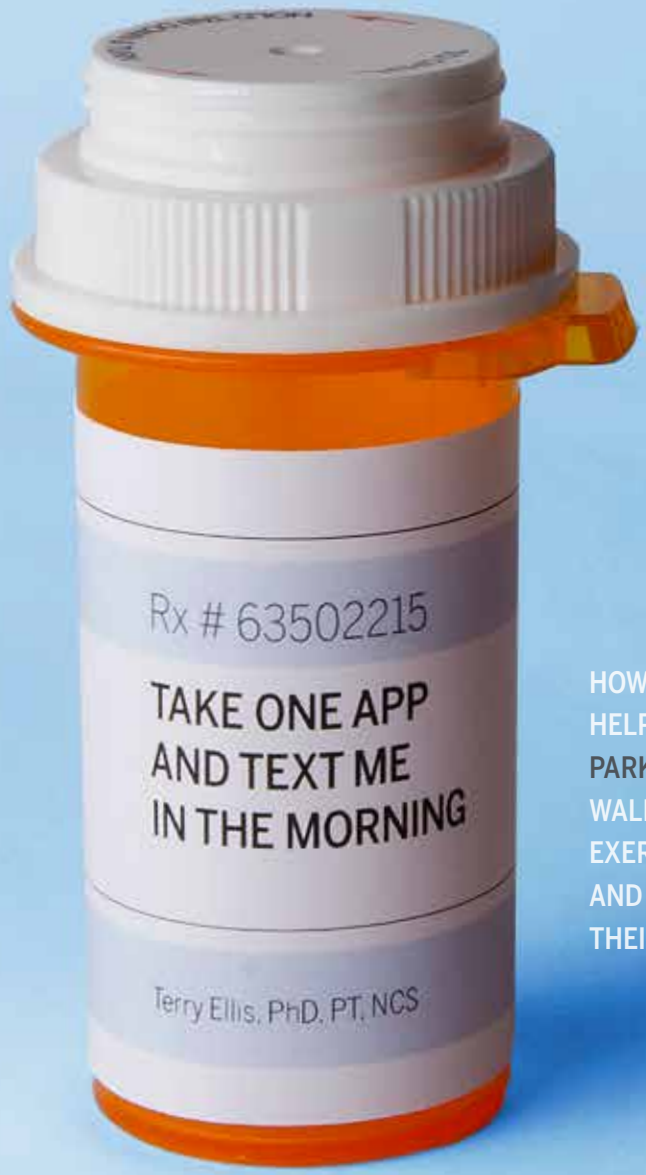
2014-2015

InsideSARGENT

Boston University College of Health & Rehabilitation Sciences: Sargent College



HOW AN IPAD APP HELPS PEOPLE WITH PARKINSON'S DISEASE WALK FASTER, EXERCISE MORE, AND KEEP THEIR INDEPENDENCE

BOSTON UNIVERSITY

Contents

2014–2015

DISCOVERY

Sargent is taking health care high tech

IN THE WORLD + STUDENT EXPERIENCE

ALSO IN THIS ISSUE

ONLINE EXTRAS

Brain Strain
See how communication works in the brain, and how it can go wrong at **go.bu.edu/sargent/inside-sargent**.

Faculty Honors
Keep track of Sargent faculty achievements at **www.bu.edu/sargent/news-releases**.

A Source for Research News
Bookmark **www.bu.edu/sargent** for regular research updates. Current work includes a study on the benefits of walking for those with or at risk for osteoarthritis.

Getting Personal
Julie Keysor explains how her own experience with arthritis drives her work at **go.bu.edu/sargent/inside-sargent**.

InsideSARGENT
2014–2015

Follow BU Sargent College on:
facebook.com/busargent
instagram.com/busargent
twitter.com/busargent
youtube.com/busargent

The 2013–2014 issue of *InsideSARGENT* received the gold award in the research publications category of the Council for Advancement and Support of Education (CASE) Circle of Excellence, the advancement field's premier international awards program.

Dean
Christopher A. Moore, PhD

Communications Manager
Stephanie Rotondo

Editor
Lara Ehrlich (UNI'03)

Contributors
Tricia Brick, Sheryl Flatow, Rachel Johnson (MET'11), Julie Rattey, Corinne Steinbrenner (COM'06), Andrew Thurston

Designer
Hy Zhitnik

Cover photograph by Steve Prue

Produced by Boston University Marketing & Communications

About
InsideSARGENT is a publication of Boston University College of Health & Rehabilitation Sciences: Sargent College. For additional copies or more information about BU Sargent College, contact Stephanie Rotondo at rotondos@bu.edu or 617-353-7476. Visit us at www.bu.edu/sargent.

Boston University is an equal opportunity, affirmative action institution.

Printed on FSC-certified paper.

Please recycle this publication.

Dean's Message

"This issue of *Inside Sargent* highlights some of the ways the Sargent community is employing cutting-edge technology to make a meaningful difference in the lives of others."

Dear Friends,

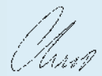
I am honored to provide a foreword, my first, for this issue of *Inside Sargent*. After nearly twenty years in academia and seven years in the federal government, most recently at the National Institutes of Health and the Department of Veterans Affairs, I've witnessed the evolution of health and rehabilitation from the perspectives of clinician, researcher, and academic. Now as dean, I am impressed to see these specialties come together so seamlessly at Sargent to provide a well-rounded, interdisciplinary education for our students. In particular, the College's emphasis on technological advancement and rehabilitation science is a true testament to its commitment to academic excellence.

This issue of *Inside Sargent* highlights some of the ways the Sargent community is employing cutting-edge technology to make a meaningful difference in the lives of others. Faculty and students at the College's more than 25 on-site research labs and clinical centers are studying and treating complex disorders, such as dyslexia, autism, muscular dystrophy, and Parkinson's disease. They join our alumni in finding innovative ways to address these conditions. As you will read in the cover story, a faculty member is using an iPad app to increase exercise adherence for people with Parkinson's. An alumnus is helping an injury-riddled NBA team reach a new performance peak. And a sophomore has leveraged her dual interests in speech and engineering to implement a new interface for people with paralysis to control their environments.

There's no doubt that technology will continue to shape the future of our profession, but the stories in this issue highlight more than just rehabilitation science in action. As techniques and technologies change, our focus on educating the next generation of health care leaders while improving the lives of our patients and community will remain steadfast.

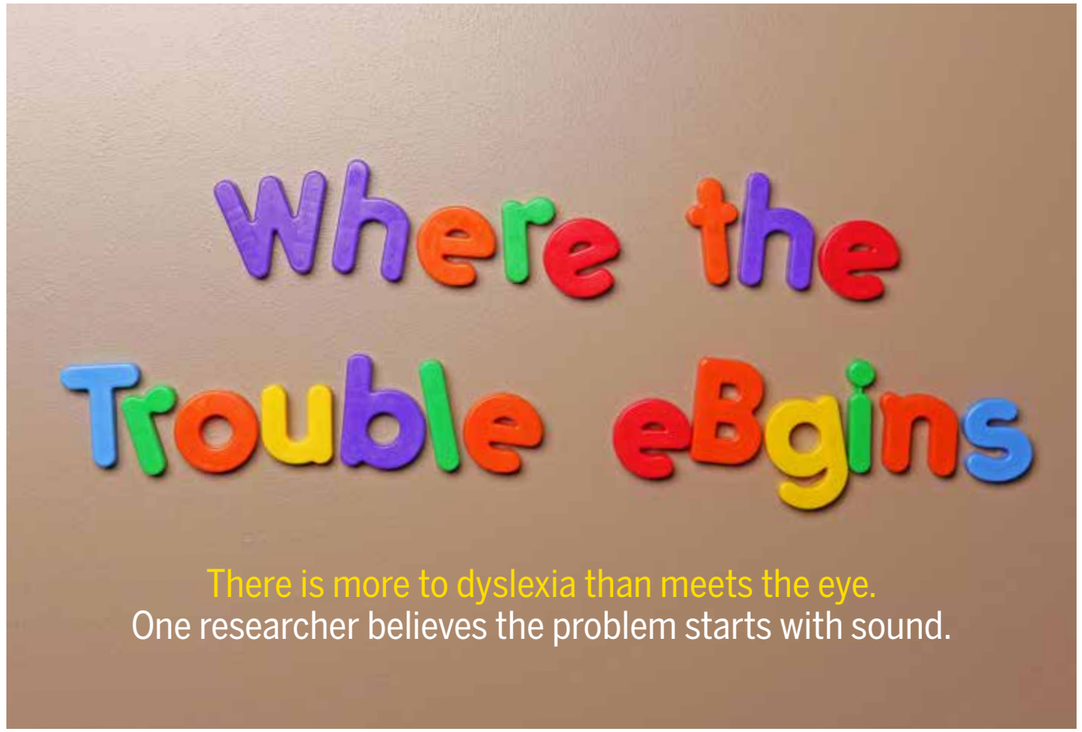
In my short time at Sargent, it has become clear to me what you already know: Sargent College is an exciting and invigorating place to be. I'm thrilled to be a part of this dynamic community, and I look forward to your insight as we continue our mission of fostering critical and innovative thinking to best serve the health care needs of society.

With warm regards,



Christopher A. Moore
Dean and Professor

BOCHICCHIO PHOTOGRAPHY



STEVE PRUE

READING IS A COMPLEX SKILL: you move your eyes across a page, sound out words, recognize visual patterns, retain information, and build sentence structure. There are lots of places where things can go wrong. And for people with dyslexia, who have no trouble comprehending spoken language, what goes wrong is their ability to decode words in print.

"There is something fundamentally different about the way their brains handle language that permits spoken communication, but makes written communication challenging," says Tyler Perrachione, an assistant professor of speech, language & hearing sciences. The difference, he believes, may be in the way their brains process variability, or variations in word sounds.

Researchers have identified two hypothetical—and historically competing—models to explain how the typical brain processes variability. According to the episodic model, the brain recognizes speech by comparing it to specific words it has heard before.

According to the abstractionist model, the brain strips away variability to access the underlying, or abstract, sounds of the words. When listening to speech, the brain also develops a catalogue of information about the speaker's voice; as the voice becomes more familiar, the speaker's words become simpler to understand. If two people with different accents speak the word *phone*, for example, the listener's brain removes the accents to focus on the phonology, or the fact that *phone* is constructed of the phonemes (speech sounds) *f*-*ō*-*n*. It is here that Perrachione thinks the trouble begins for individuals with dyslexia.

When shifting from listening to reading, an individual must match word sounds to letters, recognizing that the *f* sound in the word *phone* is the same as in the words *floor*, *finish*, and *physical*. Because letters can combine in many ways to represent speech sounds, learning to read relies on having strong abstract representations of these sounds in the brain.

While researchers habitually debate which model the brain uses to process speech, Perrachione believes that the typical brain employs both: the abstractionist model enables it to recognize words more efficiently, while it can fall back on the episodic model to recognize words with more effort. In his research, Perrachione aims to discover whether individuals with dyslexia rely on one of these models at the expense of the other.

In collaboration with colleagues at Massachusetts Institute of Technology and Massachusetts General Hospital, Perrachione used functional magnetic resonance imaging (fMRI) to measure the brain metabolism of first- and second-grade children with and without dyslexia.

continued from previous page

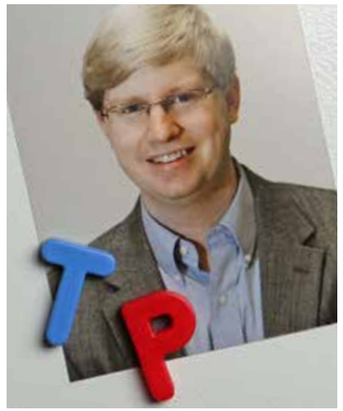
He instructed the children to read a series of words to themselves and press a button when two consecutive words began with the same sound. Perrachione found that children with typical reading skills showed more metabolic activity in areas of the brain that are related to reading and language. They also showed more activity in areas related to hearing because they heard the words in their heads when reading silently.

In the same study, children with dyslexia activated smaller areas of their brains. "When children with dyslexia are reading words and making decisions about sound, they're bringing their language network online less than children without dyslexia," Perrachione says. They're not activating the sound areas because they have difficulty connecting the phonemes to the printed words; for instance, they have more difficulty recognizing that the word *phone* comprises the sounds *f-ō-n*.

Typical readers use both methods of processing language, Perrachione says, which allows them both to recognize new words and to process familiar speech efficiently. They compare only unfamiliar speech to their catalogue of stored words. Children with dyslexia seem to compare every word to their catalogue, which requires their brains to exert more effort.

"If they don't have the abstract phoneme representations of speech sounds to serve as an intermediary, then it's harder to get to the word," Perrachione says. "It's being blocked by not having a good way to translate between print and speech." Perrachione's goal is to devise training strategies to help children with dyslexia perform this translation process, enabling them to read more quickly and efficiently.
–Lara Ehrlich

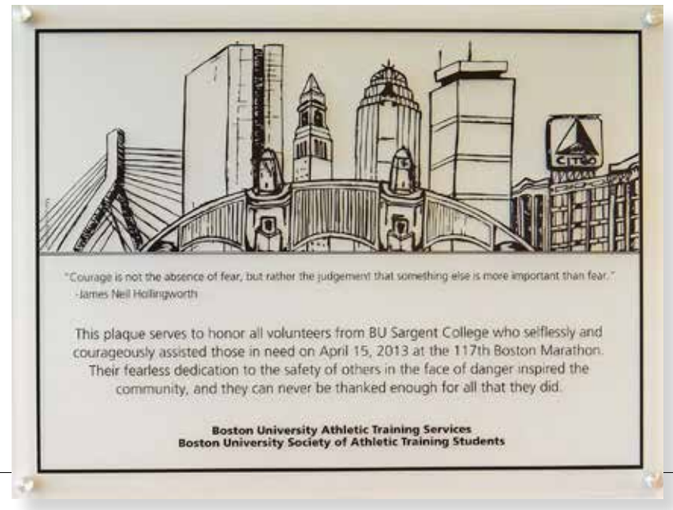
"When children with dyslexia are reading words and making decisions about sound, they're bringing their language network online less than children without dyslexia."
–Tyler Perrachione



WebExtra
Tyler Perrachione explains how communication works in the brain at **go.bu.edu/sargent/inside-sargent.**

SARGENT HONORS MARATHON VOLUNTEERS

When the finish line at the 2013 Boston Marathon became the front line in a bombing attack, 16 Sargent athletic training students and their faculty mentors went from volunteers to first responders in an instant. Their training kicked in as they transported victims in wheelchairs to first aid tents and ambulances, performed triage, and comforted the injured amid the chaos. Following the marathon, the Boston University Society of Athletic Training Students (SATS) commissioned a plaque in honor of the volunteers' courageous service. "It was important to recognize everyone—including the preceptors and athletic trainers from BU—who was present that day," says SATS President Ryan Birchall ('14), who organized the proposal for the plaque and commissioned the art by Marianne Ritterova ('14). The plaque, which now hangs on the second floor of the Sargent building, exemplifies the College's mission to educate students who are both prepared and willing to serve their community in even the most unimaginable circumstances.



TOP: STEVE PRUE; BOTTOM: KELLY DAVIDSON SAVAGE

CHITOSE SUZUKI

ATHLETIC TRAINING FACULTY HONORED

In 2014, three Sargent athletic training faculty were honored for making significant contributions to the profession. **Mark Laursen**, a clinical associate professor of athletic training and director of BU Athletic Training Services, was named the 2014 Athletic Trainer of the Year by the Athletic Trainers of Massachusetts (ATOM). **Larry Venis**, an adjunct faculty member and head athletic trainer, was elected to the ATOM Hall of Fame, and **Sara Brown**, clinical associate professor and director of athletic training programs, was named a 2014 Most Distinguished Athletic Trainer by the National Athletic Trainers' Association.

WebExtra
Keep track of all faculty achievements at **www.bu.edu/sargent/news-releases.**

TOP AWARDS

Julie Keysor, associate professor and director of Sargent's Center for Enhancing Activity & Participation among Persons with Arthritis (ENACT), has been elected chair of the Physical Activity Work Group of the Osteoarthritis Action Alliance. **Joan Salge Blake** ('84), a clinical associate professor of nutrition, has been named a fellow of the Academy of Nutrition and Dietetics, the world's largest organization of food and nutrition professionals. **Elizabeth Gavett**, a clinical associate professor of speech, language & hearing sciences, has been named an American Speech-Language-Hearing (ASHA) Fellow. **Terry Ellis**, an assistant professor of physical therapy and athletic training, has received a research award from the American Physical Therapy Association.

BU NAMED AMONG WORLD'S BEST

For the second year in a row, BU's health and medical education programs have been named among the best worldwide in the 2013–2014 *Times Higher Education* World University Rankings, conducted by Thomson Reuters. The influential survey ranked BU 22nd for clinical, pre-clinical, and health programs. To compile the ratings, the *Times Higher Education* reviews five areas: teaching, international outlook, research, research income from industry, and citations of faculty research. BU received an overall score of 74.8 out of 100, and a score of 95.8 for the citation of research influence, which accounts for the number of times a university's published work is cited by scholars globally.

NEW FACULTY AND A PROMOTION

Sargent welcomes three new assistant clinical professors and congratulates one faculty member on her promotion. In health sciences, **Shelley Brown** (SPH'07), who studies effective policy interventions and governance issues related to noncommunicable diseases, was promoted to assistant clinical professor, and **Bria Dunham**, a biocultural anthropologist who applies evolutionary anthropology to global public health, joined the department. **Laura Driscoll** ('99, '01), who specializes in critical care and geriatrics, joined the physical therapy & athletic training department, and **Robin Newman** ('11), who specializes in self-care management for cancer survivors, has become a member of the occupational therapy department.
All appointments as of August/September 2014

SCRAMBLED SIGNALS

GOING DEEP INTO THE BRAIN TO ANALYZE THE WIRING AT THE ROOT OF AUTISM

BY ANDREW THURSTON

WHEN YOU MULTITASK, the front of your brain is performing all sorts of acrobatics. As you flit between reading this article and scanning your email, from listening to a colleague to swigging your coffee, your prefrontal cortex is controlling the many signals darting through your head—some don't travel far; some do, following connections that stretch all the way back to your neck. Your attention glides smoothly from article to email, from colleague to cup.

This all assumes you don't have autism. In 2010, Basilis Zikopoulos, a research assistant professor, helped lead a study that found the prefrontal cortex of adults with autism is overloaded with connections, but that relatively few axons—the formal name for the brain's wires—stretch from it to more distant regions. People with the disorder battle an overwhelming cacophony of signals at the front of the brain and relative silence throughout the rest.

Zikopoulos points to a section of the prefrontal cortex that is particularly affected by autism. "The anterior cingulate cortex is implicated in many processes, but primarily in attention and emotions," he says. When noise in this area becomes excessive, "it's very difficult to direct attention. And when the long-distance connections are weak, you get poor communication between distant areas, such as the parts of the brain dealing with your senses." The signals become scrambled, causing problems with attention and social and emotional interactions. Having identified the distinctive connectivity of the brains of adults with autism, Zikopoulos wants to discover when—and how—the problems begin.

As part of a new National Institute of Mental Health–funded study, Zikopoulos will have access to 30 pediatric brains—15 from children who had autism, 15 from those who didn't. He hopes to be able to build on the earlier findings to draw a time line of autism, tracing its development and progression from before birth to adulthood.

For the next five years, Zikopoulos and a team of researchers at Sargent's Neural Systems Lab, including the lab's director, Professor Helen Barbas, will scan just about every square micrometer of the frontal lobes from those 30 brains. Using electron microscopes that can magnify a sample up to 100,000 times, researchers will be able to scrutinize not just individual axons, but details like the insulating layer surrounding them and the mitochondria—cell energy producers—inside them.

"I can see how neurons communicate with each other. We stain for specific proteins to see whether an axon or a neuron is inhibitory or excitatory; in other words, if it's a stop or go signal in the brain," says Zikopoulos. "A handful of labs in the world can look at the brain as a whole—all the way down to molecules and synapses. We're one of them." There are many theories about what causes autism and when the disorder starts to distort the brain's connections, but nobody knows for sure. Genes have been implicated, but are only responsible for about 10 percent of cases. It's possible the brain might begin to misconnect very early in development—during neurogenesis, the very birth of our neurons—or perinatally when axons begin to grow.

"A handful of labs in the world can look at the brain as a whole—all the way down to molecules and synapses. We're one of them."
—Basilis Zikopoulos

One of the reasons for this uncertainty is that it's difficult to study the human brain in action. Scanning techniques such as MRI are imprecise—results have been compared to a map that only shows the brain's superhighways, not its side roads. "It's hard to connect behavior to molecular, neurochemical, or other features of the brain," says Zikopoulos. "I would have to observe a person's behavior, then take the brain out and slice it."

The other reason for so much conjecture about how the human brain functions is that there just aren't that many donated postmortem brains out there. The 30 brains Zikopoulos will have access to is, therefore, "a pretty high sample size for postmortem tissue studies," he says. "We'll be looking at different brain areas at different ages and stages of development."

After five years, Zikopoulos expects to have a lot of data. Daniel Bullock, a BU professor of psychology and an expert in computational modeling, will help him visualize it. Bullock aims to build "behaviorally predictive computational models" that can simulate brain function and the impact of different developmental paths and drug interventions. Another BU psychology professor, Helen Tager-Flusberg, director of the University's federally funded Autism Center of Excellence, will help connect the data back to the individuals' clinical pathologies and diagnoses.

Zikopoulos calls his part of the research, "figuring out the fundamentals." If he can better understand the neurochemistry and molecular features of different brain areas—as well as how they're all connected—he can begin to pinpoint where and when the brains of people with autism veer off from the rest of the population. "If, for example, I find there is a specific protein that is different in the two populations, we might be able to design therapies, drugs, that will target that protein."

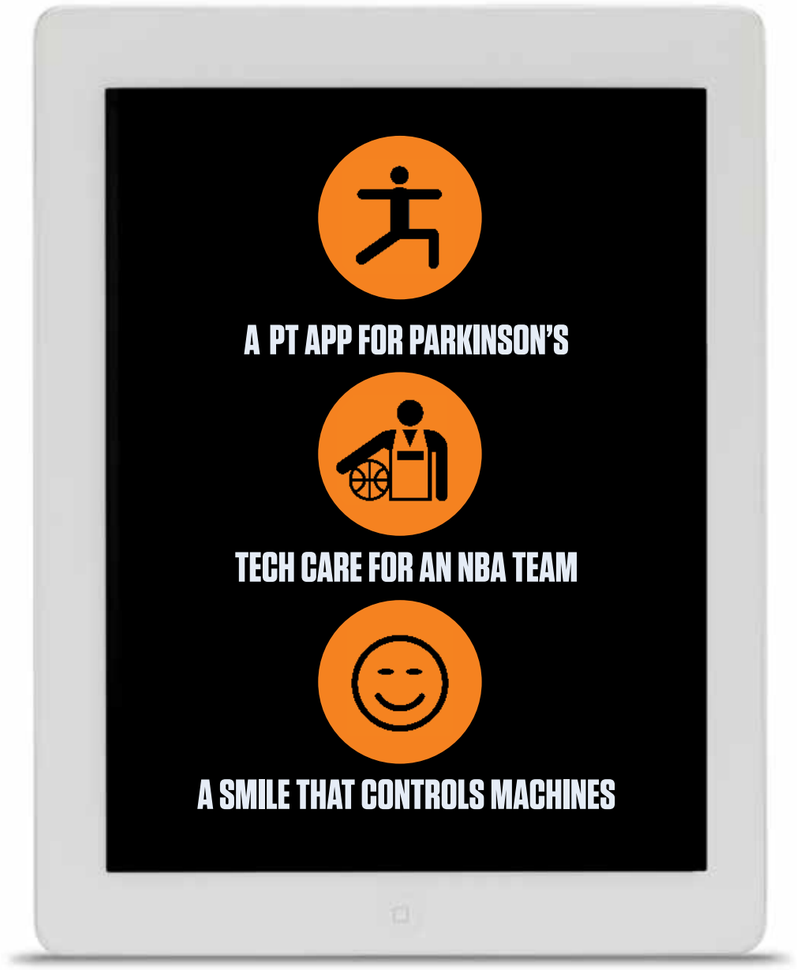
In the 2010 study, Zikopoulos and the Sargent team concentrated on one potential rogue protein, growth-associated protein 43 or GAP-43. The protein, which he says is "expressed in a specific period of development," stimulates the growth of axons in newly forming brains. In the anterior cingulate cortex of people with autism, it seemed to do too much stimulating.

"We need to figure out what makes someone more prone to autism and what environmental factors come in and make that happen," says Zikopoulos. IS

COURTESY OF BASILIS ZIKOPOULOS

Professor Basilis Zikopoulos uses a confocal laser microscope to produce images of postmortem brain sections. In the brain of a person with autism, excessive axon growth in the frontal areas, as seen here, scrambles neural communication and is associated with the symptoms of autism.

WebExtra
Learn more about Basilis Zikopoulos's research at **go.bu.edu/sargent/inside-sargent**.



Sargent is taking health care high tech

BY JULIE RATTEY

PEOPLE WITH PARKINSON'S ARE WALKING FASTER, athletes are recovering more quickly from injuries, and people with spinal cord damage may soon have new ways to communicate. Sargent's professors, researchers, alums, and students are using technology to develop innovative solutions for people with disabilities. Here are three projects that will benefit patients, health providers, and caregivers.

A PT APP FOR PARKINSON'S

ASSISTANT PROFESSOR TERRY ELLIS USES MOBILE HEALTH TECHNOLOGY TO KEEP PEOPLE WITH PARKINSON'S EXERCISING

IT STARTED IN DENISE'S* THUMB—a slight tremor when she gestured while talking. *Just part of getting older*, she thought. *Or maybe it's related to that shoulder problem I'm working out in rehab.* Her rehabilitation therapist disagreed. "Go see your doctor," she said.

Stephen's* handwriting tipped him off. It was getting smaller. Then there was that shaking in his left arm. His mother had experienced similar symptoms, and he knew what the doctor would say.

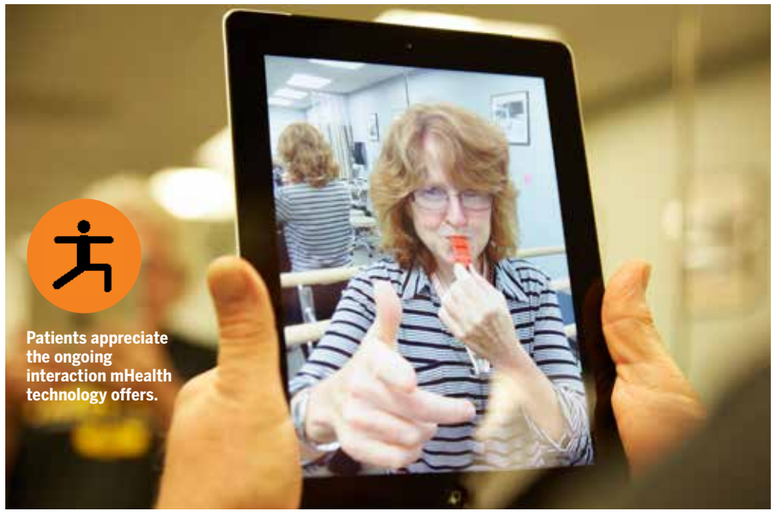
Denise and Stephen, both in their early 70s, are among an estimated 7 to 10 million people worldwide who have Parkinson's, an incurable brain disorder that affects the nervous system, causing tremors, slow movement, stiffness, and impaired balance. Terry Ellis (MED'05), an assistant professor of physical therapy and athletic training and the director of Sargent's Center for Neurorehabilitation, is working to help patients with Parkinson's like Stephen and Denise manage their disease through exercise.

Ellis's research has shown that exercise can help patients improve their walking ability, strength, and flexibility, and may even slow the disease's progression. But patients with Parkinson's aren't often referred to a physical therapist until years after their diagnosis, when function has begun to decline, Ellis says. Finding someone well versed in the disorder is difficult, especially in more rural areas, and patients' engagement in exercise typically declines once therapy is over. Ellis and her colleague Nancy Latham, a research assistant professor in the Health & Disability Research Institute at the School of Public Health, hope that keeping patients in touch with physical therapists through mobile health (mHealth) technology like smartphones and iPads will help.

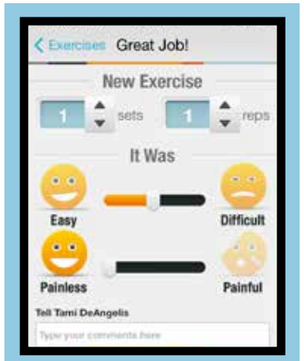
"Especially with the explosion of aging populations, we're going to have more and more people with these chronic diseases," Ellis says. "So how are we going to help them maintain a high-quality life and the highest degree of function, and to be independent and age at home? I think physical therapy has a large role, but we need to think of new models of care."

In fall 2013, with a $50,000 grant from the American Parkinson Disease Association, Ellis and Latham began recruiting for a pilot study featuring Wellpepper, application software designed to help patients stick to treatment plans. The participants, New England–area patients with Parkinson's, are randomized into two groups: an mHealth group that uses Wellpepper on an iPad mini provided by Sargent and a control group that follows an exercise routine with the help of the traditional paper instructions and demonstrative photos. Participants in the mHealth group access personalized exercise videos—Sargent videotapes them performing prescribed exercises when they enter the program—and submit their daily progress and levels of difficulty and pain. They can also chat virtually with a Sargent physical therapist who receives their Wellpepper data and readings from pedometers linked to the app via Bluetooth wireless technology. Ellis chose the iPad mini based on focus group feedback, but ultimately would like to see the app available on any platform of the patient's choice.

To participate in the program, Denise and Stephen traveled on separate occasions to the Center for Neurorehabilitation to meet with Tami DeAngelis ('02), a senior physical therapist, who guided them through several exercises and gave them a pedometer and a daily walking goal. "I hope to get fitter," says



Patients appreciate the ongoing interaction mHealth technology offers.



Participants in a Sargent study featuring the Wellpepper app access personalized exercise videos and submit their daily progress and levels of difficulty and pain.

"Especially with the explosion of aging populations, we're going to have more and more people with these chronic diseases. So how are we going to help them maintain a high-quality life?"—Terry Ellis

Stephen, who's just starting out in the paper group, "and I hope it slows down the progression of the disease." Denise, who has finished her six months in the mHealth group, says she is "willing to try anything, just so I don't fall through the cracks."

Patients appreciate the ongoing interaction and accountability mHealth technology offers, Ellis says. "They want the encouragement and some level of oversight—someone saying, 'Hey, great job! Look how much you accomplished!'" The encouragement motivates Denise, who says mHealth technology keeps her on track with her exercise routine. She likes the personal interaction, as well as working with DeAngelis to switch up her program when she wants more of a challenge. DeAngelis checks Wellpepper regularly and says mHealth technology makes her feel more connected to her patients and better able to support them.

Data collection will wrap up in fall 2014, and preliminary study results are positive. When 18 participants had completed the first three months of the study, those using the iPad had a higher exercise adherence rate (81 percent) than those using paper (57 percent). They spent more time performing moderate-intensity exercise, reported more confidence in their ability to exercise successfully, and rated the program 9 out of 10 for satisfaction.

Sargent is ahead of the curve in experimenting with these technologies, which are examples of telehealth, the delivery of health services through electronic communications such as email, two-way video, and smartphones. As Ellis and Latham point out, telehealth's possibilities are expanding as technology becomes a more integral and affordable part of people's lives, and as health care professionals seek ways to counteract higher costs of in-person care and shorter lengths of stay in hospitals or rehabilitation facilities.

The Affordable Care Act, which includes provisions for telehealth, is giving the field a boost, says Karen Jacobs ('79), a clinical professor of occupational therapy. Sargent has already incorporated telehealth into its occupational therapy curriculum, she says, and "is well positioned to be a global leader in student training and faculty research" in the field. Participants in Sargent's new Neurological Physical Therapy Residency Program, for example, are involved in observation and research for the Wellpepper project.

Telehealth poses challenging questions for the health industry: How will services be reimbursed? Will current licensing policies change to facilitate care across state and national boundaries? What steps will providers take to ensure patients' privacy and the security of their information? But Ellis says now is the time for change. "We have to be innovative in coming up with new models of care to try to reach people. I think we can have a bigger impact than people realize."

**Last names withheld for privacy*

WebExtra
Visit **www.wellpepper.com** to learn more about the app for Parkinson's care and find links to a free trial.

KELLY DAVIDSON SAVAGE

TECH CARE FOR AN NBA TEAM

ALUM CHRIS STACKPOLE USES TECH TO TRANSFORM AN NBA TEAM'S INJURY-RIDDLED RECORD

DAMIAN LILLARD NEEDED to get his left ankle into shape. The 2013–2014 National Basketball Association (NBA) season had begun, and the Portland Trail Blazers' point guard was recovering from an injury. He started practicing one-legged jumps with OptoGait, a technology whose optical sensors, placed on the floor on either side of the user, measure data on functions like gait, power, balance, and symmetry. "I could feel that my right leg was more powerful," Lillard recalled in a *Wall Street Journal* article. "The OptoGait let me track that exercise to the point where I was jumping off both legs with equal power."

OptoGait is new to the Blazers this season, just like the man who brought it to them: Chris Stackpole ('09, '12), the team's director of player health and performance. Hailed as a forward-thinking rising star, the 27-year-old was hired in June 2013 to help reverse the Blazers' abysmal health record. In the five NBA seasons from 2008 to 2013, the Blazers ranked second-to-worst for missing games due to injury, reported Jeff Stotts at instreetclothes.com, a website that tracks sports injuries.

In less than one year, Stackpole, his colleagues, and the players have achieved an impressive turnaround. In January 2014, Stotts said the fact that the team was the only one in the NBA to use the same starting lineup in every game this season was largely due to the Blazers' sports medicine professionals; in March, he reported that the Blazers had missed the fourth fewest games due to injury. Stackpole points to other signs of success: most of the players have had career years and the team won 21 more games than last year. He adds, "We've brought athletes back from injury faster than anticipated."

Stackpole brings the Blazers a model of care that's holistic, preventive, individualized, and technologically oriented. He considers every aspect of players' well-being—physical, mental, and emotional—when assessing them and delivering care. While such a model may seem commonsensical, Stackpole, his colleagues, and team members describe it as a contrast to the reactionary, group-centered approach some health professionals use.

"We've taken the approach of, 'What are each athlete's specific needs every single day?'" says Stackpole's colleague Todd Forcier, the Blazers' sports performance coach. How tired a player is, how much time he spent on the court the night before, and what's going on at home all factor into that assessment. There are few teams in the league that have models comparable to the Blazers'; some of these include the Chicago Bulls and Oklahoma City Thunder, where Stackpole interned. His Sargent training in multiple specialties helps guide him through relatively unexplored territory. "Not only being an athletic trainer, and not only being a physical

"We're using technology to track recovery and performance, so we can try to identify if and when an athlete starts to break down, or when they're at their peak."—Chris Stackpole

Chris Stackpole ('09, '12) brings the Portland Trail Blazers a technologically oriented model of care that includes using OptoGait to track players' balance and power.

JAMIE FRANCIS

therapist, I've learned how to integrate those two skill sets," he says.

Using technology to assess and rehabilitate players is part of Stackpole's arsenal. In addition to the OptoGait, the Blazers now use tools including heart rate monitors, accelerometers, GPS tracking devices, and iPads for filling out questionnaires about their health. Stackpole says sports teams in Europe and Australia have used these instruments for years; US basketball is just catching up.

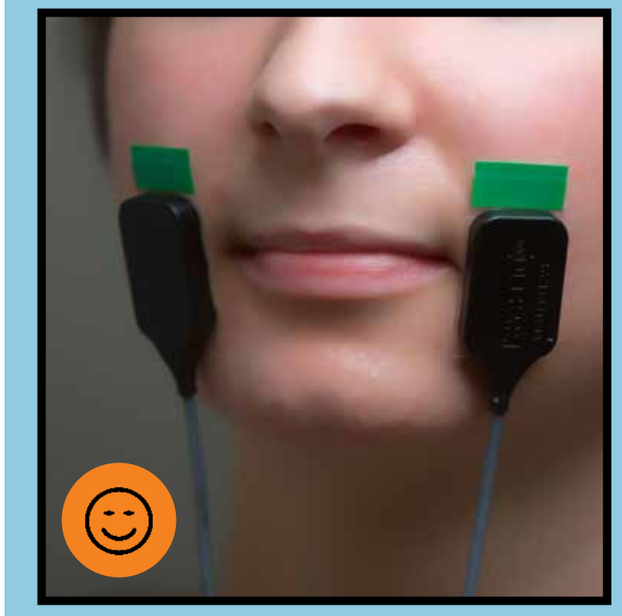
Though "the NBA is becoming more advanced in how it uses technology to track athletes' performance and recovery," there's no standard model in the league for how to use it yet, Stackpole says. "We're identifying how it fits into our organization and how we can create a competitive advantage."

Stackpole uses monitoring equipment with the team on a daily basis to keep "almost a live pulse" on players. "We're using technology to track recovery and performance, so we can try to identify if and when an athlete starts to break down, or when they're at their peak." During practice, Stackpole tracks data from players' heart rate monitors to determine who needs a break, and how to get them into optimal condition before the next game. He uses the OptoGait to establish each player's baseline jumping ability and gait symmetry, and determine who might be at risk for injury. Stackpole then designs programs to decrease that risk. Healthy baselines become a reference point for players throughout the season and a goal to return to after injury. When guard C. J. McCollum broke his foot, for example, Stackpole used a combination of rehab approaches to avoid surgery. When he got back on the court, "It looked like he had lost no time."

A holistic, technologically oriented model of care only works if players buy into the program, Stackpole says. He recalls how, when he first introduced heart rate monitors, players "would rip them off in the first 15 minutes" of practice. He had to build trust with players and medical performance staff to "establish a new culture of how athletes train and develop" and explain how these methods would help them. Now, says Forcier, players volunteer information on diet, sleep habits, and the benefits they get from prescribed exercise.

The Blazers' new and constant awareness of their bodies helps each player maintain his health, center-forward Joel Freeland told the *Oregonian*. "Whereas last year, it was different in that we were treated more as a group than individuals. They thought . . . everyone is as tired as the other because we are all doing the same thing. But it's not like that because everyone is different."

To develop a more detailed analysis of the Blazers, Stackpole would like to use technology to monitor the players during games. He hopes that either the NBA will change its rules to allow such equipment on the court or that technology like SportVU, which uses cameras and software to track players' speed and other indicators in real time, will improve. In-game data would allow Stackpole to spot gaps between practice and performance and identify a "sweet spot for training mode," taking the team to even higher levels.



Carolyn Michener ('16) (above) is working with Sensorimotor Rehabilitation Engineering Lab Director Cara Stepp on a project to help people use facial movement and sound to control human machine interfaces—no seeing or touching required. Two electrodes placed on either side of the lips enable a computer to translate muscles' electrical signals, which correspond to auditory feedback. By contracting these muscles, a user is able to change the pitch and location of the sound, effectively communicating with machines.

A SMILE THAT CONTROLS MACHINES

SPEECH STUDENT CAROLYN MICHENER'S RESEARCH HELPS PEOPLE USE TECHNOLOGY THROUGH FACIAL MOVEMENT

IMAGINE TURNING ON THE LIGHTS, adjusting the thermostat, or operating a DVD player simply by smiling. For people who are visually or verbally impaired, or who have limited motor skills, this could be a major advance in communication. Carolyn Michener ('16) is working to make it a reality.

An undergraduate in the speech, language & hearing sciences program, Michener says her lifelong stutter and interest in engineering sparked a passion to develop technology to help others communicate. Working in the STEPP Lab for Sensorimotor Rehabilitation Engineering at Sargent College, she's collaborating on a project to help people use facial movement and sound to work with human machine interfaces (HMIs)—controls like keypads and touchscreens through which people operate machines, systems, and devices.

"An HMI needs some kind of feedback to properly tell the user what it's doing," says Michener, who joined STEPP Lab Director Cara Stepp and Sargent research engineer Sylvain Favrot on the project in 2012. Often this feedback is visual—for example, a control panel flashing a colored light or displaying a message confirming that an action has been completed. "But this can be difficult for people who are visually impaired or who find the visual stimuli distracting," says Michener. The STEPP Lab project enables people to communicate with machines through sound—no seeing or touching required. Plenty of machines already do this—such as iPhone's Siri, which allows users to send messages or search for information—but these systems often require voice commands, which are not applicable to people with impaired speech. With the new STEPP Lab technology, users can communicate with machines by using facial movements to create sound.

To test the technology, Michener trained study participants in what she describes as an auditory matching game, using preexisting STEPP Lab software that Favrot modified for the project. Sitting in a soundproof booth in the lab, Michener demonstrates how the game works.

She opens communication between the player and a computer, connecting them by way of two electrodes placed on either side of the lips. This connection enables the computer to translate the facial muscles' electrical signals from the skin, a process called surface electromyography. The player undergoes a quick calibration procedure, dons a pair of headphones, receives Michener's instructions—and is ready to begin.

A tone plays through the headphones for two seconds. This is the sound the player will try to match. Then, a second tone sounds. This is the player's starting point, a low pitch

"An HMI needs some kind of feedback to properly tell the user what it's doing. But this can be difficult for people who are visually impaired." — Carolyn Michener

in both ears that represents the player's muscles at rest. The player now has 15 seconds to match the first sound's pitch and location (left ear, right ear, or both) by contracting his or her facial muscles in just the right combination. Contracting left or right—in effect, smirking—creates a medium pitch in the corresponding ear. Contracting both sides—smiling—increases the pitch and activates the sound in both ears. The trial ends when either the player hits the target for 1 second or 15 seconds have expired. The player then receives a score representing how well he or she matched the target.

While the search for the target sound is an auditory task for the user, the game's software visually records both the target location and the user's performance on a graph Michener can review on the computer. In 2013, she tested the game on 16 adults, each of whom completed three test sessions lasting 45 minutes.

After three days, users working with auditory feedback were able to communicate at an average speed of 40 bits per minute (bpm). While this speed is 50 times slower than typing on a keyboard and 15 times slower than the quickest computer mouse use, Stepp says, participants using auditory feedback were able to communicate with machines as effectively as participants using visual feedback in similar studies. "We can conclude that auditory feedback is a viable way to allow people to communicate with this kind of system," says Michener.

Michener cowrote a paper about the project with Stepp and Favrot that she presented at the Acoustical Society of America's biannual conference in May 2014. She continues to run trials of the game, this time to find out if players with a musical background perform better than others. Stepp says the team is also embarking on collaborations with Madonna Rehabilitation Hospital in Nebraska and the Perkins School for the Blind in Massachusetts to see how people who are blind and individuals with spinal cord injuries perform in and respond to the game.

"Ultimately I would like to see this technology in a device that can be used inside a patient's home," says Michener. Patients trained to associate certain musical notes with particular tasks, for instance, could match those notes using their facial movements to adjust the thermostat, operate an electric bed, turn on the TV, or communicate needs to a caregiver. Ultimately, the ability to easily interact with various machines and devices could help patients in rehabilitation and people with disabilities communicate more effectively and live more independently. IS

MICHAEL D. SPENCER

WHEN EVERY STEP IS AN OBSTACLE

CHILDHOOD OBESITY CAN MAKE GETTING FROM HERE TO THERE A CHALLENGE

BY SHERYL FLATOW

Walking is second nature to most of us. As we navigate uneven sidewalks or step from the street to the curb, our brains are using subconscious motor planning to get our bodies from here to there in one piece. Studies show that children and adults who have a high body mass index (BMI) and who are overweight or obese have a higher risk for injuries when making their way through their environment. Simone V. Gill, an assistant professor of occupational therapy and director of Sargent's Motor Development Lab, is researching how those with a higher BMI modify the way they walk, and how their movements might be different from someone whose BMI is in the normal range. She hopes her answers will help the 18 percent of children in the United States who are classified as obese.

In the summer of 2013—shortly after obesity was recognized as a disease by the American Medical Association—Gill conducted a study to find out whether BMI influences the motor planning and motor skills of children as they cross obstacles. The study involved 9 girls and 13 boys, ranging in age from 4 to 13; 12 were overweight or obese. Gill asked them to walk over three obstacles of different heights five times each—one was low, the height of a door threshold; one was medium, the height of a sidewalk curb; and the third was tall, the height of a step.

The children began and ended each series with a walk on flat ground, enabling Gill to compare how they moved when they were not faced with an impediment. She quantified the results using 3-D motion analysis, the same technology used in films to make animated characters appear lifelike, she says. "We put markers all over a person's body, and there are special cameras that track the markers and tell the computer in 3-D space how your body is moving."

While there was no pronounced difference in the way they navigated the medium obstacle, the children who were overweight and obese moved differently over the high obstacle than children with typical BMI. "Instead of lifting their foot high, they hiked it out to the side and slung it over," Gill says. She was surprised that the children who were overweight and obese also moved differently over the low obstacle, which she had thought would be an easier task. "They raised their foot and toes higher, in the same way the kids with typical BMI raised their foot and toes over the high obstacle," Gill says. "They seemed to know they were supposed to alter their movements, but they didn't know how. They also tended to lean forward more. These factors suggest they have difficulty with motor planning, which affects their motor skills and increases their fall risk."

One of Gill's long-term goals is to determine whether the obstacle-crossing task could be used not only as a diagnostic tool to identify children who are at risk for falls, but also as an intervention to help minimize the risks. "More work needs to be done to figure out how best to help them, because this is a relatively unexplored area," she says. She is conducting a similar study on overweight and obese adults, which indicates that having them repeat a task might effect change. That repetition, Gill adds, could also help obese children.

Children and adults who have a high body mass index and who are overweight or obese have a higher risk for injuries.

"I think practice matters," she says. "I watch football and basketball players do drills that make them faster and better able to leap over people on the field. And that's what we're talking about: being able to adapt your movements to what's happening in your environment. If you have a typical BMI, you don't have to practice stepping over things; you already know how. But if it's hard for you, then practicing actually makes you more aware of your body and less susceptible to injury."

Practice could lead to other benefits. "We know there's a decrease in physical activity in these kids, but we don't know a whole lot about the differences in how they move and how that might influence the fact that they're not moving as much," Gill says. "An intervention that could help them with their motor skills and motor planning might enable them to go out and play more." The ultimate payoff? An increase in physical activity, in turn, could help them maintain a healthy weight. IS

KELLY DAVIDSON SAVAGE

Simone Gill hopes her study will help overweight and obese children with their motor skills, enabling them to play more and ultimately maintain a healthy weight.

6 MILLION PEOPLE WITH ARTHRITIS CANNOT WALK ¼ MILE

SARGENT IS HELPING THEM TAKE THE FIRST STEPS TOWARD A MORE ACTIVE LIFE

BY LARA EHRLICH

The 52.5 million people in the United States with arthritis experience pain, stiffness, and inflammation that often keep them from performing everyday tasks. Inactivity only exacerbates their symptoms. While people with arthritis may find some relief with medicine or surgery, such treatments don't necessarily help them change their routines to attain more fulfilling lives, says Julie Keysor, director of Sargent's Center for Enhancing Activity & Participation among Persons with Arthritis (ENACT).

"We need a paradigm shift," says Keysor. "It's absolutely important to look at the pain and the medications," but it is equally important to "make sure we're meeting the needs of the patients in their broader daily activities." ENACT is at the forefront of this shift, conducting two studies that focus on promoting exercise adherence among people with arthritis and helping them continue working.

A LITTLE TLC GOES A LONG WAY

Judy's* knee osteoarthritis (OA) was so painful that she had not climbed a flight of stairs reciprocally (one foot above another) for 12 years. Instead, she stepped up first with the leg unaffected by OA, and then brought her affected leg to the same stair to avoid putting her full weight on her painful knee. Tired of her mobility limitations, Judy signed up for ENACT's BOOST study, which helps people with her condition learn to exercise safely and effectively.

At her first session Judy was faced with a flight of stairs. Kelly Pesanelli, a senior physical therapist at Sargent's Ryan Center for Sports Medicine & Rehabilitation, said, "Let's take one at a time, make sure your mechanics are okay, and then see if you can make it up six stairs." She helped Judy position her legs correctly to minimize strain on her knees, and then Judy climbed six stairs pain free. She began to cry.

"My first reaction was, oh my gosh, she's in pain," Pesanelli recalls. "But they were tears of joy."

MICHAEL D. SPENCER

While people with arthritis may find some relief with medicine or surgery, "we need a paradigm shift" to help patients change their routines to attain more fulfilling lives, says Julie Keysor (left), director of ENACT.

Like many people with arthritis, Judy had modified or avoided climbing stairs and other tasks in part because she had never received guidance on how to live with the disease. Primary care physicians don't have time to teach patients how to adjust their movements, and referring patients to physical therapy can be "a hit-or-miss proposition," says David Felson, director of BU's Clinical Epidemiology Research & Training Unit. "Physical therapy prescriptions are short term, and the exercise requirement is a long-term need." Without ongoing, individualized support, people with arthritis find maintaining a regular exercise regimen to be difficult; less than 15 percent of individuals over the age of 65 perform strength training, even though they know exercise is proven to help minimize pain.

The goal of the BOOST study is to determine if telephone-linked communication (TLC) is an effective method for encouraging people with arthritis to keep up a strength-training program over the long term. During the study that started in 2011, participants visit ENACT twice a week for six weeks of supervised exercise. On their first visit, they receive illustrated instructions, a logbook, and a binder with helpful hints about footwear, rest, and hydration. In addition to their supervised routine, the participants agree to exercise at home once a week. The question is whether they'll actually do it—and that's where a little TLC comes in. Participants receive an automated phone reminder every 14 to 28 days.

"What we are hoping to show is that by regularly reminding people to exercise, their strength and functional abilities improve," Pesanelli says. The study also aims to test whether people need reminders.

Sara*, another BOOST participant, found that the "motivational" phone calls kept her on track. "You think, 'I have to do this exercise because they're going to call,' and I want to say, 'Yes, I did what I said I was going to do.'"

At the end of each call, participants are encouraged to log their questions or concerns, which the system disseminates to ENACT staff. Sara logged a concern about knee pain, for instance, and in the course of a short follow-up call Pesanelli determined she was exercising with too much weight. Sara was already active in her day-to-day life, sometimes walking as much as five miles. She and Pesanelli adjusted her exercise regimen so that if she had a particularly active day, she would perform half of the program and finish the other half the following day. "You can change your strategies to keep yourself motivated," Sara says.

Sara found the study empowering. She likes "that we can do it on our own, because we have all the equipment. It's good to know that I've had a professional person tell me that what I'm doing is working, that I'm not doing too much, or that I should cut back."

Pesanelli is already finding that BOOST makes a difference in the lives of the participants. "A lot of people come

#1
ARTHRITIS IS THE MOST COMMON CAUSE OF DISABILITY IN THE US

52.5 MILLION
ADULTS IN THE US HAVE ARTHRITIS

35%
ARE OBESE

42%
ARE LIMITED IN THEIR ACTIVITIES

8 MILLION
HAVE TROUBLE STANDING

8,300,000
ARE LIMITED AT WORK

8 MILLION
HAVE DIFFICULTY KNEELING

6 MILLION
CANNOT WALK A QUARTER MILE

5 MILLION
HAVE TROUBLE CLIMBING STAIRS

3 MILLION
HAVE DIFFICULTY SITTING

44%
REPORT NO PHYSICAL ACTIVITY

2/3
WALK FEWER THAN 90 MINUTES PER WEEK

25 PERCENT
OF ADULTS IN THE US WILL HAVE ARTHRITIS BY 2030

*Statistics based on the average annual arthritis prevalence in the US population age 18 years or older, via the Centers for Disease Control and Prevention.

in and say, 'I can walk my dog now. I can get off and on the T now. I can carry my laundry basket up the stairs,'" she says. "They are seeing functional improvements in their day-to-day lives, and it's those milestones that get them to say, 'Now I get why you told me I have to exercise.'"

"WORK IT" TO WORK LONGER

Your knees stiffen in traffic, your back aches at your desk, your fingers throb on the keyboard. People are often diagnosed with arthritis mid-career—and the disease causes disabling symptoms. More than 5 percent of adults in the United States report that arthritis limits their ability to work—and yet there is no system in place to help them retain their jobs. The pain often forces them to stop working within 10 years of being diagnosed with the disease.

ENACT's Work It study, which began in 2010, is investigating whether early intervention can help people with arthritis keep their jobs. In the five-year study, participants meet with physical and occupational therapists for a structured, 90-minute interview at their place of employment or near their home to review the challenges they are experiencing at work. "To my knowledge, this is the first time we're looking at having physical therapists and occupational therapists deliver this sort of intervention for people through their community," says Keysor.

The interview includes a health evaluation and an overview of the work environment, including whether "there are issues with being able to get the support they need from coworkers or their boss," says Linda Della-Porta, an interventionist for the study and an occupational therapist at Beth Israel Deaconess Medical Center, who often collaborates with ENACT. Therapists, like Della-Porta, explore issues like how people get to work, where they park, how far they walk, and how long they stand.

The therapist works with the participant to pinpoint goals to increase their workplace wellness and overall health. These may include making adjustments to workstation ergonomics, shifting hours to avoid a heavy commute, and working from home one day a week to lessen travel time. The intervention does not end there. Three weeks after the initial meeting, the therapist calls the participant to check in on their progress. "It's a different way of doing therapy," Della-Porta says. "I see this as part of a new model of telehealth."

Della-Porta recalls one participant in a high-powered job who needed to ask her boss to change her workload so she didn't tire as easily. "She did a great job carrying out the intervention," Della-Porta says. "I felt like I was really more of her guide, and she came up with some great changes that made a difference for her. Work It is very empowering for participants because therapists are not just telling them what to do. It's getting away from that paradigm where people want somebody else to fix them. Instead, we are working together, which gives the power more to the person to make changes in their life in order to be healthier, work with less pain, and stay employed."

6,000
STEPS TO A HEALTHIER LIFE

A WALK A DAY CAN KEEP PAIN AWAY. IN A STUDY FUNDED IN PART BY GRANTS FROM THE NATIONAL INSTITUTES OF HEALTH, RESEARCH ASSISTANT PROFESSOR DANIEL WHITE FOUND THAT WALKING 6,000 STEPS A DAY (OR ABOUT 60 MINUTES) HELPS PEOPLE WITH KNEE OSTEOARTHRITIS (OA) TO INCREASE THEIR MOBILITY. EVERY STEP COUNTS.

60
MINUTES A DAY

CLOSING THE GAP

Despite the strides made as a result of the BOOST and Work It studies, there is still work to be done. "The research is absolutely important, but it is also crucial to train people and make sure that we get the information to the consumers," Keysor says. This mission is central to the grant supporting the two studies, as well as a third ENACT study focused on the outcomes of total knee replacement. The Rehabilitation Research and Training Center (RRTC) grant from the National Institute on Disability and Rehabilitation Research (NIDRR) supports ENACT in training the next generation of clinical researchers and provides assistance with disseminating the results of the studies. "NIDRR wants really good, rigorous, high-quality research, but they also want to get the information to people to make a difference in their lives," Keysor says.

The issue of closing the gap between knowledge and practice was central to the NIDRR-funded State of the Science Meeting that Sargent hosted on April 7, 2014, in Washington, D.C. The 75 participants—leaders in the fields of rheumatology and rehabilitation science—discussed promoting activity and participation in the settings of community, rehabilitation, and employment, and how the results of studies like BOOST and Work It could be integrated into the health care system. "We need to think of new models for care, which may be more public health–oriented or may mean merging rehab and public health," Keysor says. "And we need to think of ways beyond the health care system to deliver them." IS

**Last names withheld for privacy*

WebExtra
Julie Keysor explains how her personal experience with arthritis drives her work at **go.bu.edu/sargent/inside-sargent**.

WORK THERAPY

A PHYSICAL THERAPY STUDENT HELPS BU CUSTODIANS PREVENT SHOULDER INJURIES

BY RACHEL JOHNSON

As a field hockey player, Julie Collins ('12, '14) knows how debilitating repetitive stress injuries can be—she's seen plenty of student-athletes with knee, wrist, and back pain. But it was her friendship with a locker room custodian named Mary* that sparked her interest in preventing such injuries.

"As a physical therapy student, I loved analyzing people's movements," Collins says. "The more I saw Mary working in our building, the more I was breaking down her movements and trying to think of better working positions for her. I became interested in the idea of giving people suggestions about how to use their bodies properly to decrease the risk for injury."

In 2013, as part of the practicum requirement for her doctor of physical therapy (DPT) degree, Collins joined Kelly Pesanelli, a senior physical therapist and lecturer in the department of health sciences, and Lee Marinko, a clinical assistant professor and physical therapist, at the Ryan Center for Sports Medicine & Rehabilitation. Together, they developed an intervention program for BU Facilities Management & Planning.

While back and knee problems are prevalent among BU custodians, their most common injuries are to the shoulder. Between 2002 and 2009, approximately 14 percent of custodial workers' shoulder injuries were caused by repetitive motion and overuse, and those injuries alone cost the University more than $160,000 a year. "A lot of our workers were being injured doing overhead work," says Pesanelli. "They would reach up as high as they possibly could, and just from doing that for years and years, eventually they would reach up and feel excruciating shoulder pain."

As part of the intervention program, Collins shadowed the custodians, including Jessica*, who cleaned Rich Hall's 34 bathrooms every day. "Even after cleaning just one bathroom, she would shrug her shoulders to try and loosen them up," Collins says. By assessing Jessica and her colleagues at work and videotaping their movements for further study, Collins found that many of their injuries could be prevented through small changes, such as investing in step stools and mops with extended handles. She also encouraged the custodians to place their buckets on desks to minimize crouching, and bend their knees instead of their backs when lifting objects from the ground.

DAVE GREEN

At the end of the spring semester, Collins gave 45-minute ergonomics presentations during every custodial shift. She incorporated the videotapes into her talks to show the custodians how their work practices were straining their shoulder muscles and tendons, and explained the changes they could make to prevent pain. "I'm not trying to teach them how to do their job," Collins says. "I'm teaching them small things they can do to make their job pain-free."

The results were striking. Since 2010, costs for shoulder injuries among BU custodians have dropped 85 percent to approximately $25,500, and, as of 2014, custodians no longer report shoulder injuries caused by repetitive motion and overuse. Collins presented the results of her program at the 2014 Combined Sections Meeting of the American Physical Therapy Association in Las Vegas, and Marinko notes, "It's really impressive that a student in the DPT program was able to contribute to a large institutional change."

While Collins is pleased that the intervention has achieved such far-reaching influence, she is most gratified by its impact on BU's custodians. "We care about them," she says. "It's not just about saving money, it's about preventing injuries. I met almost every custodian while giving these presentations," and when she later ran into them on campus, they exclaimed, "Don't worry, I'm cleaning right. I'm using what you taught me!" IS

**Names changed for privacy*

STRONG HOPE

A NEW TREATMENT COULD HELP CHILDREN WITH MUSCULAR DYSTROPHY GET STRONGER AND LIVE LONGER

BY TRICIA BRICK

MICHAEL D. SPENCER

The symptoms of this fatal illness begin at birth. Parents notice muscle weakness and tightness in their child's hips, knees, and elbows. As the illness progresses, the child suffers from poor muscle tone, limited mobility, inflammation, and fibrosis, which further reduce mobility. In the most severe cases, children require assistance for every movement, from eating to sitting upright. While many children succumb to the illness before the age of 10, medical advances like feeding tubes have allowed others to live into their 20s and 30s, albeit with constant care.

To date, there is no effective intervention for merosin-deficient congenital muscular dystrophy type 1A, or MDC1A—but Assistant Professor of Health Sciences Mahasweta Girgenrath's work has provided evidence for a combination treatment that could improve the quality of life for children with the disease, and possibly extend their lives.

Girgenrath had been using mouse models to elucidate the mechanisms of MDC1A for more than a decade when she attended a scientific meeting that changed the trajectory of her research. Organized by the new parent-led advocacy group Cure CMD, the 2009 conference brought together clinicians, scientists, and pharmaceutical-industry representatives to share research about treating congenital muscular dystrophies. For Girgenrath, it was neither the scientists nor the physicians whose counsel was most influential.

"What was huge for my research direction was meeting parents of children with muscular dystrophy," Girgenrath says. She recalls one mother of a 16-month-old who was desperate for an intervention to slow the progression of the disease. While agonizing, the mother's story was not unique; after hearing similar stories from countless parents, Girgenrath "recognized that these children need more immediate treatment. It helped me to prioritize what needed to happen first." She began looking for ways to use her preclinical research to help patients now, turning to drugs already on pharmacy shelves.

Girgenrath had been involved in identifying two major pathways that cause the symptoms of MDC1A: a dearth of healthy muscle cells and an inability to regenerate muscle. In her lab, she had successfully tested treatments to address these pathways in a MDC1A mouse model. When this mouse was genetically engineered to overexpress the protein insulin-like growth factor 1 (IGF-1), it led to improved muscle regeneration. Another study, which inactivated a mouse gene that promotes apoptosis—the normal developmental process of programmed cell death—showed even more robust results. But in both of these single mode therapies, the problems of inflammation and fibrosis remained.

Girgenrath believed that she would have even more success from two treatments that, given together, simultaneously blocked apoptosis and boosted cellular regeneration. Combination approaches are common in treating such conditions as HIV and many cancers, but relatively untested in muscular dystrophy. "It seemed clear to me very early that this disease has so many components and so many disease drivers, if you target just one component, you only get so much benefit," she says.

When Girgenrath combined the treatments in mice—blocking apoptosis and stimulating growth—the results exceeded her expectations. Not only did the approach provide more powerful relief of symptoms than the individual treatments, it also reduced the muscle fibrosis and inflammation that are debilitating hallmarks of the disease. "There was a measurable improvement in growth and muscle mass, and in fact the interventions seemed almost synergistic," Girgenrath says. "Patients with this disease, like these mice, don't grow very well and have significant inflammation and ongoing fibrosis. If we can improve these children's overall growth, it will give them not only an improved quality of life but likely an advantage to their overall longevity."

Even as her hypotheses were being confirmed in the laboratory, Girgenrath was thinking about how her research findings might be brought to patients in the near future. She began to consider the therapeutic potential of the off-label use of drugs whose safety had already been assessed. The antihypertensive drug losartan has been shown to reduce fibrosis and inflammation in animal models. "Losartan also works on some pathways that may lead to programmed cell death," Girgenrath says. "We now have preclinical data that show if we give losartan to the sick mice that overexpress IGF-1, they get bigger and show no fibrosis at all. We are looking at whether losartan can be combined with a growth-promoting factor like IGF-1 or growth hormone, both approved for use in children. This therapeutic combination would have tremendous translational potential."

"What was huge for my research direction was meeting parents of children with muscular dystrophy. I recognized that these children need more immediate treatment."
—Mahasweta Girgenrath

Girgenrath is working with physicians at the Mayo Clinic and National Institutes of Health to lay the groundwork for future clinical trials to test the use of losartan in children. In time, she hopes it will be possible to bring the combination approach to patients as well, through the dual treatment of losartan and growth hormone. Immediate treatment is a priority. IS

A GOOD FIT AT FITWELL

FROM COOKING TO CARDIO, SARGENT STUDENTS BRING LESSONS FOR HEALTHY LIVING TO A BOSTON COMMUNITY CENTER

BY RACHEL JOHNSON

When nutrition undergraduates Erin Reese ('13, SPH'15) and Danny Neilson ('15) asked the Boston teenagers in their first community cooking class whether they had prepared a meal before, they were met with silence. "The only kid who eventually said yes, said he knew how to cook cereal," says Gina Petracca ('16), a nutrition graduate student.

Reese, Neilson, and Petracca helped develop the class for the Boston University Fitness & Wellness Center at the Blackstone Community Center (FitWell) in Boston's South End. A collaboration between Boston University and Boston Centers for Youth & Families (BCYF), FitWell provides residents with the skills they need to make physical activity and healthy choices an enduring part of their lifestyles.

"Before FitWell opened, there wasn't much of an option for affordable physical activity in the South End community. Programs like this help improve the members' overall quality of life."—Lindsey Wallis

keep them engaged," she says. They encouraged the teens to brainstorm meals for their lessons and ensured that the classes were applicable to their daily lives. "Telling them that fruits and vegetables will help them fight diabetes one day wasn't relevant to them," says Petracca. Instead, they showed the teens how healthy eating choices could benefit them now—making them more fit or helping them concentrate in school. "It was a great opportunity to present healthy eating in a creative way," Neilson says.

At Blackstone Community Center in Boston's South End, Gina Petracca ('16) (near right) taught a nutrition class for teens, while Christina Brigante ('12, '14) (far right) taught a physical fitness class for adults over the age of 55.

In the weekly cooking class, supervised by Stacey Zawacki, director of the Sargent Choice Nutrition Center, the Sargent students covered topics like nutrition, healthy meal preparation, and kitchen skills, including knife safety. At the end of class, they gave the teens grocery bags with ingredients so they could duplicate the meal or experiment with new recipes on their own. The following week, the teens shared their cooking experiences.

By developing and conducting the course, the Sargent students learned as much as the Blackstone teens. Reese discovered that soliciting the teens' input as the course progressed kept them invested in the lessons. "They'd come to our class after nine hours of school, so we had to think of ways to

The cooking class posed unexpected challenges. Blackstone does not have a kitchen, so Reese and Neilson had to get creative with a hot plate. They also had to change the lesson plan on the fly, when they found that younger siblings were tagging along to the after-school class; suddenly a class designed for teenagers had children joining in. "You don't want to give a paring knife to a first grader," Reese says. Instead of barring the younger siblings, they assigned tasks like measuring ingredients to the children and chopping to the older kids.

Erin Reese ('13, SPH'15), Danny Neilson ('15), and Alyssa Barsanti ('14) (above, left to right) designed their cooking class to be relevant to teens, while Christina Brigante ('12, '14) and Elizabeth LaMay ('12, '14) (below-center, left to right) focused their exercise sessions on specific areas of the body.

Adults at the BCYF Blackstone Community Center had a different kind of lesson. Christina Brigante ('12, '14) and Elizabeth LaMay ('12, '14), both doctor of physical therapy students, taught physical fitness to help those over the age of 55 reduce the risk of cardiovascular disease and osteoporosis. While conducting a survey in spring 2013, Brigante and LaMay discovered that older Blackstone members often avoid the gym, "where top-40 music is playing and young, strong people are exercising," says LaMay. "Some members of the older adult population found it overwhelming." To ease the adults into the gym and meet their exercise needs, the Sargent students launched a specialized program to "get the members acclimated to the gym and equipment, and give them exercises based on what they wanted to target," says LaMay.

Supervised by Clinical Assistant Professor Jean Peteet, the students taught exercise classes once a week for two months, focusing each session on a specific part of the body. To accommodate participants with a wide range of athletic abilities, the Sargent students selected exercises "that we could regress for people who found it too difficult, or progress for higher-level participants," says LaMay.

Sargent students were gratified that their lessons continued beyond the classes, particularly when a teenager went home and made taco salad for his family, or an older adult continued to exercise after class had ended for the day. Both courses were so popular that FitWell renewed them for 2014. "Before FitWell opened, there wasn't much of an option for affordable physical activity in the South End community," says Lindsey Wallis, assistant manager of fitness at FitWell. "Programs like this help improve the members' overall quality of life." IS

LEFT: STACEY ZAWACKI; RIGHT: JEAN PETEET

TOP LEFT & RIGHT: STACEY ZAWACKI; CENTER: CONOR DOHERTY; BOTTOM: JEAN PETEET

BRIDGE TO BRAZIL

ADAPTING AN ASSESSMENT TOOL ACROSS CULTURES IS NO SIMPLE TRANSLATION TASK

BY LARA EHRLICH AND CORINNE STEINBRENNER

Can your child use a straw? Walk up a flight of stairs without a handrail? Ask permission to borrow a friend's toy? Children with physical or behavioral disabilities may struggle with these and other tasks—challenges that therapists must consider as they work with parents to design individualized rehabilitation programs.

The Pediatric Evaluation of Disability Inventory (PEDI), a functional assessment for children up to age seven, tests proficiency in mobility, daily activities, and social/cognitive skills to help therapists construct rehabilitation programs for children with disabilities. Developed by Wendy Coster, a professor and chair of the department of occupational therapy, and a team of colleagues, the instrument has become widely used in the United States and other countries—including Sweden, Australia, Israel, Slovenia, Hong Kong, Iceland, and Italy—since its introduction 22 years ago. Coster's former student Marisa Mancini ('97) brought the tool to her native Brazil, where it has inspired a profound shift in the rehabilitation field.

In 1992, Coster had just launched the PEDI when Mancini arrived at Sargent College on a Brazilian government scholarship to pursue a Doctor of Science degree; Mancini translated the assessment into Portuguese as part of her doctoral work. Upon returning to Brazil, she and her husband, Sérgio Fonseca ('97), helped to build a highly ranked rehabilitation sciences program at the Universidade Federal de Minas Gerais (UFMG). Mancini, now a professor of occupational therapy and rehabilitation sciences at UFMG, introduced the PEDI in Brazil as an alternative to the tests in use at the time, which she believed did not adequately serve children with disabilities.

Prior to the PEDI, the pediatric assessment tools employed in Brazil—and internationally—"focused on specific behaviors that were direct consequences of a disease or lesion, such as the presence of reflexes and the quality of muscle tone," says Mancini. "These behaviors said absolutely nothing about the child's strategies to meet daily challenges, which were often taken for granted, as most typically developing children learn quickly to brush their teeth, put on a shirt, comb their hair, and other daily tasks." Children with disabilities can find many of these activities difficult, so these tests could not sufficiently measure their ability to develop everyday skills.

The PEDI was different because it assessed a child's ability to function within his or her home environment—information therapists could use to develop rehabilitation programs to help young clients acquire the skills they need for daily life. By bringing the PEDI to Brazil, Mancini aimed to "help professionals shift their focus in clinical practice to what really matters to children and families," she says. Several rehabilitation centers in Brazil have since adopted the PEDI as their primary assessment tool.

In 2012, Coster and her colleagues completed an updated version of the PEDI. Now a computer adaptive test (CAT), the revised instrument, called PEDI-CAT, allows users to track a client's change in functional performance across the entire developmental period, from infancy to age 20. PEDI-CAT is quicker and more efficient than the original paper test and produces immediate results arranged in a graphic display illustrating the child's development. These scores allow therapists to work with families to make goals based on the assessment in combination with the parents' knowledge of their child. The PEDI-CAT fosters "the collaborative decision-making process that is considered best practice in rehabilitation," Coster says.

During a sabbatical in fall 2013, Coster joined UFMG as a visiting professor to help Mancini translate the instrument into Portuguese. Coster is experienced at adapting assessment tools for use in other countries, and she knew the task would involve more than simply translating words. To ensure the tool was culturally appropriate for Brazilian children, the team needed to modify some components. One question, meant to assess weight-transfer skills, addressed a child's ability to get in and out of a sport utility vehicle. Because there is no direct translation of "sport utility vehicle" in Portuguese, and "children with lower socioeconomic status don't have access to this kind of car," Mancini says, the translators had to choose their words carefully.

MARISA MANCINI

Marisa Mancini ('97) (left) and Wendy Coster (second from right) created a Brazilian version of an evaluation for children with disabilities.

"Research with properly translated and culturally adapted instruments will inform us about how children's culture and context influence the timing and sequence of their skill development."
—Wendy Coster

Now that Mancini's team has a Portuguese version of the PEDI-CAT, they are collecting normative data, assessing approximately 2,000 typically developing Brazilian children to determine whether the US-based computer scoring algorithm norms are appropriate for Brazilian clients.

"Different cultures have different expectations for how and when children should become independent at these tasks," Coster says. "American parents are big on independence, but we've already discovered that in some countries, it's not a big deal whether the child is doing things independently at the same early age as in the US." For example, not all cultures have the same timetables for when children should be able to dress themselves, manipulate a knife and fork, and brush their teeth without assistance. So, "we may need to establish Brazilian norms for the PEDI-CAT," Coster says, with the goal of having the translation ready for use by early 2015.

In the meantime, Coster says, "research with properly translated and culturally adapted instruments will inform us about how children's culture and context influence the timing and sequence of their skill development." These tools will enable the occupational therapy community worldwide to collaborate and compare assessments of children with disabilities on a global scale. IS

Grant Awards

BU SARGENT COLLEGE'S FACULTY RECEIVED **$11,877,499** IN RESEARCH FUNDING IN 2013-2014. HERE IS A LIST OF OUR PROJECTS AND THE AGENCIES AND FOUNDATIONS SUPPORTING THEM.

PRINCIPAL INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED 2013–2014	YEAR OF AWARD	TOTAL AWARD
Sudha Arunachalam, assistant professor of speech, language & hearing sciences	A Non-Interactive Method for Teaching Noun and Verb Meanings to Young Children with ASD	Autism Speaks	$58,900	2 of 2	$118,886
Sudha Arunachalam	Toddlers' Representations of Verbs: Effects of Delay and Sleep on Verb Meaning	Northwestern University	$57,706	2 of 2	$119,847
Sudha Arunachalam	Mechanisms Underlying Word Learning in Children with ASD: Non-social Learning and Memory Consolidation	NIH/NIDCD	$171,433	1 of 4	$688,018
Sudha Arunachalam	Individual Differences in Toddlers' Abilities to Learn New Verbs From Their Linguistic Context	Language Learning	$10,000	1 of 1	$10,000
Helen Barbas, professor of health sciences	Organization of Prefrontal Feedback Circuits	NIH/NIMH	$438,124	5 of 5	$2,260,464
Helen Barbas	Prefrontal Anatomic Pathways in Executive Control	NIH/NINDS	$374,799	5 of 5	$1,990,887
Helen Barbas and Claire Timbie, predoctoral student	Circuitry of Emotion: Integration in Orbitofrontal Cortex	NIH/NIMH	$47,232	4 of 5	$178,140
Shelley Brown, clinical assistant professor of health sciences	Boston University Health Science Program: Developing Global Citizens through Civic Engagement in Public Health	Association of American Colleges and Universities	$10,000	1 of 1	$10,000
Kee Chan, assistant professor of health sciences	Medical Decision Analysis Models for the Millions Veterans Program	Dept. of Veterans Affairs (VA)	$16,867	1 of 1	$16,867
Kee Chan	Cost-Effectiveness Analysis of Genomic Medicine	VA Boston Healthcare System	$32,657	1 of 1	$32,657
L. Clarke Cox, clinical associate professor of speech, language & hearing sciences	Hearing Acuity, Cognitive Aging and Memory for Speech	Brandeis University	$13,096	2 of 5	$81,850
Terry Ellis, assistant professor of physical therapy & athletic training	Telemedicine Intervention to Improve Physical Function in Persons with Parkinson Disease	VA	$54,773	1 of 1	$54,773
Terry Ellis	Mobile Health Technology to Promote Physical Activity in Persons with PD	American Parkinson Disease Association, Inc.	$50,000	1 of 1	$50,000
Terry Ellis	Pilot Study: Feasibility and Usability of the Theracycle in People with Parkinson Disease	RSS Industries, Inc.	$11,682	1 of 1	$11,682
Terry Ellis and Katy Hendron, physical therapist	IPA - VA Agreement	VA	$12,162	1 of 1	$12,162
Marianne Farkas, director of training & international services, BU Center for Psychiatric Rehabilitation, and E. Sally Rogers, director of research, BU Center for Psychiatric Rehabilitation	Improved Employment Outcomes for Individuals with Psychiatric Disabilities	Dept. of Education (ED)	$848,218	5 of 5	$4,245,042
Marianne Farkas	Bringing Recovery Supports to Scale Technical Assistance Center Strategy	SAMHSA	$64,460	3 of 5	$708,521
Marianne Farkas	Toolkit of Recovery Promoting Competencies for Mental Health Rehabilitation Providers	NIDRR	$199,921	2 of 3	$599,504
Simone V. Gill, assistant professor of occupational therapy	Multicenter Career Development Program for Physical and Occupational Therapy	CORRT	$135,000	1 of 1	$135,000
Mahasweta Girgenrath, assistant professor of health sciences	Modulation of Inflammation and Fibrosis in the Context of Regeneration in MDC1A	MDA	$119,149	3 of 3	$357,465
Mahasweta Girgenrath	Inhibition of Angiotensin II Signaling in Congenital Muscular Dystrophy Type 1A (MDC1A)	Cure CMD	$50,000	1 of 2	$100,000
Jennifer Gottlieb, research assistant professor, BU Center for Psychiatric Rehabilitation	Improving Quality and Reducing Cost in Schizophrenia Care and New Technologies and New Personnel	CMMI	$83,368	2 of 3	$409,022
Frank Guenther, professor of speech, language & hearing sciences	Neural Modeling and Imaging of Speech	NIH/NIDCD	$333,155	3 of 5	$1,777,490
Frank Guenther	Sequencing and Initiation in Speech Production	NIH/NIDCD	$347,863	4 of 5	$1,838,207
Frank Guenther	Minimally Verbal ASD: From Basic Mechanisms to Innovative Interventions	NIH/NIDCD	$347,133	2 of 4	$1,982,833
Frank Guenther and Emily Stephens, predoctoral student	Decoding Imagined Vowel Productions Using Electroencephalography	NIH/NIDCD	$29,545	3 of 3	$101,984
Kenneth G. Holt, associate professor of physical therapy & athletic training	Smart Exoskeleton Suit—Biomechanically Synergistic Body Support and Protection System	Wyss Institute for Biologically Inspired Engineering—Subcontract	$116,140	2 of 2	$116,140
Kenneth G. Holt	Smart Exoskeleton Suit—Biomechanically Synergistic Body Support and Protection System	Wyss Institute for Biologically Inspired Engineering—Subcontract	$54,856	1 of 1	$54,856
Kenneth G. Holt	Biologically Inspired Soft Smart Exosuit for Injury Prevention and Performance Augmentation	Wyss Institute for Biologically Inspired Engineering-Subcontract	$67,800	1 of 1	$67,800
Norman Hursh, research associate professor of occupational therapy	The City Connects Model of Student Support: Building a K–12 Student Support Practice and Process	Boston College	$47,333	1 of 1	$139,180
Karen Jacobs, clinical professor of occupational therapy	Project Career: Development of a Multidisciplinary Demonstration to Support the Transition of Students with Traumatic Brain Injuries from Postsecondary Education to Employment	Kent State University/ED	$81,325	1 of 5	$405,000
Susan Kandarian, professor of health sciences	The Molecular Basis of Muscle Wasting in Cancer Cachexia	NIH/NIAMS	$349,909	3 of 5	$1,841,213
Julie J. Keysor, associate professor of physical therapy & athletic training	ENACT: Enhancing Activity & Participation among Persons with Arthritis	ED	$799,988	4 of 5	$3,999,924
Julie J. Keysor	Walkability Audit: OA Action, Phase I Critical Review of Existing Assessments	Arthritis Foundation	$9,999	1 of 1	$9,999
Julie J. Keysor	New Investigator Workshop on Advancing Arthritis Research	NIH/NIAMS	$18,000	1 of 1	$18,000

PRINCIPAL INVESTIGATOR	TITLE OF PROJECT	AGENCY/ FOUNDATION	FUNDS AWARDED 2013–2014	YEAR OF AWARD	TOTAL AWARD
Gerald D. Kidd, professor of speech, language & hearing sciences	Spatial Hearing, Attention, and Informational Masking in Speech Identification	Air Force	$233,739	2 of 3	$685,945
Gerald D. Kidd	Central Factors in Auditory Masking	NIH/NIDCD	$506,542	3 of 5	$2,745,301
Gerald D. Kidd	Top Down Control	NIH/NIDCD	$589,661	1 of 5	$2,756,185
Gerald D. Kidd and H. Steven Colburn, professor of biomedical engineering	Core Center Grant—Sound Field Laboratory (Core 1)	NIH/NIDCD	$207,229	4 of 5	$1,208,700
Swathi Kiran, professor of speech, language & hearing sciences	Theoretically Based Treatment for Sentence Comprehension Deficits in Aphasia	NIH/NIDCD	$576,853	4 of 4	$2,399,432
Swathi Kiran	The Neurobiology of Recovery in Aphasia: Natural History and Treatment-Induced Recovery	Subaward—Northwestern University	$241,073	1 of 5	$1,299,597
Swathi Kiran and Chaleece Sandberg, predoctoral student	Changes in Neural Patterns in Persons with Aphasia Following Theory-Based Generative Naming Treatment (NRSA)	NIH	$29,672	2 of 2	$83,600
Jessica Kramer, assistant professor of occupational therapy	Multicenter Career Development Program for Physical and Occupational Therapy	CORRT	$135,000	1 of 1	$135,000
Jessica Kramer	Evaluation of Project TEAM (Teens Making Environmental and Activity Modifications)—Effectiveness, Social Validity and Feasibility	ED	$198,156	2 of 3	$597,509
Susan E. Langmore, clinical professor of speech, language & hearing sciences	Non-Invasive Brain Stimulation for Swallowing Recovery After Dysphagic Stroke	Beth Israel Deaconess Medical Center	$115,990	1 of 5	$476,591
Cara L. Lewis, assistant professor of physical therapy & athletic training	Effect of Femoroacetabular Impingement (FAI) on Hip Motion in Young Adults	NIH/NIAMS	$130,680	1 of 5	$646,596
Cara L. Lewis	Sex-Specific Movement Pattern Differences in Young Adults with and without Hip Pain	NIH/NIAMS	$209,945	1 of 2	$405,158
Cara L. Lewis	SBIR Phase II: Compliant Nonlinear Quasi-Passive Orthotic Joint	Adicep Technologies	$42,768	2 of 2	$70,000
Jessica Maxwell, clinical assistant professor of physical therapy & athletic training	Limitations in Participation Following Knee Replacement	Rheumatology Research Foundation (RRF)	$48,191	3 of 3	$173,052
Susan McGurk, associate professor of occupational therapy and senior researcher, BU Center for Psychiatric Rehabilitation	A Dismantling Study of Cognitive Remediation for Supported Employment	NIH/NIMH	$540,851	3 of 5	$2,771,031
Kathleen Morgan, professor of health sciences	Dynamics of the Vascular Smooth Muscle Cytoskeleton	NIH/NHLBI	$987,822	5 of 5	$8,786,466
Kim Mueser, executive director, BU Center for Psychiatric Rehabilitation, and professor of occupational therapy	Integrating Illness Management & Recovery with Assertive Community Treatment	NIH/NIMH	$19,356	3 of 3	$58,246
Kim Mueser	Integrating Illness Management & Recovery with Assertive Community Treatment	NIH/NIMH	$20,162	3 of 3	$52,419
Kim Mueser	Recovery After an Initial Schizophrenia Episode (RAISE)	NIH/NIMH	$57,536	5 of 5	$143,267
Kim Mueser	Illness Management and Recovery Treatment	NIH/NIMH	$12,981	2 of 4	$62,053
Kim Mueser	Enhancing Assertive Community Treatment with CBT and SST for Schizophrenia	NIH/NIMH	$42,532	4 of 5	$192,913
Kim Mueser	Effectiveness of Psychosocial Treatment for Inpatients with Psychosis	NIH	$18,827	1 of 3	$56,481
Kim Mueser	Development and Randomized Controlled Trial of a Mobile System for Self Management of Schizophrenia	NIH	$14,814	2 of 3	$37,035
Paula A. Quatromoni, associate professor of health sciences	KickinKitchen.TV—An Innovative Digital Learning Interactive Educational Program on Nutrition, Cooking and Active Lifestyles to Prevent Childhood Obesity	USDA Subaward—KidsCOOK, LLC	$45,816	2 of 2	$75,000
Zlatka Russinova, research associate professor of occupational therapy and senior research specialist, BU Center for Psychiatric Rehabilitation	Advanced Research Training Program in Psychiatric Rehabilitation	ED	$149,980	5 of 5	$749,946
Zlatka Russinova	Advanced Research Training Program in Employment and Vocational Rehab	ED	$149,978	1 of 5	$749,806
Elliot Lee Saltzman, associate professor of physical therapy & athletic training	RI: Medium: Collaborative Research: Multilingual Gestural Models for Robust Language-Independent Speech Recognition	NSF	$52,627	2 of 4	$52,627
Elliot Lee Saltzman	Modeling the Behavioral Dynamics of Social Coordination and Joint Action	NIH/NIGMS Subaward—University of Cincinnati	$24,900	1 of 5	$124,500
Joshua Stefanik, research assistant professor of physical therapy & athletic training	Effect of Massive Weight Loss on Patellofemoral Joint Structure and Pain	Arthritis Foundation	$50,000	3 of 3	$150,000
Joshua Stefanik	Identifying Patellofemoral OA by Pain Site & Activities	RRF/ACR	$59,688	2 of 2	$109,688
Cara E. Stepp, assistant professor of speech, language & hearing sciences	Automation of Relative Fundamental Frequency Estimation	NIH/NIDCD	$163,700	2 of 3	$480,927
Cara E. Stepp	Development of an Electromyo-graphically Controlled Electrolarynx (EMG-EL) Voice Prosthesis	Griffin Laboratories, Inc. (NIH/NIDCD)	$26,110	2 of 2	$49,615
Cara E. Stepp	Videogame-Based Speech Rehabilitation for Children with Hearing Loss	Deborah Munroe Noonan Memorial Fund	$80,000	1 of 1	$80,000
Gloria S. Waters, professor of speech, language & hearing sciences, and William Evans, predoctoral student	Attention and Executive Control During Lexical Processing in Aphasia (NRSA)	NIH/NIDCD	$36,490	1 of 2	$70,032
Daniel K. White, research assistant professor of physical therapy & athletic training	Factors for Change in Day-to-Day Walking in Knee OA	ACR	$125,000	3 of 3	$250,000
Daniel K. White	Prevention of Pain and Functional Limitation in People at High Risk of Knee OA through Physical Activity	RRF	$75,000	1 of 2	$75,000
Basilis Zikopoulos, research assistant professor of health sciences	Organization of Excitatory and Inhibitory Prefrontal Circuits in Children with Autism	NIH/NIMH	$395,236	1 of 5	$2,018,222
Total			**$11,877,499**		**$55,501,354**

Faculty in Print

OUR FACULTY'S RESEARCH REACHES AUDIENCES ACROSS THE GLOBE. HERE'S A SELECTION OF PUBLICATIONS AND ARTICLES WRITTEN BY BU SARGENT COLLEGE FACULTY DURING 2013-2014.

Arunachalam, S., Leddon, E., Song, H., Lee, S., and Waxman, S. (2013). Doing more with less: verb learning in Korean-acquiring 24-month-olds. *Language Acquisition: A Journal of Developmental Linguistics*, 20, 292–304.

Bandini, L. G., Lividini, K., Phillips, S. M., and Must, A. (2013). Accuracy of dietary reference intakes for determining energy requirements in girls. *The American Journal of Clinical Nutrition*, 98(3):700–4.

Curtin, C., **Bandini, L. G.**, Must, A., Gleason, J., Lividini, K., Phillips, S., Eliasziw, M., Maslin, M., and Fleming, R. K. (2013). Parent support improves weight loss in adolescents and young adults with Down syndrome. *Journal of Pediatrics*, 163(5):1402–8.e1.

Grange, P., **Bohland, J. W.**, Okaty, B. W., Sugino, K., Bokil, H., Nelson, S. B., Ng, L., Hawrylycz, M., and Mitra, P. P. (2014). Cell-type–based model explaining coexpression patterns of genes in the brain. *Proceedings of the National Academy of Sciences of the United States of America*, 111(14):5397–402.

Wolock, S. L., Yates, A., Petrill, S. A., **Bohland, J. W.**, Blair, C., Li, N., Machiraju, R., Huang, K., and Bartlett, C. W. (2013). Gene x smoking interactions on human brain gene expression: finding common mechanisms in adolescents and adults. *Journal of Child Psychology and Psychiatry*, 54(10):1109–19.

Chan, K. (2013). Our DNA family reunion. *Public Health*, 127(11):984–6.

Fix, G. M., **Cohn, E. S.**, Solomon, J. L., Cortés, D. E., Mueller, N., Kressin, N., Borzecki, A., Katz, L. A., and Bokhour, B. G. (2013). The role of comorbidities in patients' hypertension self-management. *Chronic Illness*, advance online publication.

Constantino, D. P., Eger, S., and Matthies, M. (2013). Clinical use of self-reports to measure CBT program outcomes. *Perspectives on Fluency and Fluency Disorders*, 23, 15–20.

Coster, W., Law, M., Bedell, G., Liljenquist, K., Kao, Y-C, Khetani, M., and Teplicky, R. (2013). School participation, supports, and barriers of students with and without disabilities. *Child: Care, Health and Development*, 39, 535–543.

Pagoto, S., Schneider, K., Jojic, M., **DeBiasse, M.**, and Mann, D. (2013). Evidence-based strategies in weight-loss mobile apps. *American Journal of Preventive Medicine*, 45(5):576–82.

Busch, A. M., Whited, M. C., Appelhans, B. M., Schneider, K. L., Waring, M. E., **DeBiasse, M. A.**, Oleski, J. L., Crawford, S. L., and Pagoto, S. L. (2013). Reliable change in depression during behavioral weight loss treatment among women with major depression. *Obesity* (Silver Spring), 21(3):E211–8.

Ellis, T., and Motl, R. (2013). Physical activity behavior in persons with neurologic disorders: overview and examples from Parkinson disease and Multiple Sclerosis. *Journal of Neurologic Physical Therapy*, 37(2):85–90.

Saint-Hilaire, M. and **Ellis, T.** (2013). A prescription for physical therapy and exercise in Parkinson's disease. *Advances in Parkinson's Disease*, 2(4):118–120.

Farkas, M. (2013). Introduction to psychiatric/psychosocial rehabilitation. *Current Psychiatry Reviews*, 9(3), 177–187.

Hung, Y., Meredith, G. S., and **Gill, S. V.** (2013). Influence of task constraints during walking for children. *Gait and Posture*, 38, 450–4.

Lick, D. J., Johnson, K. L., and **Gill, S. V.** (2013). Deliberate changes to gendered body motion influence basic social perceptions. *Social Cognition*, 31, 656–671.

Yamauchi, J., Kumar, A., Duarte, L., Mehuron, T., and **Girgenrath, M.** (2013). Triggering regeneration and tackling apoptosis: a combinatorial approach to treating congenital muscular dystrophy type 1 A. *Human Molecular Genetics*, 22(21):4306–17.

Gottlieb, J. D., Harper Romeo, K., Penn, D. L., **Mueser, K. T.**, and Chiko, B. P. (2013). Web-based cognitive-behavioral therapy for auditory hallucinations in persons with psychosis: a pilot study. *Schizophrenia Research*, 145, 82–87.

Civier, O., Bullock, D., Max, L., and **Guenther, F. H.** (2013). Computational modeling of stuttering caused by impairments in a basal ganglia thalamo-cortical circuit involved in syllable selection and initiation. *Brain and Language*, 126, 263–278.

Niziolek, C. and **Guenther, F. H.** (2013). Vowel category boundaries enhance cortical and behavioral responses to speech feedback alterations. *Journal of Neuroscience*, 33, 12090–12098.

Wu, C. L., Cornwell, E. W., Jackman, R. W., and **Kandarian, S. C.** (2014). NF-kB but not FoxO sites in the MuRF1 promoter are required for transcriptional activation in disuse muscle atrophy. *American Journal of Physiology-Cell Physiology*, 306(8):C762–7.

Allaire, S. J., AlHeresh, R., and **Keysor, J. J.** (2013). Risk factors for work disability associated with arthritis and other rheumatic conditions. *WORK*, 45(4):499–503.

Kidd, G. Jr., Favrot, S., Desloge, J., Streeter, T., and Mason, C. R. (2013). Design and preliminary testing of a visually-guided hearing aid, *The Journal of the Acoustical Society of America*, 133, EL202–207.

Kidd, G. Jr., Mason, C. R., Streeter, T., Thompson, E., Best, V., and Wakefield, G. W. (2013). Perceiving sequential dependencies in auditory streams. *The Journal of the Acoustical Society of America*, 134, 1215–1231.

Best, V., Thompson, E. R., Mason, C. R., and **Kidd, G. Jr.** (2013). An energetic limit on spatial release from masking. *Journal of the Association for Research in Otolaryngology*, 14, 603–610.

Best, V., Thompson, E., Mason, C. R., and **Kidd, G. Jr**. (2013). Spatial release from masking in normally hearing and hearing-impaired listeners as a function of the spectral overlap of competing talkers. *The Journal of the Acoustical Society of America*, (L), 133, 3677–3680.

Hashimoto, N., Widman, B., **Kiran, S.**, and Richards, M. A. (2013). A comparison of features and categorical cues to improve naming deficits in aphasia. *Aphasiology*, 27, 1–28.

Lester, S., **Langmore, S. E.**, Liintzenich, C. R., Wright, S. C., Grance-Martin, K., Fife, T., and Butler, S. G. (2013). The effects of topical anesthetic on swallowing during nasoendoscopy. *Laryngoscope*, 123, 1704–8.

Monaghan, G. M., **Lewis, C. L.**, Hsu, W. H., **Saltzman, E.**, Hamill, J., and **Holt, K. G.** (2013). Forefoot angle determines duration and amplitude of pronation during walking. *Gait and Posture*, 38(1):8–13.

Maxwell, J. L., Keysor, J. J., Niu, J., Singh, J. A., Wise, B. L., Frey-Law, L., Nevitt, M. C., and Felson, D. T. (2013). Participation following knee replacement: the MOST cohort study. *Physical Therapy*, 93(11):1467–74.

McGurk, S. R., Mueser, K. T., Mischel, R., Adams, R., Harvey, P. D., McClure, M. M., Look, A. E., Leung, W. W., and Siever, L. J. (2013). Vocational functioning in schizotypal and paranoid personality disorders. *Psychiatry Research*, 210, 498–504.

Lindenmayer, J. P., **McGurk, S. R.**, Khan, A., Saurabh, K., Thanju, A., Hoffman, L., Valdez, G., Wance, D., and Herrmann, E. (2013). Improving social cognition in schizophrenia: A pilot intervention. *Schizophrenia Bulletin*, 39, 507–17.

Kim, H. R., Gallant, C., and **Morgan, K. G.** (2013). Regulation of PKC autophosphorylation by calponin in contractile vascular smooth muscle tissue. *BioMed Research International*, 2013;2013:358643.

Poythress, R. H., Gallant, C., Vetterkind, S., and **Morgan, K. G.** (2013). Vasoconstrictor-induced endocytic recycling regulates focal adhesion protein localization and function in vascular smooth muscle. *The American Journal of Physiology-Cell Physiology*, 305(2):C215–27.

Vetterkind, S., Poythress, R. H., Lin, Q. Q., and **Morgan, K. G.** (2013). Hierarchical scaffolding of an ERK1/2 activation pathway. *Cell Communication and Signaling*, 11:65.

Mueser, K. T., Bond, G. R., Essock, S. M., Clark, R. E., Carpenter-Song, E., Drake, R. E., and Wolfe, R. (2014). The effects of supported employment in Latino consumers with severe mental illness. *Psychiatric Rehabilitation Journal*, 37, 113–122.

Mueser, K. T., Glynn, S. M., Cather, C., Xie, H., Zarate, R., Fox, L., Clark, R. E., **Gottlieb, J. D.**, Wolfe, R., and Feldman, J. (2013). A randomized controlled trial of family intervention for co-occurring substance use and severe psychiatric disorders. *Schizophrenia Bulletin*, 39, 658–672.

Bartels, S. J., Pratt, S. I., Aschbrenner, K. A., Barre, L. K., Jue, K., Wolfe, R. S., Xie, H., McHugo, G. J., Santos, M., Williams, G. E., Naslund, J. A., and **Mueser, K. T.** (2013). Clinically significant improved fitness and weight loss among overweight persons with serious mental illness. *Psychiatric Services*, 64, 729–736.

Lin, E. C. L., Chan, C. H., Shao, W. C., Lin, M. F., Shiau, S., **Mueser, K. T.**, Huang, S. C., and Wang, H. S. (2013). A randomized controlled trial of an adapted illness management and recovery program for individuals with schizophrenia awaiting discharge from a psychiatric hospital. *Psychiatric Rehabilitation Journal*, 36, 243–49.

Lu, W., Yanos, P. T., Silverstein, S. M., **Mueser, K. T.**, Rosenberg, S. D., **Gottlieb, J. D.**, Marcello-Duva, S., Kularatne, T., Dove-Williams, S., Paterno, D., Hawthorne-Seraile, D., and Giacobbe, G. (2013). Public mental health clients with severe mental illness and probable posttraumatic stress disorder: Trauma exposure and correlates of symptom severity. *Journal of Traumatic Stress*, 26, 266–273.

Pratt, S. I., Bartels, S. J., **Mueser, K. T.**, Naslund, J. A., Wolfe, R., Pixley, H. S., and Josephson, L. (2013). Feasibility and effectiveness of an automatic telehealth intervention to improve illness self-management for individuals with serious mental illnesses and medical comorbidity. *Psychiatric Rehabilitation Journal*, 36, 297–305.

Kuo, M. H., **Orsmond, G. I.**, **Cohn, E. S.**, and **Coster, W. J.** (2013). Friendship characteristics and activity patterns of adolescents with an autism spectrum disorder. *Autism: The International Journal of Research and Practice*, 17, 481–500.

Kuo, M. H., **Orsmond, G. I.**, **Coster, W. J.**, and **Cohn, E. S.** (2013). Media use among adolescents with autism spectrum disorder. *Autism: The International Journal of Research and Practice*. Advance online publication.

Perrachione, T. K., Fedorenko, E. G., Vinke, L., Gibson, E., and Dilley, L. C. (2013). Evidence for shared cognitive processing of pitch in language and music. *PloS One*, 8(8).

Perrachione, T. K. and Ghosh, S. S. (2013). Optimized design and analysis of sparse-sampling fMRI experiments. *Frontiers in Neuroscience*, 7, 55.

Vadiveloo, M., Scott, M., **Quatromoni, P.**, Jacques, P., and Parekh, N. (2013). Trends in dietary fat and high-fat food intakes from 1991 to 2008 in the Framingham Heart Study participants. *British Journal of Nutrition*. Epub.

Mizock, L., Harrison, K., and **Russinova, Z**. (2013). Lesbian, gay, and transgender individuals with mental illness: narratives of the acceptance process. *Journal of Gay and Lesbian Mental Health*, online, doi:10.1080/19359705.2013.828007.

Kelty-Stephen, D. G., Palatinus, K., **Saltzman, E.**, and Dixon, J. A. (2013). A tutorial on multifractality, cascades, and interactivity for empirical time series in ecological science. *Ecological Psychology*, 25, 1–62.

Stefanik, J. J., Zumwalt, A. C., Segal, N. A., Lynch, J. A., and Powers, C. M. (2013). The association between measures of patella height, trochlear morphology and patellofemoral joint alignment: the MOST Study. *Clinical Orthopaedics and Related Research*, 471, 2641– 2648.

Bowen, L. K., Hands, G. L., Pradhan, S., and **Stepp, C. E.** (2013). Fundamental frequency variability in Parkinson's Disease. *Journal of Medical Speech-Language Pathology*, 21, 235–244.

Peeva, M., **Tourville, J. A.**, Agam, Y., Holland, B., Manoach, D. S., and **Guenther, F. H.** (2013). White matter impairment in the speech network of individuals with autism spectrum disorder. *NeuroImage: Clinical*, 3, 234–241.

White, D. K., Tudor-Locke, C., Felson, D., Gross, K. D., Niu, J., Nevitt, M., Lewis, C., Torner, J., and Neogi, T. (2013). Walking to meet physical activity guidelines in knee OA: Is 10,000 steps enough? *Archives of Physical Medicine and Rehabilitation,* 94, 711–717.

Zikopoulos, B. and **Barbas, H.** (2013). Altered neural connectivity in excitatory and inhibitory cortical circuits in autism. *Frontiers in Human Neuroscience*, 7:609.

Bunce, J. G., **Zikopoulos, B.**, Feinberg, M., and **Barbas, H.** (2013). Parallel prefrontal pathways reach distinct excitatory and inhibitory systems in memory-related rhinal cortices. *Journal of Comparative Neurology*, 521(18):4260–83.

BU Sargent College

WHO WE ARE		
STUDENTS	**UNDERGRADUATE**	**GRADUATE**
Number of full-time students (as of spring 2014)	1,212	378
Average SAT	1999	n/a
Average GRE	n/a	310*
FACULTY		
Full-time	73	
Part-time	58	
ALUMNI	**16,157** in **60** countries	
CLINICAL SITES	More than 1,400 in all 50 states and 4 countries	

KALMAN ZABARSKY

Programs of Study

Athletic Training
Audiology
Behavior & Health
Health Science
Human Physiology (Pre-Med)
Nutrition
Occupational Therapy
Physical Therapy
Rehabilitation Sciences
Speech, Language & Hearing Sciences
Speech-Language Pathology

Special Programs

- Combined BS and MPH in Public Health
- Combined BS in Athletic Training and Doctor of Physical Therapy
- Combined BS in Health Studies and Doctor of Physical Therapy
- Combined BS and MS in Human Physiology

U.S. News & World Report Best Graduate School Rankings

Our graduate programs are officially among the nation's best—Sargent programs tracked by *U.S. News & World Report* all rank in the top 8 percent in their respective fields:

- **Occupational Therapy Program** ranked number 2 out of 156 programs
- **Physical Therapy Program** ranked number 16 out of 201 programs
- **Speech-Language Pathology Program** ranked number 21 out of 250 programs

National Certification Board Exam Passing Rates

Percentage of BU Sargent College students in entry-level graduate programs who passed the exam the first time (data averaged over the past three years):

Nutrition	100%
Occupational Therapy	98%
Physical Therapy	99%
Speech-Language Pathology	100%

ABOUT US

Boston University College of Health & Rehabilitation Sciences: Sargent College has been defining health care leadership for more than 130 years. As knowledge about health and rehabilitation increases and society's health care needs become more complex, BU Sargent College continuously improves its degree programs to meet the needs of future health professionals. Our learning environment fosters the values, effective communication, and clinical skills that distinguish outstanding health professionals. Our curriculum also includes an important fieldwork component, providing students in every degree program with substantive clinical experience. Clinical internships are available at more than 1,400 health care facilities across the country. The College also operates outpatient rehabilitation centers that offer a full range of services to the greater Boston community.

*Based on the GRE revised General Test Scores (for tests taken on or after August 1, 2011).

Boston University College of Health
& Rehabilitation Sciences: Sargent College

NONPROFIT
US POSTAGE
PAID
BOSTON MA
PERMIT NO. 1839

Get in Touch
To visit BU Sargent College or learn more about our academic programs, research, and clinical practice, please contact us:

Email: sargrad@bu.edu

Phone: 617-353-2713

Mail:
Boston University
College of Health & Rehabilitation Sciences:
Sargent College
635 Commonwealth Avenue
Boston, Massachusetts 02215

www.bu.edu/sargent

1014