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Marlo Anatomical Socket® Studied for Coronal Plane Stability

R. J. Garrick, PhD, and Stefania Fatone, PhD, BPO(Hons)

[*This work was funded by the National Institute on Disability and Rehabilitation Research (NIDRR) Grant H133E08009 of the US Department of Education. The opinions in this article are those of the grantee and do not reflect those of the US Department of Education. Grantees appreciate the use of the Jesse Brown Veterans Affairs Medical Center Motion Analysis Research Laboratory.*]

Stefania Fatone, PhD, BPO(Hons), **Rebecca Stine**, MS, and **Robert Tillges**, CPO, have completed data collection on the NIDRR-funded research project, *Effect of Socket Characteristics on Coronal Plane Stability during Gait in Persons with Unilateral Transfemoral Amputation.* Patients who wear the Marlo Anatomical Socket (MAS®) report greater range of hip motion, improved comfort, proprioception and cosmesis. Developed by Marlo Ortiz (Guadalajara, Mexico) in 2004, the MAS® is thought to offer improved stability due to increased skeletal support along the medial ischial ramal complex (IRC) and volumetric distribution of the residuum's soft tissue; however, quantitative knowledge is lacking about the effect of the MAS® characteristics on the gait of persons with transfemoral amputation (TFA). This study quantifies gait characteristics for six persons with unilateral TFA who now wear a MAS®; and examines self-reported Socket Comfort Scores.

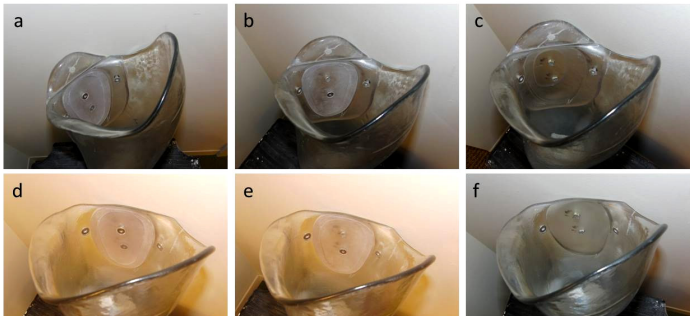

Figure 1. Socket conditions: a) intact MAS®, b) MAS® with one panel removed, c) MAS® with two panels removed, d) MAS® with 'ear' removed, e) 'ear' and one panel removed, f) 'ear' and both panels removed.

Data were collected from subjects walking at a comfortable, self-selected speed on 6 force plates (AMTI) embedded in the center of a 12m walkway and filmed by an 8 camera motion analysis system (Motion Analysis Corporation) while randomly wearing the MAS® in each of six modified conditions: 1) intact MAS®; 2) MAS® with one medial panel removed; 3) MAS® with both medial panels removed; 4) MAS® with medial 'ear' removed and both panels in place; 5) MAS® with medial 'ear' and the first panel removed; and 6) MAS® with medial 'ear' and both panels removed (See Figure 1). Other data recorded Socket Comfort Score (0 denotes most uncomfortable and 10 denotes most comfortable), walking speed, stride width, coronal plane pelvic range of motion, maximum lateral trunk lean in prosthetic stance and transverse plane prosthetic limb rotation during swing for each socket condition. Researchers hypothesized that reports of comfort and stability for

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sockets 1 to 6 would decrease incrementally.

Analysis of data from the six socket conditions systematically demonstrates the contribution of ischial ramal containment and medial soft tissue compression to coronal plane stability for persons with TFA while wearing a MAS®. Results from six persons with TFA who walked successively in six different MAS® socket conditions reported an incremental decrease in comfort and showed an increase in coronal plane pelvic ROM for sockets 1 to 6 (See Figure 2). Differences in length and firmness of residuum may have affected the results. A subject with a very fleshy residuum exhibited the largest variations in transverse plane rotation during swing with each socket. This study demonstrates a systematic relationship between socket comfort and stability; and contributes to an understanding of socket design that will help address problems at the interface that are reported by persons with TFA.

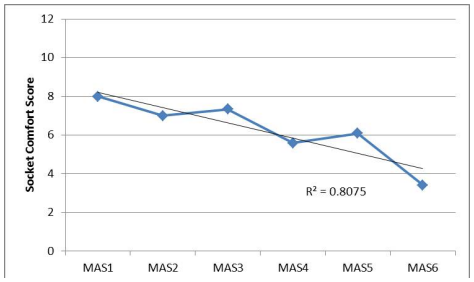

Figure 2. As supportive structure is incrementally removed in each of the 6 tested socket conditions, the Socket Comfort Score correspondingly declines.

How the MAS® Provides Comfort and Stability

R. J. Garrick, PhD

Wearers of prosthetic sockets rely on their prosthetist to create a socket with an intimate fit to provide comfort and stability. Persons with TFA who wear the MAS® report high satisfaction with comfort and stability. Structural features related to volume matching and proximal trim lines are thought to contribute to MAS® stability and comfort. Compared to other ischial containment designs, the MAS® contains without impinging on the ischial ramal complex; and by excluding the posterior aspect of the ischium provides coronal plane stability during mid-stance.

The posterior trim line located at the gluteal fold, obviates weight bearing by the gluteus maximus; the anterior trim line inferior to the anterior superior iliac spine allows nearly unrestricted range of hip motion; and the trim line of the lateral wall proximal to the greater trochanter maintains contact without gapping throughout the entire gait cycle.

Clinical fit aims for equilateral distribution of interior socket forces without local weight bearing pressures. Ortiz emphasizes that socket fit requires volumetric distribution of the residuum's soft tissue, "*Meticulous volume matching between the socket and the soft tissues of the thigh is critical to provide both quasi-hydrostatic weight bearing and excellent femoral stabilization*" (Marlo Ortiz, M.A.S.® [Marlo Anatomical Socket], 2004). The MAS® holds the femur securely in a physiologically adducted position, enabling a narrow-based, ergonomically efficient gait without gapping or loss of suction in the socket.

Mr. Rob Rieckenberg participated as a subject in NUPOC's MAS® research project. He said "*I want to do whatever I can to benefit other amputees and help them get up and walk*." Rob likes wearing his MAS® fitted by prosthetist, Robert Tillges, CPO. "*It feels like more a part of my body. It is lighter and I have more control. I trek, bike, hunt, ski and play softball*." Rob is a peer advocate of **Wiggle Your Toes**, the Minnesota-based non-profit organization that provides practical support and information for new amputees. The organization's premise is "*Recoup, recover, flourish!*" Learn more at: www.wiggleyourtoes.org.

NUPOC Welcomes Research Collaboration with Robert Tillges, CPO, FAAOP

R. J. Garrick, PhD

Robert Tillges, CPO

NUPOC welcomes the research collaboration of **Bob Tillges**, CPO/L, FAAOP. Mr. Tillges is owner and president of Tillges Certified Orthotic Prosthetic Inc. (TCOP), founded in 1992. Tillges has more than 34 years of P&O experience and is a Fellow of the American Academy of Orthotists and Prosthetists. A recognized leader in MAS® socket fitting and fabrication, Mr. Tillges has extended his expertise to collaborate with the NIDRR funded project, *Effect of Socket Characteristics on Coronal Plane Stability during Gait in Persons with Unilateral Transfemoral Amputation* (Principal Investigator **Stefania Fatone**, PhD). Collaboration with leading P&O professionals like Mr. Tillges enriches the process and outcome of the research project.

A native of St. Paul, MN, Mr. Tillges reflected on the impetus that led him to specialize in P&O, *"From about sixth grade, I began working with my father who was a self-employed homebuilder. He was very meticulous in his work and I apply the same care to my own work in P&O. I maintain high standards and TCOP provides high quality products and services. I require excellence from my technicians, like my father expected from me*."

Seamlessly integrating family and work, Mr. Tillges and his two sons, also CPOs, work together at TCOP. Tillges adheres to a family-based philosophy of patient care. Mr. Tillges said, "*I treat my patients like my family. I work for the satisfaction of my patients. If we can make their quality of life better, then we've got success. I feel satisfied when I see my patients who came in looking depressed leave my office smiling.*"

Sara Koehler, PhD, Successfully Defends Dissertation

Sara Rebecca Koehler, PhD, successfully defended her doctoral dissertation, *Neuromechanical Mechanisms of Prosthetic Knee Joint Control: Associations with Prosthetic Alignment*, submitted in the field of Biomedical Engineering in the Robert R. McCormick School of Engineering and Applied Science at Northwestern University on November 12, 2012. **Steven A. Gard**, PhD, served as her adviser and dissertation chair.

Sara Rebecca Koehler, PhD

Dr. Koehler's research, which was funded by a Merit Review grant (A7115R) through the Department of Veterans' Affairs and a fellowship through the Orthotics and Prosthetics Education Research Foundation (OPERF), explored the control strategies used by persons with transfemoral amputation to coordinate the movement of a passive prosthetic knee joint during the stance phase of gait.

As part of her work, she cross-validated the performance of an iPecs™ load cell (College Park Industries, Inc., Fraser, MI, USA), a wireless device designed to measure tri-axial forces and moments within a prosthesis, to that of a gold-standard motion analysis system. Using this load cell as part of a novel protocol to measure joint kinematics, kinetics, and residual-limb muscle activity, she subsequently characterized the response of persons with transfemoral amputation to systematic variations in prosthetic knee joint alignment during a level walking task. She then investigated the extent to which this response was exaggerated by the mechanical demands of sloped walking.

Overall, Dr. Koehler found that subjects responded to a destabilizing alignment perturbation by increasing their hip extension moment during early stance phase. In addition, subjects decreased the rate at which they loaded their prosthesis, decreased their step length, increased their trunk flexion, and maintained their limb in a more vertical posture at the time of opposite toe off. These findings suggest that to overcome a reduction in knee-joint stability, amputees rely on a combination of both kinematic and kinetic control strategies. In contrast, subjects were relatively insensitive to alignment perturbations that favored excessive knee-joint stability.

Collectively, the findings from this research provide new insight into the control options of persons with transfemoral amputation, which may have important implications for the design and alignment of lower-limb prostheses, as well as post-amputation training paradigms.

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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.

Dr. Koehler Accepts Position at Minneapolis VA Health Care System

After completing her doctoral degree, Dr. Koehler accepted a position as Research Health Scientist at the Minneapolis VA Health Care System (MVAHCS), where she is involved in a variety of research projects dedicated to improving the lives of veterans.

Together with **Andrew Hansen**,PhD, Director of the Rehabilitation Engineering Research Program at MVAHCS, she is currently working on a project to develop rocker shoes that can naturally immobilize the ankle and reduce chronic joint pain for persons with arthritis and rheumatism. She also is working on a project to assess the biomechanical contribution of adaptable prosthetic ankle joints for amputee gait.

NUPOC Welcomes Brian Robillard, BS

R. J. Garrick, PhD

Brian Robillard, BS, has joined NUPOC as a Research Assistant on the Department of Defense-funded research project (Principal Investigator, **Stefania Fatone**, PhD), *Development of Subischial Prosthetic Sockets with Vacuum-Assisted Suspension for Highly Active Persons with Transfemoral Amputations*. (See page 6.) This socket design aims to maximize flexibility without sacrificing the rigidity necessary for force transmission between the user and prosthetic limb. The current socket design is a three layer system that consists of a rigid frame sandwiched between two flexible layers. The potential benefits of an automated fabrication technique over current hand fabrication of sockets are the ability to control flexibility of the frame through gradated thicknesses. Mr. Robillard plans to utilize NUPOC's Stratasys Fusion Deposition Modeling (FDM) 400mc™, a rapid prototyping machine, as a novel way to develop transfemoral prosthetic sockets; and will help to develop an injection molding process to replicate and automate the socket fabrication process.

Brian Robillard, BS

Reflecting on BME as a career choice, he said, "*I am attracted to the beauty of combining many fields into an overarching discipline. I always enjoyed math most as a subject, but I also read widely and had considered pursuing medicine. I attended Notre Dame, where I majored in Mechanical Engineering. It appeals to me as a discipline rooted in classical engineering and acts as an entrée to all other areas. The design component is most exciting.*" Mr. Robillard is working toward a Master of Science degree in Biomedical Engineering at Northwestern University; he will integrate some of his work on the DoD project with his academic work.

Interested in Prosthetics and Orthotics (P&O) since high school, working with the DoD project team allows Mr. Robillard to apply his skills in design and problem-solving to the field of P&O. "*I love the design process, which is a combination of problem-solving and team work. In the future, I would like to focus on design and perhaps launch a medical device start-up company.*"

The third of four brothers, Mr. Robillard hails from Fresno, CA. He enjoys being outdoors and frequently hiked Half Dome in Yosemite National Park, located less than an hour from his home. He and his family enjoy frequent travel to Australia, Italy, Spain, Ireland France, and Japan. He plays soccer for enjoyment and trains as a distance runner 5 days per week. He has completed international and domestic marathons and half-marathons. He plays acoustic and electrical guitar and reads widely. Welcome to NUPOC, Brian!

NUPOC Hosts Crystal Lake South High School Science Students

R.J. Garrick, PhD

NUPOC Associate Director, **Edward Grahn**, BSME, and **R. J. Garrick**, PhD, facilitated an educational tour for more than 50 science students from Crystal Lake South High School (CLSHS) who visited NUPOC on November 27, 2012 with their science instructors, Rich Marrano, Rene Kasischke, and others.

Science students and teachers from Crystal Lake South High School visited NUPOC to learn about rehabilitation engineering for Prosthetics and Orthotics.

Students visited research stations where they learned about rehabilitation engineering for Prosthetics and Orthotics (P&O) and education and career opportunities. NUPOC Executive Director **Steven A. Gard**, PhD, provided an overview about NUPOC research

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NUPOC Hosts FSM Chicago Community Engagement Program Tour

R. J. Garrick, PhD

In conjunction with Northwestern University Family and Community Medicine's Chicago Community Engagement Program (CCEP), the Family Medicine Interest Group (FMIG), and the T. K. Lawless Society, NUPOC hosted an educational tour for 11th-grade students from the Perspectives Charter High Schools (Chicago) on December 5, 2012. Acting in accord with their school motto, "*Educating for college, preparing for life*", Perspectives Charter High School students toured NUPOC to learn about education, research, and career prospects in the field of Prosthetics and Orthotics.

CCEP engages FSM students to participate actively in community health activities and supports them with guidance and resources. Annually, FSM medical student volunteers work with CCEP to organize and sponsor internships for high school students with the objective of introducing different aspects of the medical field. With CCEP, the high school student interns practice academic, professional, and social skills that are essential for success as university students and as employees in all occupations.

Students from the Perspectives Charter High Schools learned about Prosthetics, Orthotics and human motion analysis when they visited NUPOC. From left to right: Alejandra Jacobo-Cardenas, Loren Lowery, Ashley Adams, Tia Young, Hope Jernigan, Cynthia Botello, Romanus Hutchins, Noami Hernandez, Deion Caldwell, and Crystal Onate.

NUPOC hosted this tour as part of an annual commitment to public education. NUPOC appreciates the **T. K. Lawless Society** of the Feinberg School of Medicine, **Mark Loafman**, MD, MPH, Faculty Advisor; **Amy Lu**, 2nd year FSM student; **Marynia Kolak**, MFA, CCEP Coordinator; and NUPOC's **Ingrid Masterton**, MPT, and **R. J. Garrick**, PhD, for developing this collaborative opportunity.

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and education programs, current projects and funding sources. **Craig Heckathorne**, MS, explained and demonstrated how upper limb prostheses work. **Oluseeni Komolafe**, PhD, demonstrated human gait; and, with **Rebecca Stine**, MS, discussed biomechanics and human motion analysis. **Matty Major**, PhD, presented *Clinical Outcome Measures* and instructed student volunteers in performing several tests, such as the Timed Up and Go, L-Test, Four Square Step Test, Functional Reach Test, and 10-M Walk Test.

Matty Major, PhD, instructed and supervised CLSHS students who performed Clinical Outcome Measures, such as the Functional Reach Test.

A panel of NUPOC engineers, **Kiki Zissimopoulos**, MS, Oluseeni Komolafe, PhD, Matty Major, PhD, and **Pranitha Gottipati**, PhD, responded to students' questions about education, training, and career opportunities in biomedical engineering and Prosthetics and Orthotics.

Positive feedback from the CLSHS students indicated that their experience at NUPOC was fruitful. One student commented, "*I didn't know anything about prosthetics before this trip. It is awesome to see what NUPOC is doing to help people who need prosthetic limbs. I learned about metabolic load and how difficult it can be to walk with prosthetic limbs.*"

Another student remarked, "*The motion analysis lab was really impressive. The technology helps researchers to measure movements of different joints. Data were detailed enough to solve issues of energy loss for people who wear prostheses. I didn't realize all the research and design that goes into giving someone a prosthetic limb*." Representative of many CLSHS students' experience was the comment, "*NUPOC was great, relatable, and interesting!*"

NUPOC sponsors annual learning opportunities for students who are interested in science, technology, engineering and mathematics (STEM). Exposure to issues and concepts in biomedical engineering P&O may motivate students to pursue these disciplines in the future.

Fatone Delivers Keynotes in Australia

R. J. Garrick, PhD

Stefania Fatone, PhD, BPO(Hons), was an invited keynote speaker at the ISPO Australian National Member Society Annual General Meeting in Melbourne where she presented *The NIDRR Rehabilitation Engineering Research Center for Prosthetics & Orthotics at Northwestern University*. Dr. Fatone also presented two one-day, multi-disciplinary instructional courses on the *Orthotic Management of Stroke* for the International Society for Prosthetics and Orthotics, Australian National Member Society. As part of the instructional course, Dr. Fatone also delivered a hands-on workshop, *Using Outcome Measures to Assess the Effect of Ankle-Foot Orthoses on Gait*. She demonstrated how to administer stroke-specific outcome measures and how to use these data to evaluate the effectiveness of orthotic interventions and adjustments. She delivered keynotes and workshops in Canberra on November 30 and again in Melbourne on December 3. Dr. Fatone has presented this well-received workshop to rehabilitation specialists and allied health professionals in the Philippines, Sweden and the USA.

Stefania Fatone, PhD, delivering Keynote Address at ISPO Australian National Member Society Annual General Meeting.

Fatone and Caldwell Launch Collaborative Project with Center for the Intrepid (CFI); Fatone Awarded Supplemental Funding

As the final part of a 3-year project, *Development of Subischial Prosthetic Sockets with Vacuum Assisted Suspension for Highly Active Persons with Transfemoral Amputations*, funded by the US Department of Defense (Grant #W81XWH-10-1-0744) to develop a flexible subischial prosthetic socket for highly active persons with transfemoral amputation, Principal Investigator **Stefania Fatone**, PhD, BPO(Hons), and **Ryan Caldwell**, CP/L, study prosthetist, visited the Center for the Intrepid at Brooke Army Medical Center in San Antonio, TX, from October 29-31, 2012.

Ryan Caldwell visited the CFI as part of Stefania Fatone's DoD funded research project.

The CFI is a state-of-the-art facility for US military personnel who have sustained amputations, burns, or functional limb loss during their service in Afghanistan and Iraq. CFI offers cutting-edge technologies designed to be used for rehabilitation, research, education, and training. Dr. Fatone and Mr. Caldwell worked with CFI collaborators, **Jason Wilken**, PhD, and **John Fergason**, CP, to transition the project socket technology for final performance evaluation with military subjects. During the three day visit, Dr. Fatone and Mr. Caldwell enrolled three subjects; cast, fabricated, and fit check sockets; reviewed the draft instructional manual for socket fabrication; and finalized details of the study protocol.

In December 2012, Dr. Fatone was awarded supplemental funding through the Joint Warfighter Medical Research Program (JWMRP) to augment and accelerate high priority Department of Defense (DoD) initiatives that imminently will achieve their objectives and yield a benefit to military medicine. This funding will supplement work on the *Development of Subischial Prosthetic Sockets with Vacuum-Assisted Suspension for Highly Active Persons with Transfemoral Amputations*.

Vacuum-assisted suspension uses an active pump to create a negative pressure differential between the interior of a prosthetic socket and the surface of a residual limb. The original project developed plans and submitted patent applications for three hybrid, integrated electric/mechanical pump systems that require further development to achieve full maturity and deployment within the military environment. The objectives of this supplemental funding are to prototype and test these three hybrid vacuum pumps to create suitable vacuum for prosthesis suspension in highly active persons with transfemoral amputation. Joining Dr. Fatone on this project are NUPOC postdoctoral fellow, **Matthew Major**, PhD, and NUPOC instrument maker, **Dilip Thaker**.

NUPOC News

Publications

Sensinger J, Intawachirarat N, Gard SA. "Contribution of Prosthetic Knee and Ankle Mechanisms to Swing-Phase Foot Clearance." *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 21(1)74-84, January 2013.

Presentations

Fatone S, Schweitzer J and **Gard SA.** *Perceptions of Prosthetics and Orthotics Research within the Prosthetics and Orthotics Community*. Poster Presentation, American Academy of Orthotists and Prosthetists (AAOP) 39th Annual Meeting and Scientific Symposium, Orlando, FL, February 20-23, 2013.

Fatone S, Stine R, Tillges R. *Effect of Socket Characteristics on Coronal Plane Stability during Gait in Persons with Unilateral Transfemoral Amputation*. Paper presentation, American Academy of Orthotists and Prosthetists (AAOP) 39th Annual Meeting and Scientific Symposium, Orlando, FL, February 20-23, 2013.

Fatone S, Howell J, Caldwell R, Komolafe O, Stine R. *Role of Socket Design, Flexibility and Suspension in Transfemoral Sockets during Walking*. Poster Presentation, American Academy of Orthotists and Prosthetists (AAOP) 39th Annual Meeting and Scientific Symposium, Orlando, FL, February 20-23, 2013.

Wynne J, **Fatone S,** Bertram C, Coulter C, Kaluf B. *Organized Session: Learn Patient Reported Outcomes for your Adult and Pediatric Patients*. 39th Academy Annual Meeting and Scientific Symposium of the American Academy of Orthotists and Prosthetists, Orlando, FL, February 20-23, 2013.

Grant Submissions

Boutwell E. *How Prosthesis Stiffness Influences Impact Forces during an In Vivo Impact and Level Walking*. Fellowship Resubmission to the Orthotic and Prosthetics Education and Research Foundation (OPERF), January 18, 2013.

Fatone S and Bjornson K. *Orthotic Management of Gait in Cerebral Palsy: Effect of Footwear Modifications*. R21 application submitted to NIH, February 16, 2013.

Gard S. *Effect of Prosthetic Foot and Ankle Stiffness on Standing and Walking*. Submitted to Department of Veterans Affairs, Rehabilitation Research & Development Service, December 2012.

Gard S and **Casanova H**. *Evaluation of a Vacuum-Based Impression and Alignment Device (V-BIAD)*. Submitted to Department of Veterans Affairs, Rehabilitation Research & Development Service, December 2012.

Gard S, Major M, Gottipati P. *Estimating Post-Stroke Hemiplegic Gait Stability Using Nonlinear Dynamic Analyses*. Submitted to NIH/NICHD on October 15, 2012.

Major M. *Sensory-Motor Mechanisms Underlying Fall Risk in Transtibial Amputees*. Career Development Award (CDA-2) Application submitted to Department of Veterans Affairs, Rehabilitation Research & Development Service, December 2012.

Wu Y and **Gard S.** *Development and Evaluation of an Improved Method for Prosthetic Alignment*. NIDRR Field Initiated Proposal, submitted the Department of Education, January 18, 2013.

Letter of Intent Submissions

Fatone S, Major M, Hansen A**.** *Determining the Causes for Falling in Veterans with Lower Limb Amputations*. VA Letter of Intent resubmitted for the March 15, 2013 due date.

NUPOC-IS Volunteers Improve Lives in Guatemala

R. J. Garrick, PhD

This is the fourth consecutive year that **NUPOC International Service (NUPOC-IS)** prosthetists and orthotists have volunteered their clinical skills at the Range of Motion Project-Chicago (ROMP) clinic in Zacapa, Guatemala. **Melinda Thorpe**, CPO, directs the NUPOC-IS outreach and **Robert Lipschutz**, CPO, served as the 2012 NUPOC-IS team leader.

Nine individuals (see photo) from NUPOC raised funds to cover their transportation, accommodations and other expenses. Some NUPOC-IS participants also generated donations of prosthetic and orthotic components that they contributed to ROMP. Mr. Lipschutz and the NUPOC-IS group worked collaboratively with ROMP staff to custom design thermoplastic orthoses and prostheses for Guatemalan clients, many of whom traveled long distances to receive P&O treatment.

NUPOC-IS volunteers provide supervised services and products to Guatemalans who need prosthetic or orthotic treatment. Participants practice their P&O skills and observe immediate improvement in their ROMP clients' quality of life. **Larissa Conner**, CO, a NUPOC graduate and participant in the 2012 service trip, fitted one transtibial and three transfemoral prostheses. Ms. Conner said that she enjoyed helping her clients regain mobility and independence. "*This was a great experience. I felt thankful to see problems that I could address and improve people's lives. I'd like to do it again.*"

NUPOC-IS 2012 participants at the ROMP Clinic in Zacapa, Guatemala. Front row, from left: Elsa Orellana, Vivian Aragon, Karen Acevedo, Glendy Salguero, Jesse Albright; Larissa Conner; Liz Chabot, and Scott DeMelo (reclining); and Jessica Driscoll (seated front). Not shown is Kelly Simon.

Back row, from left: Carlos Levi Larios, Robert Lipschutz (2012 team leader); Katie Antle-Johnson; Dave Krupa (ROMP co-founder); Nicholas Denroche, Vinicio Ortiz, Jonathan Naber (founder of Illini Prosthetic Technologies (IPT) and Open Socket-technology Prosthetic Arms), and Luis Aragon.

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Craig Heckathorne, MS, Presents Live Webinar

R. J. Garrick, PhD

More than 30 individuals nationwide attended a live webinar presented by **Craig Heckathorne**, MS, Research Engineer, on November 29, 2012. Mr. Heckathorne presented *Prosthetics for Farmers and Ranchers: What Is Used and What Is Needed* for the AgrAbility Virtual National Training Workshop. Co-authors of the work are **Kathryn Waldera, Margaret Parker**, and **Stefania Fatone**. Paul Jones, National AgrAbility Project Manager, moderated the webinar, which attracted a national audience of participants from Maine to California. Attendees also tuned in from Wyoming, Colorado, Kansas, Utah, Missouri, West Virginia, Minnesota, North Carolina, Illinois and Indiana to attend Mr. Heckathorne's webinar.

Craig Heckathorne, MS, presenting webinar for the AgrAbility Virtual National Training Workshop.

An interactive question and answer session followed the presentation. Mr. Jones asked, "*How can the state AgrAbility projects assist you in expanding the pool of interviewees?*"

Mr. Heckathorne replied, "*The state and regional AgrAbility Projects and their affiliated collaborators can help us by making the survey known to farmers and ranchers with amputations. Farmers and ranchers who participate in the survey can help to improve our understanding of their problems using prostheses.*"

Webinar participant Vicki Janisch inquired, "*How might you deal with the survey tool distribution if internet is limited or if clients have no computer experience?*"

Mr. Heckathorne responded, "*We will make the survey available on SurveyMonkey® and in printed form. Online, the survey is automatically tailored to farmers or ranchers, upper limb and lower limb amputations, and unilateral and bilateral amputations. The online survey is relatively compact and relates to the individual responder. The printed form is more cumbersome and is manually tailored to each individual.*" Additional interactions addressed questions of durability for prostheses used in agricultural work and conditions of material and device failure.

Mr. Jones concluded the webinar, "*Your talk has been helpful and interesting. We will continue to work with you to get the word out to state and affiliated AgrAbility programs.*"

This webinar is archived and accessible at: www.AgrAbility.org/Online-Training/archived/2012virtualntw.cfm.