RESEARCH, MENTORING, AND VESTIBULAR AND CONCUSSION ASSESSMENT

A BALANCING ACT

BY JOSCELYN MARTIN
The American Academy of Audiology Foundation (AAAF) has partnered with the Academy to support the Research Grants in Hearing and Balance program (formerly known as the Academy Research Awards) since 2003. As part of the Foundation’s efforts to promote innovative audiology research, Audiology Today periodically features interviews with past recipients of Foundation research funding.

Julie Honaker, PhD, was awarded a 2008 New Investigator Research Grant for her project, Gaze Stabilization Testing for Predicting Fall Risk, while receiving a post-doctorate fellowship at Mayo Clinic in Rochester, Minnesota. She is now an assistant professor at the University of Nebraska-Lincoln (UNL), and has since mentored three students who also have received Academy Research Grant funding. Joscelyn Martin, AuD, former Foundation Board Trustee, recently spoke with Honaker to find out how the Foundation’s support affected her research and her career, and why she feels it’s important to share her passion for research with her students.

Joscelyn Martin (JM): It’s a pleasure to talk with you, Julie. It has been a few years since we have had a chance to connect, so let’s begin with a recap of the post-doctoral research you were working on at Mayo.

Julie Honaker (JH): Absolutely. My project was evaluating a functional measure of the vestibular system, the Gaze Stabilization Test. My hypothesis was that this particular functional vestibular measure would be sensitive to identifying individuals with a previous history of falls, and might lead to a new objective tool for falling-risk assessment. Falling-risk assessment is a major focus of my research, since it is a critical component of preventative care.

The Foundation grant was my first major grant, and it helped to launch my career. I started my work at Mayo Clinic and completed the project at the University of Nebraska-Lincoln, where I am currently an assistant professor. I found that the Gaze Stabilization Test is a sensitive measure for identifying individuals with a history of falls. However, if we use this measure in combination with another performance-based tool, specifically the Dynamic Gait Index, it actually has optimal sensitivity and specificity for identifying falling risk. Therefore, it led to the development of a clinical falls-risk protocol for audiologists and physical therapists.

That’s really pretty neat. And I love how you have that preventive umbrella that guides your research. Have you done any follow-up projects on this specific topic?

One of my students, Choongheon Lee, received the 2012 Vestibular Research Summer Fellowship for his project, Development of a Bedside Gaze Stabilization Test. For his project, we developed a low-cost way to functionally evaluate the vestibular system, with a “bedside” Gaze Stabilization Test. The intention was to develop a screening tool that could be used for fall risk and identification of vestibular dysfunction. Choongheon has a background in electrical engineering, so we worked to develop a low-cost accelerometer that could be used to monitor head velocity and head amplitudes, similar in design to the Gaze Stabilization Test. We tested and piloted it in a normal population. We wanted to first answer questions such as how reliable is it? Is it picking up what we intended it to pick up? We found it was highly reliable and his work on this project was published. Very exciting!
Do you plan any future work on the same topic? Applying the bedside Gaze Stabilization Test to falling risk is ongoing work, but we’re also exploring research in another area on head injury and concussion. So we’re collaborating with other universities to look at this low-cost alternative to determine if this could be a reliable indicator for concussions and to also monitor vestibular function over time.

In addition to Choongheon, you mentor several other students who have received funding from the Foundation. Would you like to tell us a little bit about their projects as well?
I always encourage students at the AuD and PhD level to apply for these grants, and I have helped three other students receive funding from the Grants in Hearing and Balance program. I try to get students to appreciate research early in their careers and to understand the importance of research for our profession. The three students who have received funding are conducting research with student-athletes to answer concussion-related questions.

Robin Criter received the 2013 Vestibular Research Student Investigator grant for her project Characterizing Effects of Anxiety on Postural Sway in Collegiate Athletes. Before I discuss her project, I would like to briefly discuss the three current recommendations for standard clinical assessment that are recommended following head injury. One is a neuro-cognitive measure, a paper-and-pencil test, or computerized program that can be used for baseline and post-concussion assessment. The second is a checklist for symptoms that the individual may have following head injury. The third component is a postural control measure to monitor body sway, typically with high-technology equipment such as computerized dynamic posturography. There are also lower technology standing-balance tasks for use in assessment, such as standing on a flat surface and standing on a piece of foam, that can document changes in body sway.

Criter is exploring the impact of anxiety on postural control in collegiate athletes. We know that anxiety correlates with changes in postural control in other populations, leading to increased body sway. This can put an individual at increased risk for injury. So Criter is looking at what happens overall for individuals who have a history of anxiety, as anxiety is a leading concern for physicians and clinicians treating student athletes. Specifically, her work is getting a really good snapshot of changes in their overall postural performance across an athletic season (preseason, mid-season, and end-of-season). And, she is trying to answer if this could lead to more specific information about change after a head injury, so her work is looking at these variables. She has validated anxiety measures that she’s using to monitor levels of anxiety in these individuals.

Interesting work! And you have two other students who received funding this year, correct?
Yes, that’s correct. Jessie Patterson received the 2014 Vestibular Research Student Investigator grant for her project, Characterizing Effects of Fatigue Following Physical Exertion on Dynamic Visual Acuity Test in Collegiate Athletes. With current sideline postural control testing, it has been documented that a rest period of upwards of 15 minutes following physical exertion is needed to mitigate the effects of fatigue. Unfortunately, this is not feasible on the sideline, as physicians and athletic trainers need immediate confirmation of potential head injury. This led to her project, where she is looking at the effects of fatigue following physical exertion on a vestibular measure, the Dynamic Visual Acuity Test, to determine its potential inclusion as a sideline concussion measure. Patterson has a control group and a physical exertion group. She’s collecting data now on collegiate athletes at UNL. As part of her testing, athletes receive pre-testing dynamic visual acuity and then, immediately following a 20-minute period of either rest for the control...
group or a known protocol for physical exertion, they will have dynamic visual acuity tested again. Then, there is an additional testing period after 10 minutes. She has just started collecting data and I look forward to her results.

The last student researcher I am working with is Diana Weissbeck, who received the 2014 Student Summer Vestibular Research Fellowship for Development of a Head-Shake Postural Control Protocol for Potential Use in Concussion Assessment. She is examining a low-technology head-shake posturography protocol for future incorporation into concussion management. Withstanding postural control testing for concussion assessment, ceiling and floor effects have been observed on portions of the testing. She hopes that her new protocol will provide a better means of monitoring postural control.

Typically, head-shake posturography is used with computerized dynamic posturography equipment that is very expensive. She has a low-cost alternative, using an inexpensive rate sensor to monitor head movements. She uses a laser pointer to monitor head exertion, and she has athletes perform standing balance tasks on a flat and foam surface with horizontal and vertical head movements. For this study, she is looking at the overall reliability of this new head-shake measure, collecting normative data, and trying to determine if there are any ceiling or floor effects with the addition of the head-movement tasks. Most of our balance measures are in a population who are not experienced athletes. They don't have high performance levels, so we've had to up the ante. With this research, we think about what an athlete is capable of doing and, since they do so well on our typical measures, we're trying to systematically make them more challenging to see if we can pull out abnormalities after head injury.

I'll look forward to learning what your students are discovering. As a matter of fact, I work with some of your former students, and they talk about how mentoring is very important to you. Tell me about your role as a mentor to these student researchers and why it's so important.

I've benefitted so much from my mentor experiences with Drs. Neil Shepard and Jeffrey Staab at the Mayo Clinic. Having them guide me through the research process, from the conceptualization of a research question and the overall design, to executing the study and disseminating the findings, has been so rewarding for me. I really enjoy passing this on to my students and helping them appreciate research. The best way to appreciate research is by immersing yourself in the entire process, and that's what I try to do for my students. I want them to become independent, critical thinkers and to truly take ownership of a research project. I'm here to guide them as they make the project their own. It's rigorous and they know it's time intensive, but it teaches them to appreciate all aspects of the research process.

Wonderful. Now as a quick side note, when it comes to mentoring the next generation of scientists, I understand that it's a family affair. Your daughter participated in a school science fair as well this year, right? Can you tell us about that?

Last year, my daughter was in kindergarten, and we worked together on a school science fair project. I went about it the same way I would with any student, I asked her to think about things she was passionate about, which happens to be our three dogs. For her project, she developed a research question and investigated the difference in how loud our dogs’ barks were in response to various stimuli, such as the doorbell. It was great fun, and she loved talking to the judges about her project at the science fair.

You really can apply the same mentoring principles that you use in your work everywhere!
I understand that your lab has moved, and you are now part of the Center for Brain, Biology, and Behavior, right? It sounds like you’re fostering an incredible opportunity for new partnerships. Can you tell us about some of the collaborations that you’ll be working on with other departments?

I’ve been very fortunate. In November 2013, we moved over to the Center for Brain, Biology, and Behavior. We refer to it as CB3, which is a nice little acronym.

There’s always an acronym, isn’t there?

Of course! What’s great, particularly for my balance and concussion work, is that my lab is housed in the football stadium. We have prime access to the population we’re testing. When I first came to the University, I had to build a lab and find that population. Now that population is right here, which is ideal.

To give you a little background on the stadium, about four years ago, the idea of this research complex was born. They really wanted to have a facility exploring the mechanisms related to concussions, and another portion dedicated to athletic performance. Through this joint collaboration, we’re able to integrate these two sides looking at the mechanisms involved in concussions, as well as to promote the long-term health and well-being of the student athletes. I work with researchers within these labs, and actually the director of CB3 is Dr. Dennis Molfese. He brings expertise on brain-recording techniques to study the cognitive functions and interventions for head injury.

Dr. Judy Burnfield is the director of the Nebraska Athletic Performance Lab and she is a physical therapist by background. She really has filled out the team for biomechanics and human performance.

You definitely have a unique lab with a wide range of equipment and collaborations.

Indeed. We have close ties with the Department of Athletics, interfacing weekly to monthly. Aside from the research, I can now provide a unique clinical opportunity for doctor of audiology students at UNL. I’ve worked closely with the head athletics physician, and we now provide clinical audiology services for the student athletes. Looking at the balance and vestibular components in athletes, our students are able to collect baseline information from the athletes and then re-evaluate them after head injury.

The students must enjoy working with a different type of population, too.

It’s been really fun for the students and me. When I developed a five-year plan years ago, I never would have imagined where I am today. I’m thankful that this opportunity presented itself and that the students are able to be here with me. I’m really grateful. Hopefully, these types of innovative collaborations are a trend for audiology.

THANK YOU!

In 2009, the AAA Foundation embarked on a partnership with the American Institute of Balance (AIB) Education Foundation, Inc., that has resulted in increased funding for student research on vestibular topics. The Foundation thanks Dr. Richard Gans, AIB CEO, for the grant funding that has supported these student research projects.

2010
Jessica Pierce
East Carolina University, Morphological Correlates of Gravity Receptor Functional Aging

2011
Gary Gaines II
AuD/PhD candidate, East Carolina University, Neural Generators of Mammalian Vestibular Responses to Linear Head Motion

2012
Choongheon Lee
University of Nebraska-Lincoln, Development of a Bedside Gaze Stabilization Test

2013
Robin Criter, AuD
University of Nebraska-Lincoln, Characterizing Effects of Anxiety on Postural Sway in Collegiate Athletes

2014
Jessie Patterson
AuD/PhD student, University of Nebraska-Lincoln, Characterizing Effects of Fatigue Following Physical Exertion on Dynamic Visual Acuity Test in Collegiate Athletes
That actually leads to my next question. What other trends do you see for the future of vestibular research? With the dawn of the video-head impulse test, and knowing what we know about vestibular-evoked myogenic potentials (VEMPs), we really have a unique opportunity to incorporate objective measures to evaluate all of the sensory organs of the vestibular system. I really think it is going to broaden the populations we're able to evaluate, and the clinical research questions that we can answer. I think that the future is very bright for vestibular assessment.

Do you have any advice for future researchers who are just starting their careers?
This is my advice for future researchers: “Never, never, never give up.” I try to encourage students to integrate research early and often, and never give up. Keep reaching for your dream, whatever that might be. Keep making goals and setting new ones.

Supporting new investigators and student researchers is an important part of the AAA Foundation’s work. Can you talk about what the Foundation’s grant has meant to you and your students’ research?
I would say that it’s been the foundation in launching my program. I’m forever grateful for the AAA Foundation, not only for funding the work that I did, but also facilitating my students’ projects. Even students who have not received the award but have applied have had such a rewarding experience. I highly encourage any student or new investigator to seek out opportunities like this.

Thank you, Julie, for sharing about the exciting research that you and your students are conducting. And thanks, too, for sharing about how the Foundation had a positive impact on your career. We hope that learning more about your work will inspire others to apply for one of the Foundation-funded grants. Thank you for giving me the opportunity to share with AT readers the exciting research my students and I are conducting.

Joscelyn Martin, AuD, is a past member of the board of the American Academy of Audiology Foundation and an instructor of audiology at the Mayo Clinic in Rochester, Minnesota.

For more information on the Academy’s Research Grants in Hearing and Balance, visit www.audiology.org and search keyword “research.”