-v2

Appendix **D**
Bike safety for children

Bicycling is for all kids ... of all ages

Every one of all ages and abilities can enjoy the bicycling experience. Riley Hospital for Children supports programming and information resources that help make it possible for children of all ages to bicycle and to be safe bike riders. While some children and adults with disabilities or special health care needs may not be able to use conventional bikes, there are different models of adapted bikes that are commercially available and that can adapt to different needs for positioning and mobility. This list, which is not intended to be all-inclusive, provides an introduction to many of the manufacturers and distributors of these products.

Children and adults with disabilities or special health care needs can benefit considerably from the opportunity to bicycle. Bicycling helps them to realize many benefits, including increased social activity with friends and family members and opportunities to improve physical function and coordination abilities. Therapists and other medical professionals can work with families to shape individual goals for children and adults with disabilities or special health care needs to develop a healthy and fit lifestyle that includes bicycling as a regular recreational activity.

Before anyone ever rides a bike, it is important to take the time to teach and learn the basics of bike safety, operation, and maintenance. Regardless of a person's ability, the basic guidelines for bike safety remain the same for all riders. These guidelines must be followed by everyone:

- Wear a bike helmet. Anyone who rides a bike must wear a properly fitted and approved bike helmet. Bike helmets must meet current safety standards set by the U.S. Consumer Product Safety Commission. Bike helmets must fit snugly on the rider's head with the chinstrap snugly secured. If the rider falls from a bike, is involved in a bicycle crash, or if the helmet contacts a hard surface, the bike helmet must be replaced.

- Know the rules of the road. All riders must be able to demonstrate knowledge of basic bike safety practices: bike hand signals, riding bikes with traffic, how to respond to traffic safety signs.

- Be seen and heard. Reflectors, lights, horns, and flags help people to see and/ or hear a bike at all times of the day. Do not ride a bike at night when you cannot be seen by motor vehicle drivers. If riding a bike at dusk or dawn, make certain all bike riders wear light colored or reflective clothing to be easily seen.

- Prepare for safe bike rides. Drink plenty of fluids before, during, and after a bike ride to prevent dehydration. Take water with you on a bike ride and plan to make frequent stops

so that no one becomes overheated. During the late spring and summer months, use sunscreen to help prevent sunburn. Pack a first aid kit and cell phone (if available) for the bike ride to be able to react to any immediate first aid emergencies. Prior to bike riding, talk with your physician to identify any issues relating to your rider's medications and their use prior to, during, and after a bike ride and their impact on your rider if he becomes overheated.

- Learn bike maintenance. Riders and families should know basic bike maintenance responsibilities, which include regular inspections of brakes, gears, tires, and bike seat and handlebars. Periodic inspections should review that all parts are intact and in working order.

- Provide supervision. All riders require supervision to varying degrees, depending upon their age, development, and ability. People with disabilities or special health care needs may require extra attention, particularly since bike riding may be a new experience and may be exercising newly developing motor and control skills.

Types of Adapted Bikes

Foot driven cycles
Foot driven cycles resemble a standard tricycle that is modified to meet special needs. The three-wheeled styling offers a wider base of support to allow increased independence for those with balance issues. They are suitable for children and adults with a wide range of physical problems from mild balance problems to more severe disabilities.

Optional Accessories: A front hand brake for safety, trunk and hip supports, a fixed position wheel and foot saddle attachments to the pedals which helps the peddling action, an adductor support to help with scissoring of the legs, along with numerous other accessories to aid in proper positioning and safe riding.

Hand driven cycles
Like the foot driven cycle, the hand driven cycle also provides a wider base of support for increased stability. The hand driven cycle would be ideal for those with poor balance, reduced leg strength, incomplete para- or tetraplegia, hemiparesis, generalized muscle weakness, amputation, or back pain. Multiple accessories are available including various seating options for increased stability and comfort.

Optional Accessories: A front hand brake for safety, trunk and hip supports, a fixed position wheel and foot saddle attachments to the pedals which helps the peddling action, an adductor support to help with scissoring of the legs, along with numerous other accessories to aid in proper positioning and safe riding.

Tandem cycles
Tandems, or two person models, are available for those riders who would prefer to ride with another person rather than be totally on their own. Several different designs include side-by-side tandems, front and back tandems that are versatile so that the rider with a disability may ride in either position, and a wheelchair based tandem where a bicycle attaches to the rear of and pushes a wheelchair. In some models, the wheelchair is detachable for participation in activities while you are out. Certain tandem bicycles allow for there to be a passive rider who can sit back and enjoy the experience of riding without the physical exertion involved.

The **Recumbent Cycle** places the rider in a reclined position, while the **Prone** positioning cycles place the rider in a forward leaning posture with their legs behind them in relation to the midline. This is recommended for those with high extensor tone and/ or poor head and trunk control.

The **bicycle trailer** attaches to the back of a standard adult bicycle. Various seating devices and accessories are available based on the needs of the consumer.

To assist in your search for the product that fits your individualized needs, we have developed a categorization system. Following each company name there is a series of letters that correspond

with a letter in the key below. Determine what criteria the product you are searching for needs to meet, and then eliminate those who do not, speeding up the process.
Example: If I was searching for an adult (A), recumbent bike (R), It would be likely that I would find one possible product on the Freedom Concepts Inc. website since the categorization letters include "A" and "R".

Category Key:

A – Adult	C – Children	T – Tandem	U – Upright
P – Prone	R – Recumbent	BT – Bicycle Trailer	

AmTryke/Ambucs (C,U) 	Specializes in hand / foot driven therapeutic tricycles for individuals of all ages and offers patients improvement in several different areas such as motor skill development. PO Box 5127 High Point, NC 27262 Phone: 1-800-838-1845 Fax: 1-336-852-6830 Website: http://ambucs.org E-mail: ambucs@ambucs.org
Angletech (A,C,R,T) 	Manufactures custom fit hand and foot powered recumbent tricycles for all ages and abilities. These tricycles offer the rider comfort, fun, and safety. 1483 Garden of the Gods Road, Colorado Springs, CO, 80907. Phone: 1-719-687-7475 Website: http://cycledifferent.com/ Email: angeltech@me.com
Bike On (A,C,R) 	Makes hand-cycles with a large variety of different designs meant to cater to the needs of the rider. These tricycles can be used by children as well as adults. 72 College Street, Warwick, RI 02886 Phone: 1-888-4bikeon (424-5366) or 1-401-821-7544 Website: http://www.bike-on.com E-mail: info@bike-on.com
Blue Sky Carts (A,C,BT) 	Manufacturer of a “special needs trailer” to be attached to the rear of an adult bicycle. Weight Capacity – 200 lbs. Various accessories such as a canopy kit are available. 1614 Southside Road, Sutherlin, OR 97479 Phone: 1-541-459-2978 Website: http://blueskycyclecarts.com E-mail: sales@blueskycyclecarts.com

Consumer Care Products Inc. (C,U)  It is important to wear a properly fitted helmet for every ride	A catalog based company manufacturing pediatric hand and foot powered trikes and a do-it-yourself upper trunk support kit and belt. W282 N7109 Main Street, Merton, WI 53056 Phone: 1-262-820-2300 Fax: 1-800-977-2256 Website: http://www.consumercarellc.com E-mail: CCPI@consumercarellc.com
CycleTote Corp (C,BT) 	Manufactures a special needs trailer / stroller that can fit an occupant up to 5'4" in height and 170 lbs. This product can accommodate multiple seating systems such as a panda or tumble form feeder / carrier seat. Various accessories are available. 517 Link Lane, Ft. Collins, CO 80524 Phone: 1-800-747-2407 Fax: 1-970-530-0232 Website: www.cycletote.com E-mail: cycletote@cycletote.com
The Dragonfly Toy Co. (C,A,P,U)	Manufacturer of pediatric and adult prone / upright and hand / foot driven tricycles. 291 Yale Ave. Winnipeg, MB, Canada R3M OL4 Phone: 1-800-308-2208 Fax: 1-204-453-2320 Website: www.dragonflytoys.com Email: sales@dftoys.com
Equipment Shop (C,U) 	Manufactures adapted tricycles for young children and accessories including upright handlebars, back support, pommel, and foot pedal attachments for do-it-yourself adaptations. Box 33, Bedford, MA 01730 Phone: 1-800-525-7681 Fax: 1-800-793-7922 Website: http://www.equipmentshop.com E-mail: info@equipmentshop.com
Flaghouse (C,A,U,P,R,T) 	A catalog based company carrying more than 25 different hand and foot powered tricycles and accessories for all ages and abilities. To request a "special populations" catalog, contact them at: 601 Flaghouse Drive, Hasbrouck Heights, NJ 07604-3116 Phone: 1-800-793-7900 Fax: 1-800-793-7922 Website: www.flaghouse.com E-mail: sales@flaghouse.com

Freedom Concepts Inc. (C,A,P,U,R,T) 	Manufactures custom fit, foot powered tricycles for all ages. Various accessories such as a chest harness and Velcro foot straps are available for purchase. Canada: PO Box 45117, RPO Regent, Winnipeg, Manitoba, Canada-R2C 57C US: 3651 Lindelle Road Suite D239, Las Vegas, NV 89103 Phone: 1-800-661-9915 Fax: 1-204-654-1149 Website: www.freedomconcepts.com E-mail: mobility@freedomconcepts.com
The Freedom Ryder (A,R) 	A hand powered bicycle you steer by leaning your body. It combines the fun of cycling and the benefits of an upper-body workout with the sensation of slalom skiing. Bike International, Ltd. 20589 S.W. Elkhorn Ct., Tualatin, OR 97062 Phone: 1-800-800-5828 Fax: 1-970-221-4308 Website: http://www.freedomryder.com/ E-mail: mikelofgren@freedomryder.com or text 1-503-692-1029
Green Speed (A,R) 	Human powered transportation. Green Speed specializes in recumbent bikes. US distributor: Jerome Hediger, 330 Cally Ln., Highland, IL 62249 Phone: 1-618-3955 Austrailia: 69 Mountain Gate Drive, Femtree, Gully VIC 3156 Phone: +613 9758 5541 Fax: +613 9752 4115 Website http://www.greenspeed.com.au/ E-mail: ian@greenspeed.com.au
Handcycles by Palmer (A,C)	Hand cycles for both adults and children. PO Box 5707, Endicott, NY 13763 Phone: 1-800-847-1304 or 1-607-754-2957 Fax: 1-607-754-1954 Website: www.palmerind.com Email: palmer@palmerind.com
Invacare (C,A,U,R) 	Manufactures upright and recumbent hand cycles for adolescents and adults. One Invacare Way, PO Box 4028, Elyria, OH 44035-4049 Phone: 1-800-333-6900 Website: www.invacare.com
Lightning Handcycles (A, R)	Lightweight handcycles. 312 N. 9th Street Suite B, Lompoc, CA, 93436-4967 Phone: 1-805-736-0700 Website: www.lightningbikes.com Email: information@handcyle.com

Mobility & Access, Inc. (C,A,T) 	Formerly Frank Mobility Systems. Manufacturer of the "Duet", a wheelchair bicycle tandem which is a bicycle that has a wheelchair attached to the front that can be easily removed for wheelchair participation in other activities. 1003 International Drive, Oakdale, PA 15071-9223 Phone: 1-844-562-8034 (toll free) Fax: 1-724-695-2922 Website: www.mobilityaccess.com E-mail: duetbike@frankmobility.com
One-Off Titanium Handcycle (A,R) 	Created the first off road hand cycle that can also be ridden on the street. The steering is similar to the downhill racers, and has a crank for propulsion. 494 Stage Rd., Cummington, MA 01026 Phone: 1-413-634-5591 Website: www.oneoffhandcycle.com E-mail: mike@titaniumarts.com
Palmer Industries (A,C)  It is important to wear a properly fitted helmet for every ride	Manufactures handcycles for adults and children. Also has several different options such as foot pedal combination, seats, and a basket to carry things PO Box 5707 Endicott, NY 13763 Website: http://palmerind.com E-mail: palmer@palmerind.com
Power Pumper (C,U) 	The Power Pumper is made for children ages 5-11. Often used for rehabilitation because it encourages normal movement of upper and lower extremities, it has been found to be helpful for children with Autism, low muscle tone, Spina Bifida, Cerebral Palsy, and developmental disorders as well as many others. Columbia-Inland Corporation 606 15th St., Oregon City, OR 970045 Phone: 503-657-6676 Website: www.powerpumper.com E-mail: info@powerpumper.com
Quickie Designs, Inc (C,A)	Manufactures hand-cycles that are designed for high performance for all ages. 505 West Thomas Road, Phoenix, AZ 85013 Phone: 1-800-236-4215 Website: www.quickie-wheelchairs.com

Rifton Tricycles (C,A,U) 	Manufactures a foot-powered tricycle in three different sizes for children and adults up to 200 pounds. Additional accessories available for customization. P.O. Box 260, Rifton, NY 12471-0260 Phone: 1-800-571-8198 Website: www.rifton.com E-mail: sales@communityproducts.com
Rock N' Roll Marketing , Inc. (C,A,T,U)	Manufactures custom fitted hand and foot powered tricycles for all ages. Also manufactures a bicycle that attaches to the rear of a wheelchair to push it. 12403 CR 2300, Lubbock Texas 79423 Phone: 1-800-306-3223 Website: www.rockandrollcycles.com
Spokes 'n Motion (A,R) 	Spokes 'n Motion is a specialist in adaptive sports equipment and the promotion of sports equipment for persons with disabilities. They sell both Praschberger and Freedom Ryder handbikes. 2535 South Wadsworth Blvd, Lakewood, CO 80227 Phone: 1-303-922-0605 Fax: 1-303-265-9685 Website: http://www.spokesnmotion.com E-mail: info@spokesnmotion.com
Sunrise Medical (A,C,R) 	Produces a variety of hand cycles for adults and children with all ranges of abilities. They also offer a product to transform your wheel chair into a bike. 2842 N. Business Park Ave, Fresno CA 93727 Phone: 1-800-333-4000 Website: www.sunrisemedical.com E-mail: webmaster@sunmed.com
ToniCross Tricycles (C,A,U) 	Manufactures foot powered tricycles for pediatric and adolescent consumers up to 180 pounds. 9435 Waterstone Boulevard, Cincinnati, OH 45249 Phone: 1-877-808-4540 Website: www.adaptivespecialties.com
Trailmate (C,A,U,R,T) 	Manufactures various tricycles for adolescents and adults with unique features such as a step through design and swing away handlebars. 2359 Trailmate Drive, Sarasota, FL 34243 Phone: 1-800-777-1034 Fax: 1-800-477-5141 Website: www.trailmate.com E-mail: Info@trailmate.com

Triaid (C,U)	Manufactures hand and foot powered tricycles for children up to130 pounds. PO Box 1364, Cumberland, Maryland 21501-1364 Phone: 1-800-306-6777 Fax: 1-310-759-3525 Website: www.triaid.com Email: sales@triaid.com
Varna Innovation & Research (A,R)  It is important to wear a properly fitted helmet for every ride	Designs and manufactures cycles and handcycles. 1635 Queequeg, Gabriola Island, BC VOR 1X5 Phone: 250-247-8379 Website: www.varnahandcycles.com Email: Varna@varnahandcycles.com
Worksman Cycles (A,U,R) 	Offers a full variety of Adult Tricycles, Folding Bikes, Tandems, Cruisers, Middleweight Bicycles and even Dual Rider Tricycles. Even if you cannot balance a 2-wheel bike, there is a Worksman Pleasure cycle right for you. 94-15100th Street, Ozone Park, New York 11416 Phone: 1-888-3wheeleror718-322-2000 Fax: 718-529-4803 Website: www.worksman.com Email: cycles@worksman.com