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Recognizing NUPOC's Educational Models and Research Subjects

R. J. Garrick, PhD, and John Michael, MEd, CPO

Community volunteers are indispensible contributors to our educational and research mission. NUPOC deeply appreciates the commitment of the dedicated men and women who serve as our Educational Models and Research Subjects. Able-bodied research subjects help us establish control samples; persons with a physical disability enrich our understanding of the full range of human movement and functional possibilities.

NUPOC relies on Educational Models to teach professional skills and technical proficiency to NUPOC students. Director of Prosthetics Tom Karolewski, CPO, (kneeling center) critiques a student's fit and alignment of lower extremity prostheses on an Educational Model.

NUPOC cannot effectively train students or conduct research without the willing involvement of men and women with physical disabilities who may use orthoses or prostheses. Some dedicated individuals participate as both Educational Models and Research Subjects. Each person expends generous amounts of time, effort, and patience to further the important work that is done at NUPOC.

Participation of Educational Models enables prosthetics and orthotics students to learn and to practice essential clinical skills, including proper measuring, casting, and fitting protocols. To permit students to gain experience with a wide range of different biomechanical designs, Educational Models are willing to work with trial prostheses and orthoses that are not necessarily the best for their personal needs.

NUPOC students are not trained with manikins having amputated or atrophied limbs, nor do they rely upon inanimate Patient Simulators such as those used in medicine, surgery, and obstetrics. Thanks to the generosity of our Educational Models, NUPOC students learn to become prosthetists and orthotists by working directly with people who have a physical disability that may require a prosthesis or orthosis for their Activities of Daily Living (ADL). Although many health disciplines utilize trained actors who portray Standardized Patients, NUPOC students hone their P&O skills by working with individuals who have decades of collective experience wearing actual prostheses and orthoses.

In addition to enabling P&O students to develop technical proficiency, Educational Models also help students learn "people skills". Interactions with Educational Models provide students with a deeper understanding of the interpersonal relationship with a client that is critical for future success as prosthetists and orthotists in clinical settings. During the critique portion of the practicum, Educational Models provide valuable input about not only students' technical competency and the device they have created, but also about their communication abilities. The feedback, participation and insights of Educational Models ultimately improve P&O outcomes in clinical practice.

This issue features only two of the many invaluable individuals who have participated through the years. With respect and gratitude, NUPOC salutes all our Educational Models and Research Subjects, past and present, who have helped train our students and provide essential data for our research.

A Tribute to NUPOC's Educational Models: Prosthetics

George Wedel: A Friend to NUPOC

Anthony and Louie Bartolomeo, with R. J. Garrick, PhD

George F. Wedel (1917-2011) was a true-blue Chicagoan. Born in the Lake Park Community on Chicago's Southside, he spent most of his life in the Garfield Ridge neighborhood. He was a consummate Chicagoan in his devotion to his family and neighborhood, his work at the iconic Campbell Soup Company, his stalwart support of the Chicago Cubs, and his 40-year participation as an Educational Model in Prosthetics at the Northwestern University Prosthetics-Orthotics Center (NUPOC).

A consummate Chicagoan, George Wedel stands before the magnificent Chicago skyline with his grandsons Louie (left) and Anthony (right) Bartolomeo.

In 1936 George began working in the Tomato Yard at the Campbell Soup Company, in Brighton Park, IL. The next year at the age of 19, George lost his arm to a machine accident in the plant. His grandson, Anthony Bartolomeo, recalled George speaking of the accident, *"I remember standing there looking down at my arm."* The company gave him a 2 year leave of absence for rehabilitation. Within the first year, George was eager to return to work but was not allowed.

George Wedel and Irene Granowski were married in 1946 and spent a happy life together.

When he returned to work, he was promoted to foreman in the Plant Service Department where he met a fellow forelady, Miss Irene Granowski. Their relationship blossomed into a true love and by 1946 George and Irene were married. A year later they welcomed their son, George, followed by their daughter, Susan. During their lifetime together, George enjoyed pointing out that it was Irene who had asked him out to their first date! They were life partners until Irene passed away in 1996.

After many years with the Campbell Soup Company, George retired from the firm in 1975. Several years later, he began his association with NUPOC, where he volunteered as an Educational Model in Prosthetics. He thoroughly enjoyed his volunteer activity and for 40 years continued to give generously of his time and energy at NUPOC! He was fascinated with the science of prosthetics. He influenced decades of NUPOC prosthetics students. NUPOC staff and students remember him with great fondness for his congenial and kind manner. Never cross, short-tempered, or critical with the student prosthetists, his patience and kind nature made him a favorite Educational Model. A tolerant and forgiving person, George always gave people the benefit

George and Irene Wedel were like parents to their grandchildren, Anthony (left) and Louie (right) Bartolomeo.

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of the doubt. As his grandson Anthony Bartolomeo expressed, *"He never judged others by what he saw with his eyes, but responded to what he saw with his heart."*

George Wedel with his English bulldog, Smash, in the background.

George was a Chicagoan through and through. A pioneer in Chicago's Garfield Ridge neighborhood, he loved drinking Budweiser on the porch with his neighbors. He loved watching wrestling and competitive sports such as baseball. Naturally, he was a Cubs fan. He often spoke of having attended the 1945 World Series – the beginning of the Curse of the BIlly Goat and yet another loss for the Chicago Cubs! He loved to play Bunco with his sisters. Throughout his retirement years, George maintained a lively interest in guns, British bulldogs, woodworking, and whiskey. George loved his British bulldogs and named each one, successively, Smash. He took an interest in breeding bulldogs and was pleased with their offspring.

Living with an amputation did not define George; rather, resilience and warm relationships with others distinguished his life. Grandsons Anthony and Louie Bartolomeo reflected that George was devoted to his family and his six grandchildren who survive him, loved him deeply, miss his participation in their lives, and daily remember the ways he touched their lives.

George met the unexpected hardships of life with fortitude and determination. He worked to overcome the loss of his arm, the death of his beloved wife and colon cancer in his mid 70s, a hip replacement at age 87, and a pacemaker at age 94. Anthony and Louie recalled George Wedel with affection and respect, *"Our grandfather was always supportive. He was there for us when we were hurt and guided us through tough times when we needed help. He showed us how to love and how to live. He showed us how to live a life to the fullest. On February 9, 2011 we lost the grandest grandfather."*

For 40 years George Wedel volunteered as an Educational Model in Prosthetics at NUPOC. Shown here in his 90s, he was a favorite of prosthetics staff and students.

George generously gave his time and energy at NUPOC as an Educational Model for 40 years! We deeply appreciated his commitment to the education of prosthetists at NUPOC. The staff and students of NUPOC miss George Wedel, and we remember him with fondness and deep appreciation.

Louie (left) and Anthony (right) Bartolomeo recently visited NUPOC to share recollections about their grandfather, George Wedel, NUPOC's longest serving Educational Model in Prosthetics. NUPOC appreciates their significant contributions to this article.

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Subscription is free to all individuals and institutions interested in prosthetics and orthotics. Issues are archived on the NUPOC website, **www.nupoc.northwestern.edu**. Send subscription requests and address changes to: *Capabilities*, Northwestern University RERC, 680 North Lake Shore Drive, Suite 1100, Chicago, IL 60611.

A Tribute to NUPOC's Educational Models: Orthotics

Clarence Coakley: A Man with a Purpose

R. J. Garrick, PhD

Clarence Coakley is a man of quiet charm and heartfelt conversation. In November 2010 Mr. Coakley founded Men with a Purpose, a support group designed to help men with disabilities. The group meets on the second and fourth Fridays of each month from 1:00-3:00 p.m. at Access Living.

Recently, NUPOC and Mr. Coakley conversed about his experiences and how he developed the idea for this peer support group. Learn more about Men with a Purpose and the improvement this activity has made in his life and in the lives of others.

Clarence Coakley is the founder of Men with a Purpose, a support group designed to help men with disabilities.

NUPOC: How did you get the idea for your support group?

Mr. Coakley: *I sat in the RIC lobby beside the statue of Henry Betts and invited people to attend. Also, I spent time in the RIC cafeteria talking with other men about how I wanted to build this group. For months I talked to various people, nurses, PTs, OTs, and Jamee R. Heelan, OTR/L, the Education Program Manager in the RIC Life Center. Everyone said, 'Go for it. What are you waiting for? You can do it. Speak from the heart.'*

I began to look for meeting rooms. I went to Access Living and spoke from my heart about what I thought the group would be about. I just got the ball rolling. Access Living offered a meeting room and help getting the word out. At first I was afraid that no one would show up, but someone always shows up. Now the group has been meeting there for 6 months.

NUPOC: Do you have an agenda or planned programs at your group meetings?

Mr. Coakley: *Sometimes guest speakers come to talk with us. The meetings are an opportunity for us to talk about building friendships, getting out into the community, living in a safe environment, and health care issues, like how to avoid pressure sores. We talk about how to work out and keep our strength built up. This improves our confidence and our health. We talk about what programs and topics we are interested in for the future. The group is growing by word of mouth, flyers, and my calls to people on a sign up list. Sometimes I sit by the statue of Henry Betts in the RIC lobby and I talk to new people that I meet. Someone new attends every meeting.*

NUPOC: Who are the participants in Men with a Purpose?

Mr. Coakley: *Men with a Purpose reaches out to all men with a disability. We welcome everyone. They might be blind, have an amputation, traumatic brain injury, stroke, cerebral palsy, spinal cord injury, or something else. Men with all kinds of disability are welcome. At every meeting different people attend, sometimes more and other times less. Recently, we had a meeting that 15 people attended.*

My goal is to reach out to other men who also are living with physical disabilities. If I can touch one person, influence just one person to get out into the community, I will have done my job. If I can help other men who have disabilities, then my job would be complete.

NUPOC: Tell us a little about yourself.

Mr. Coakley: *I have been living 27 years in a wheelchair. Sometimes people in a chair seem to give up. If I can help them get back out into the community, they will feel better.*

Last year I felt depressed from living with this condition. When you feel depressed, you tend to overeat. My weight bulked up from 175 pounds to 225 pounds. I've been working hard to stay toned and trim back. Now I weigh 190 pounds and I hope to be at 185 this summer. I tone up with weights and I don't eat in the evening. I work to tone my muscles, not build bulky muscles.

I thank God that I'm still here. I never went to a nursing home. My mother took care of me at home. Now she is 84 and my older sister and my personal assistant help me with things I can't do by myself. Now, I wouldn't want to go into a nursing home. I'd do whatever I could to stay on my own. Our house is on the ground level, so I have an easy access entry. It's small, but it's a roof over our heads.

NUPOC: How were you injured?

Mr. Coakley: *I was shot 5 times in a case of mistaken identity. I was shocked. My body just shut down and I couldn't run. Everything seemed like it was slow motion. I was shot 1 time in the side and 4 times in the back. I have an incomplete C-7 condition, but I can dress myself, and put on my shoes by myself. I was 24 at the time. Now I am 52, so I have spent 27*

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years in a wheelchair.

At the time, I couldn't believe that this happened to me. I spent 56 days in the Intensive Care Unit. They caught the shooter and he served 6 years and then got out of prison. At first I was bitter. Now I don't hold a grudge and I'm not bitter. This kind of thing can happen to anyone. I used to think that this would not have happened if I had stayed home that night, but this can happen to anyone. Life is not promised to anyone.

NUPOC: At the outset, how did you recover from the initial shock of being paralyzed?

Mr. Coakley: *My family, friends and people on the rehab team all helped me, but especially my family helped me. My sister's boyfriend was real good to me. He used to push me in my chair and gave me transportation to wherever I wanted to go. I came to RIC with a pressure sore that I didn't even know I had. I learned how to avoid pressure sores by shifting my weight and keeping my skin moisturized.*

NUPOC: The change in your situation must have been especially difficult when you were a young man. It must have taken a lot of effort to recover from a devastating, life-altering injury.

Mr. Coakley: *Now I've made new friends, different friends than when I was walking. People who were my friends back then didn't show up. After I got shot, they didn't call. I felt sad waiting for them and used to sit by the window and cry. My father told me, 'Junior, you have to get over that.' So I put it in my mind that if they come over, OK and if they don't, it's OK. I came back to rehabilitation for recreation and I met new people who are my friends now. Now I get out into the community. I go shopping on my own to the mall and other stores. It's good to get out into the community. We may consider going out as a group somewhere, maybe have a barbecue or go bowling.*

NUPOC: You have faced some really difficult times in your life.

Mr. Coakley: *Everyone has difficult times in their life. I know what it's like to feel low and last year I felt like I could not go on. Some people have really helped me come back and that's one reason why I want to reach out and help other people through my support group.*

Mr. Coakley also volunteers his time as an Educational Model for orthotics students at NUPOC. Mr. Coakley (center) at NUPOC with orthotics student Brittney Obermeier (left) and orthotics instructor, Chris Robinson, CPO (right).

Of course my family stands by me and is always important to me. Another person I really want to appreciate is Ms. Evelyn Rodriguez, Girls' Mentoring Coordinator at Access Living. She's been very helpful and encouraging. She told me, 'Clarence, what are you waiting for? I've got a meeting and a room set up for you at Access Living!' When I started the support group, she booked the rooms in November, December, and January. She really stood by me. She facilitated the women's support group and gave me a lot of important information about how to keep a support group running.

Another person I want to appreciate is Elijah Washington. I grew up with Elijah Washington and we went to grammar school together. Elijah tried to help me after I got hurt. Also, he really helped me after I tried to commit suicide and came to the hospital almost every day to support me. He is my really good friend.

NUPOC: You have come a long way.

Mr. Coakley: *When I felt depressed last year, I decided to leave it in God's hands. God showed me a vision and it was building this support group for men with disabilities. My friends told me that they never saw me fight so hard for something. My friends tried to get me to go out and protest about something, but that's not for me. I'd rather meet and talk with people. Recently I started talking to a young woman who was recovering from a car accident. She said that she hadn't laughed for months. I told her, 'Don't give up. Don't ever give up.'*

Mr. Coakley is a man who never gives up. Modest and compassionate, he would hesitate to admit that his outreach activities are inspirational, but he has adapted and adjusted to life changes that emerged from trauma, tragedy, and disability. Mr. Coakley has survived these experiences as a personable and sincere activist who seeks to improve the circumstances and life experience of men who live with a disability.

In addition to outreach activities on behalf of Men with a Purpose, Mr. Coakley also volunteers his time as a patient model for orthotics students at NUPOC. If you are a man who lives with a disability, you may wish to consider joining Mr. Coakley at an upcoming meeting of Men with a Purpose.

A Case Study Evaluation of a Bilateral Transtibial Prosthesis User Walking with the NUPOC Mechanically Adapting Prosthetic Ankle

Samuel Kwak, Illinois Math and Science Academy
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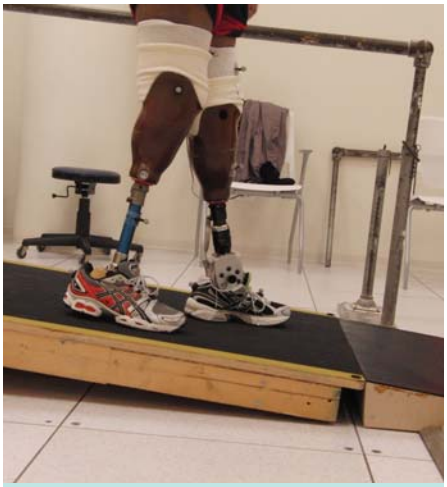
This work is supported by the Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR) grant number H133E080009. The contents of this paper do not necessarily represent the policy of the Department of Education and do not constitute endorsement by the Federal Government. Data were collected at the Jesse Brown VA Medical Center Motion Analysis Research Laboratory, Chicago, IL. This case study was conducted in fulfillment of Samuel Kwak's Student Enquiry and Research Project.

Joint motion, especially about the ankle, allows able-bodied walkers to walk with little difficulty across inclines and declines; whereas lack of ankle motion in most prosthetic feet hampers ambulation over sloped surfaces for persons with transtibial amputation, causing moments about the knee that need to be accounted for by larger postural realignments (Gailey and Clark, 1992). Recent developments such as the Proprio-Foot™ by Ossur, using a microprocessor-controlled mechanism, provide realignment of the ankle to sloped surfaces but cannot adjust on the first step (Alimusaj et al., 2009; Fradet et al., 2010). A prosthetic ankle that automatically adapts to sloped surfaces at every step is still needed.



Subject walked down a 5° ramp using both a non-adapting prosthetic ankle (left) and the NUPOC prosthetic ankle (right).

This case study examines the use of a second-generation prosthetic ankle prototype that automatically adapts to sloped surfaces at every step. The proof of concept model was originally developed at the Northwestern University Prosthetics-Orthotics Center (NUPOC) by graduate student Ryan Williams (Williams et al. 2009) with further development by Eric Nickel (Nickel et al. 2011). The current prototype is lighter, slimmer, and quieter than the original proof of concept model. In response to loading and unloading of the walker's weight on the prosthetic ankle, a clutch spring mechanism locks out a low stiffness bumper during dorsiflexion and a high stiffness bumper during plantarflexion allowing the foot to "find the ground" before resistance to ankle rotation is provided.

After endurance testing of the NUPOC prosthetic ankle and lab based testing on three persons with unilateral amputation (Nickel et al. 2011), the ankle was tested on an individual with bilateral transtibial amputations. We were interested not only in the quantitative assessment of ambulation with the ankle but also feedback from the subject. Therefore, at the first visit the subject completed two questionnaires about the non-adapting prosthetic ankles he used daily: 1) the Activities-Specific Balance Confidence (ABC) Scale and 2) the Prosthesis Evaluation Questionnaire – Mobility Scale (PEQ-MS). The ABC Scale assessed the individual's balance confidence in various situations, while the PEQ-MS assessed ability to perform various activities such as walking up and down steep slopes. Also during the first visit, the subject walked on the NUPOC prosthetic ankle until he indicated that he felt comfortable using it and understood how it functioned.

At the second visit, prior to data collection, the subject walked on the NUPOC prosthetic ankle for about 10 min and walked up and down the ramp a few times to get used to the adaptable prosthetic ankle function. Researchers then attached reflective markers to various joints on the subject's body in order to measure walking. The individual was asked to walk at a self-selected pace across a level surface, and up, and down a ramp with a 5° slope using his regular prostheses with non-adapting ankles while gait data were recorded. These data were then compared to data collected while walking with the NUPOC prosthetic ankle. All testing took place in the Jesse Brown VA Medical Center Motion Analysis Research Laboratory located within NUPOC. Eight cameras placed around the laboratory recorded the position of the reflective markers. As the subject walked, six force plates embedded in the floor measured ground reaction forces. After data collection, the subject again answered the two questionnaires, the ABC Scale and the PEQ-MS, this time focusing on function with the adaptable ankle.

Gait data were processed using CORTEX and MATLAB software. The results from the ABC scale were collected (100% would indicate full confidence in the tasks described in the questionnaire). For the PEQ-MS, the point value for all questions were added (a maximum possible value of 48 indicates full mobility).

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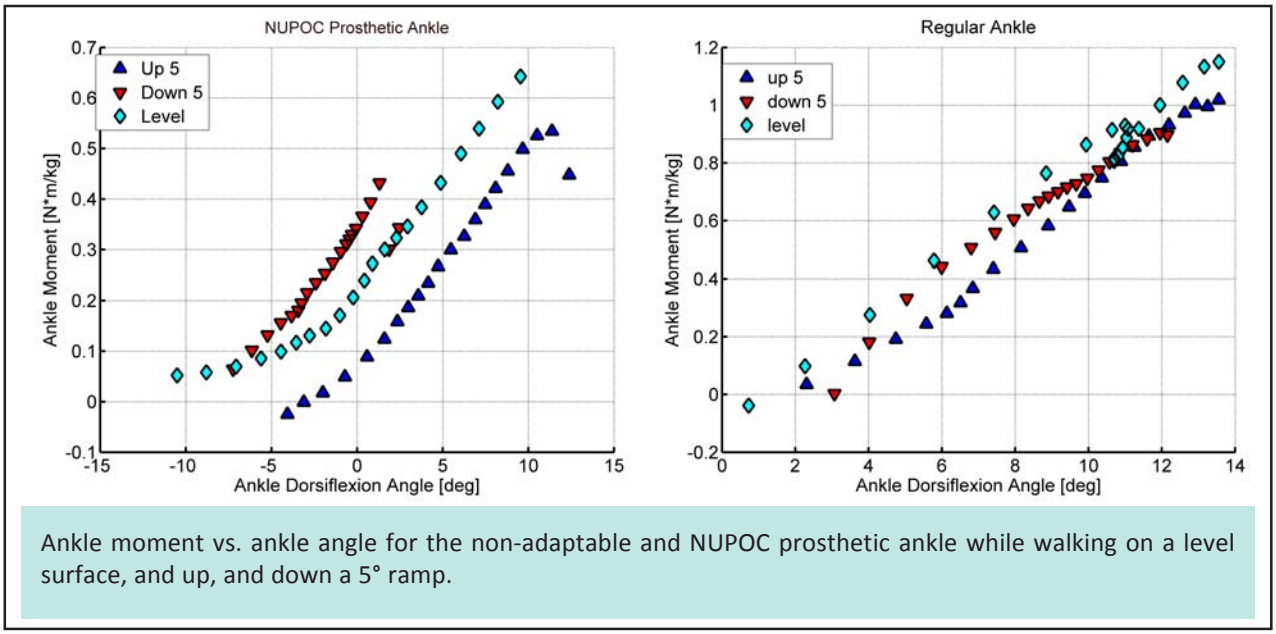
The NUPOC prosthetic ankle provided greater range of motion than the non-adapting ankle in all walking conditions. Motion of the NUPOC prosthetic ankle more closely resembled that of able-bodied individuals, although neither prosthetic ankle provided entirely "normal" motion. Ankle angle-moment data demonstrated the adaptation of the NUPOC prosthetic ankle to inclines and declines by changing the ankle angle during stance while maintaining the ankle moment.



Ankle moment vs. ankle angle for the non-adaptable and NUPOC prosthetic ankle while walking on a level surface, and up, and down a 5° ramp.

While our results show that the current NUPOC prosthetic ankle adapts to slopes on each step, it lacks performance reliability. During one incline walking trial, the clutch mechanism of the NUPOC prosthetic ankle failed to fully engage during the stance phase so that the ankle moved into a dorsiflexed position without sufficient resistance. However, on the next step the clutch functioned as it should.

Based on the ABC Scale, the subject had a higher balance confidence level, 68.8%, when walking with his usual non-adaptable ankles than the NUPOC prosthetic ankle, 50.6%. The PEQ-MS results showed that the subject perceived his ability to perform various mobility activities with the NUPOC prosthetic ankle as being higher (34) than with his usual non-adaptable ankles (25). The subject gave a higher score for activities that are affected by the adaptability of a prosthetic ankle, such as walking up and down a steep hill and sitting down on and getting up from various chair heights. Together, these results show that although the subject lacked balance confidence in using the adaptable ankle, he perceived that it was effective in its intended function.

This case study suggests that it is possible for persons with bilateral transtibial amputations to benefit from prosthetic ankles that mechanically adapt to changes in ground slope on each step, consistent with results previously reported for persons with unilateral transtibial amputation. More research and development is needed to confirm these possible benefits and to address the performance problems encountered with the current prototype.

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NUPOC Hosts Sons and Daughters at Work

R. J. Garrick, PhD

NUPOC participated in Northwestern University's 17th Take Our Sons and Daughters to Work Day on April 28. NUPOC hosted 2 groups of pre-teen and teenage children of NU employees, their relatives and friends. Sponsored by Northwestern University Women's Center, tours aimed to introduce careers that are open to both women and men. Based on the theme "Invent the Future", children visited NUPOC as one of 11 possible sessions offered on the Chicago campus.

NUPOC hosted several groups of children who are interested in science as part of Northwestern University's 17th Take Our Sons and Daughters to Work Day.

Young visitors to NUPOC learned 5 important points: 1) a prosthesis replaces a missing limb; 2) an orthosis supports a weak limb; 3) NUPOC is a school that trains prosthetists and orthotists, 4) NUPOC is a research center that studies human gait and motion, and 5) NUPOC helps improve the lives of people who live with a disability.

NUPOC postdoctoral fellows, **Azucena Rodriguez**, PhD, and **Oluseeni Komolafe**, PhD, explained the goals of motion analysis research and talked about lower limb prostheses, motion capture, force plates, and phases of the human gait cycle. Visitors to the Jesse Brown VA Medical Center Motion Analysis Research Laboratory received a do-it-yourself project sheet that they could make into a flip book. The project allows children to cut out and sequentially collate 24 pictures of a computerized stick figure generated by motion capture. When flipped from front to back, the pictures appear to move, demonstrating human gait. **Craig Heckathorne**, MSc, provided a hands-on overview of upper limb prostheses and cosmetic gloves. Visitors enjoyed learning about how myoelectric signals can control prosthetic hand prehension. **Ingrid Masterton**, MPT, presented opportunities for visitors to try on orthotic devices such as hand-wrist braces. Participants learned about orthotic function by manipulating and placing 3-dimensional objects.

NUPOC hopes that this experience may help young people aspire to become future rehabilitation engineers, prosthetists and orthotists!