2018-2019

Inside Sargent

Boston University College of Health & Rehabilitation Sciences: Sargent College

ILLUMINATING THOUGHT

INFRARED-LIGHT BRAIN IMAGING WILL ALLOW US TO LOOK INSIDE THE LIVING BRAIN—AND SEE STROKE RECOVERY IN REAL TIME. *RESEARCH AT THE TECH FRONTIER.*

BOSTON UNIVERSITY

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2018–2019

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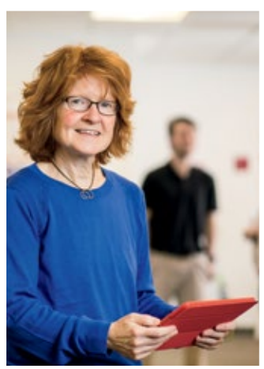

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ONLINE EXTRAS

Walk This Way
Watch how a 3-D motion capture system processes data about a subject's gait and walking patterns at **go.bu.edu/sargent/inside-sargent**.

Trek Through Thailand
See a slideshow of Sargent students from the International Service Learning Program in Thailand at **go.bu.edu/sargent/inside-sargent**.

Research News
Bookmark **bu.edu/sargent** for regular research updates.

2018 Meredith E. Drench Lecture
Watch Dana Suskind explain how inequities in children's exposure to language can have public health implications, in a video at **go.bu.edu/sargent/inside-sargent**.

InsideSARGENT
2018–2019

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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 bu.edu/sargent.

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Dean's Message

"Sargent's goal is unwavering: educating the next generation of leaders in health and rehabilitation to enhance the health of our patients. We're at the forefront of changing lives."

Dear Friends,

As I write to you this fall, I reflect proudly on a year of steady growth and success at Sargent College. Our faculty continue to be celebrated as leaders and innovators in their fields. We are especially excited by the recognition of Assistant Professor Deepak Kumar, who was selected as a recipient of the 2018 American Physical Therapy Association's Eugene Michels New Investigator Award, as well as Clinical Professor Ellen Cohn, who will deliver the American Occupational Therapy Association's prestigious Eleanor Clarke Slagle Lectureship this spring in New Orleans. We also developed two new combined programs, creating a more efficient path for students in both occupational therapy and physical therapy to pursue a PhD in rehabilitation sciences. We continue to shatter fundraising goals, doubling our participation in the University's annual Giving Day.

We also completed renovations and upgrades to infrastructure and research labs, which include an impressive array of new technology that inspires our cover story, "From MRI to Motion Capture." Just a few examples: physical therapy researchers use a 3-D motion capture system to identify connections between movement patterns and disease. Speech, language & hearing sciences faculty study dyslexia with BU's state-of-the-art MRI machine. Health sciences researchers use an electron microscope—one of the only systems like it at the University—to map brain connections in disorders like autism.

Also in this issue, you'll learn how occupational therapy doctoral students support women who are incarcerated prepare for life after prison. A physical therapy professor demonstrates the benefits of treating Parkinson's with exercise. Faculty and students in Sargent's Aphasia Resource Center test the effectiveness of conversation therapies. And a human physiology professor collaborates with BU engineers to tackle vascular dementia.

Whether helping young stroke survivors earn college degrees or employing the power of photography to give voice to those with mental illness, Sargent's goal is unwavering: educating the next generation of leaders in health and rehabilitation to enhance the health of our patients. At the same time, our alumni continue to hold key research and clinical positions at top institutions throughout the world—they, like the faculty and students at Sargent, maintain their commitment to improving the human condition. We're at the forefront of changing lives.

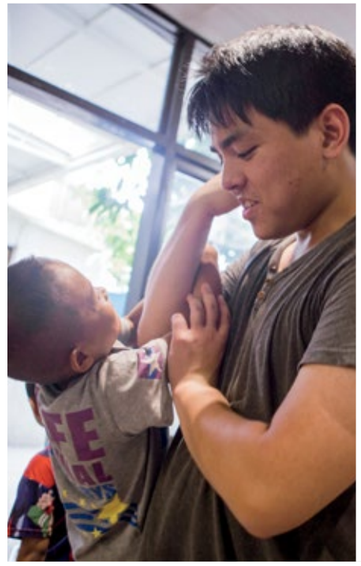
I look forward to sharing more stories in the year ahead, and I hope you'll keep in touch with me directly at mooreca@bu.edu. It's always a pleasure to hear from you.

Best wishes,

Christopher A. Moore
Dean and Professor,
@SARDeanBU

DAN AGUIRRE

Snapshots



DESTINATION: THAILAND

In spring 2018, 17 undergraduates learned firsthand about Thailand's healthcare system on a two-week trip offered through Sargent's International Service Learning Program. They traveled to hospitals and NGOs, helped build a road, and visited temples. "The more you travel, the more you broaden your horizons," says Hannah Giffune ('19,'21). "That allows you to empathize more with your patients."

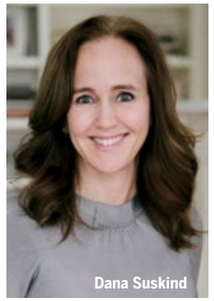
Web Extra

Learn more at **go.bu.edu/sargent/inside-sargent**.

JANICE CHECCHIO

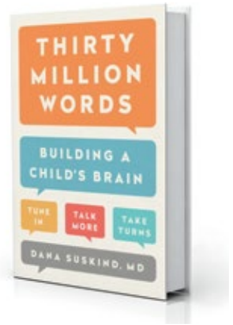
WebExtra Watch Suskind's lecture at **go.bu.edu/sargent/inside-sargent**.

EVERY WORD MATTERS


Dana Suskind

"Learning doesn't start on the first day of school, but rather on the first day of life," said Dana Suskind, in her 2018 Meredith E. Drench Lecture, "Thirty Million Words: A Public Health Approach to Early Childhood Education" at Sargent. The first three years of a child's life—during which 80 to 85 percent of brain growth occurs—are crucial to language development, and much of that development takes place at home, through communication with parents and caregivers. Deprivation of language due to factors like hearing impairment can have lifelong consequences for children's language and literacy, as well as many facets of development, like spatial reasoning and socioemotional maturity.

That's why Suskind, codirector of the University of Chicago's TMW Center for Early Learning + Public Health, advocates for helping parents and caregivers to effectively communicate with children. Suskind, a cochlear implant surgeon, founded the Thirty Million Words Initiative—and published a book of the same title—to develop evidence-based interventions that "meet families where they are" in maternity wards, pediatricians' offices, childcare centers, and at home.



In her lecture, Suskind talked about how the initiative supports children's language development during these critical years. Seemingly simple modifications can have a big impact. For example: when taking a walk with a child, instead of pointing out what you see, like a triangular bush, Suskind suggests a more interactive approach, instead asking, "Where do you see a triangle?" That shift not only engages the child in conversation, but enhances their aptitude in other developmental areas; in this case, recognizing shapes. Even small changes to everyday interactions with children can make a lasting difference in their lives.

WebExtra Learn more at **go.bu.edu/sargent/inside-sargent**.

TOP AWARDS


Ellen Cohn

SLAGLE LECTURESHIP AWARDED TO OCCUPATIONAL THERAPY PROFESSOR

Ellen Cohn, a clinical professor of occupational therapy, has been awarded the prestigious Eleanor Clarke Slagle Lectureship, which honors a member of the American Occupational Therapy Association for their contribution to the profession. When she presents the lecture in 2019, Cohn will join a distinguished list of eight prior Slagle lecturers from BU and Sargent.

They are: **Wendy Coster**, professor and chair, and **Karen Jacobs**, clinical professor; former Sargent faculty **Anne Henderson**, **Catherine Trombly**, and **Jerry Johnson**; and alums **Elizabeth Yerxa** (Wheelock'68,'71), **Anne Fisher** ('77,'84), and **Kathleen Barker Schwartz** ('75).

FACULTY

Deepak Kumar, an assistant professor of physical therapy & athletic training (PTAT), received the 2018 Eugene Michels New Investigator Award.
Diane Heislein, a clinical associate professor of physical therapy, has been elected to a 3-year term on the Nominating Committee of The American Council of Academic Physical Therapy (ACAPT). **Cara Lewis**, an associate professor of PTAT, received a 2018 APTA Section on Research Traveling Fellows Award.

STUDENTS

Sargent nutrition students and alums won the majority of the 2018 awards given out by the Massachusetts Academy of Nutrition and Dietetics:
Jay Patruno ('18) received the Recognized Dietetics Student award.
Nicolette Maggiolo ('15) received the Recognized Young Dietitian award.
Kellene Isom ('09) received the Recognized Dietitian award.
Jennifer Kong Heinen ('13) received the Emerging Leader in Dietetics award.

GULNARA STUDIO (SUSKIND); COURTESY OF SARGENT (COHN)

PHOTOGRAPHING MENTAL ILLNESS

Much of the tree lies sideways, a shattered mess of splinters; its neighbors loom, still reaching for the clouds. Under a photo of this fallen giant, a person with mental illness has written what the broken tree means to them: "Depression will wreck its way through your personal life [like] a tornado, tearing up the foundations of your life....But it is in these time[s] that we learn which of our roots are the strongest."


A photo from PhotoVoice, which puts cameras in the hands of those often left without a voice by society.

The image is from one of PhotoVoice's many international initiatives, which put cameras in the hands of those often left without a voice by society—from Indonesian migrant workers to rural Zimbabweans—allowing them to share pictures and words that shape their world. For more than a decade, the BU Center for Psychiatric Rehabilitation has used PhotoVoice to empower people with mental illness and educate the public about their lives.

During BU's Alumni Weekend 2017, Mary Elizabeth "Tipper" Gore (CAS'70), a mental health advocate, photographer, and former Second Lady, visited the center to learn more about its mission and see a selection of its PhotoVoice work.

In recent studies, the center has evaluated the effectiveness of several PhotoVoice projects in helping people with psychiatric disabilities pursue employment, reduce stigma, turn social isolation into civic participation, and create a social media community.

Zlatka Russinova, the center's director of research, hopes that Gore is inspired to "share information about the power of PhotoVoice as a tool for public education."—Andrew Thurston

Mary Elizabeth "Tipper" Gore (CAS'70) visited the BU Center for Psychiatric Rehabilitation (CPR) to see PhotoVoice images and meet with Sargent Dean Christopher Moore (center) and members of the CPR team, including Executive Director E. Sally Rogers (right).

JACKIE RICCIARDI (GORE)

NEW FACULTY & PROMOTIONS

NEW FACULTY

Dustin Allen, lecturer, health sciences
Malwina Carrion, lecturer, health sciences
Kaytlin Eldred, lecturer, health sciences
Lindsey Locks, assistant professor, health sciences
Leanne Yinusa-Nyahkoon, clinical assistant professor, occupational therapy

PROMOTIONS

Swathi Kiran, associate dean for research
Jessica Kramer, associate professor, occupational therapy
Lee Marinko, clinical associate professor, physical therapy and athletic training
Cara Stepp, associate professor, speech, language, and hearing sciences
Lawrence Were, assistant professor, health sciences
Stacey Zawacki, clinical assistant professor, health sciences, programs in nutrition

IN MEMORIAM

We are sad to share that Nancy Talbot, former Sargent dean, passed away in February at the age of 86. Talbot worked at BU for 14 years, first as a professor and chair in the Department of Occupational Therapy and then as dean of Sargent until she retired in 1996. Retirement did not stop Nancy's work in her field. She was treasurer of the American Occupational Therapy Association and served on the American Occupational Therapy Foundation Board, among other boards, for seven years. We are thankful for Nancy's many contributions to BU, Sargent, and the field of occupational therapy. She will be greatly missed.

Terry Ellis received a five-year, $3 million grant from the National Institutes of Health for an exercise program with an mHealth component.

Slowing Parkinson's

WHY EXERCISE IS ONE OF THE BEST MEDICINES | BY BARBARA MORAN

Each year, doctors diagnose about 60,000 Americans with Parkinson's disease, a progressive neurodegenerative disorder that can lead to tremors, limb and facial rigidity, and balance and walking problems. There are treatments, but no cure.

One of the best therapies turns out to be one with no cost and few side effects, says Terry Ellis, an assistant professor of physical therapy and athletic training and the director of Sargent's Center for Neurorehabilitation. That treatment, says Ellis, is exercise.

Ellis, who directs the American Parkinson Disease Association National Rehabilitation Resource Center at Boston University, has been working with patients and studying the neurology of Parkinson's for 20 years. Widely recognized as a national leader on the subject, Ellis has received many teaching and research accolades, including the 2016 Chattanooga Research Award. Presented by the American Physical Therapy Association, the award recognizes the most significant research paper contributing to the science and practice of physical therapy that year.

Ellis has also pioneered work on using mobile health (mHealth) technology like iPads to help people with Parkinson's keep moving. With Gammon Earhart, a professor at Washington University in Saint Louis, she recently received a five-year, $3 million grant from the National Institutes of Health to enroll 200 people with Parkinson's in a one-year exercise program with an mHealth component to study how well it works and why.

We spoke with Ellis about how Parkinson's treatment has changed through the years, and her outlook for the future.

***Inside Sargent:* When you were first working as a clinician, 30 years ago, how did you treat people with Parkinson's? What was the standard practice?**

Ellis: Back then, we thought, "Oh, these people have a chronic progressive disease; they're just going to get worse." We didn't really expect them to improve, so we just taught them strategies to get by. Like, "If you can't stand up out of a chair by yourself, here's how someone might help you."

And what was the understanding of the effect of exercise on Parkinson's?

At that time, there were almost no studies looking at the benefits of physical therapy or exercise for people with Parkinson's.

JAKE BELCHER

> "We promote people coming directly to physical therapy at the point of diagnosis [so that we can] prescribe an exercise program that's tailored to their needs."
> –Terry Ellis

It wasn't until the 1990s that there were some animal studies done in rats and mice with Parkinson's. And scientists found a potential neuroprotective effect, meaning that maybe exercise does something to slow down the progression of the disease or to protect cells from dying.

What do we know about exercise and Parkinson's now?

Studies conducted here at Sargent as well as by other research groups looking at the benefits of physical therapy and exercise for people with Parkinson's have shown improvements in things like walking and balance. Most of those early studies were short-term; you could make a difference over 8 to 12 weeks. What about longer? People with Parkinson's live a long life and want to live well.

In the last five years or so, more long-term studies have come out looking at what happens if you exercise consistently for a year or two. The results show that people with Parkinson's who exercise do better than people who don't.

Why? What's happening?

We know that exercise improves overall brain health. But in Parkinson's, there may be an increase in neurotrophic factors that protect sick cells from dying. We don't know for sure. We see improvements at the functional level. We see that people can walk better for a longer period of time. We see that balance can improve. We see that strength can improve. So now exercise is becoming part of the standard recommendations for treatment for people with Parkinson's.

Are there issues with exercise that are particular to people with Parkinson's?

Yes. First of all, they have mobility problems, so they can fall, they have a shuffling gait, they're slow. These can make it difficult to exercise. But I think, more important, there are issues related to depression and apathy, and they may have poor confidence in their ability to exercise successfully. These factors make it even more difficult to overcome that inertia. Also, the number of people in the United States with Parkinson's who are referred to physical therapy is around 14 percent. That's terrible. In my mind, it should happen for everybody right away.

Do other countries do it better?

Yes, because other countries with socialized medicine aren't dealing with third-party payers. If you have Parkinson's in the Netherlands, you can just go to a physical therapist and get treatment.

We promote people coming directly to physical therapy at the point of diagnosis. Then we can do a battery of tests to get a baseline assessment—what's your initial walking ability, your balance, your quality of life—so that we have solid data. And then we prescribe an exercise program that's tailored to their needs.

Are there certain types of exercise that seem especially beneficial for people with Parkinson's?

It seems that there may be a neuroprotective effect from aerobic exercise. There are also studies showing that progressive resistance exercises or strengthening exercises help people with Parkinson's who have bradykinesia, or slowness of movement, to turn on their muscles faster so that they can move more efficiently. Balance exercises are also very important because of the fall risk.

I was wondering whether they should avoid exercises requiring balance.

Well, at one time, that was the recommendation. But if you sit too much, you're going to be so deconditioned, that creates a whole other cadre of problems. And so we recommend people move, and move a lot.

How does mHealth fit into that?

When we see people every six months, they still have to exercise independently between visits. So what we've been doing is using a mobile health platform, an app. People have their device—either their iPad, tablet, or their smartphone—and we use an app that shows videos of their exercises. So they get home, open the app, and then they can see the exercises that we've prescribed for them and remember how to do them. After they finish the exercise each day, they answer certain questions, like, Was this hard or easy? How many did you do?

Then the therapist can check the data. And based on the responses, we can remotely adapt the exercise program so we can keep it interesting. One of the big things that patients report to us is that accountability makes a difference. They know that you're watching, and they know they're coming back in six months to be remeasured, and they want those numbers to improve. They want to take control of this disease.

Where do you hope treatment will be 20 years from now?

Well, maybe we'll have a cure. But I think what might happen is that there will be a "buffet" of treatments that slow the progression of the disease. And one of those will be exercise. And I hope that we have a system in place across the United States so that everybody gets this, not just people in the know. IS

This interview has been condensed and edited for clarity.

FROM MRI TO MOTION CAPTURE

HOW FIVE NEW TECHNOLOGIES SUPPORT INNOVATIVE RESEARCH

BY LARA EHRLICH

ADDITIONAL REPORTING
BY SARA RIMER
PHOTO BY MIRA WHITING

1 **SCANNING FOR SPEECH**

A faster, more detailed MRI to analyze speech recognition

2 **WALK THIS WAY**

Motion trackers and physiological sensors help improve walking ability

3 **DETECTING BRAIN ACTIVATION**

Near-infrared light detects changes in the brain's blood flow

4 **CAPTURING MOTION**

3-D motion capture reveals movement pattern complexity

5 **ZOOMING INTO THE BRAIN**

A microscope provides the closest-ever look at the brain's axons or cables

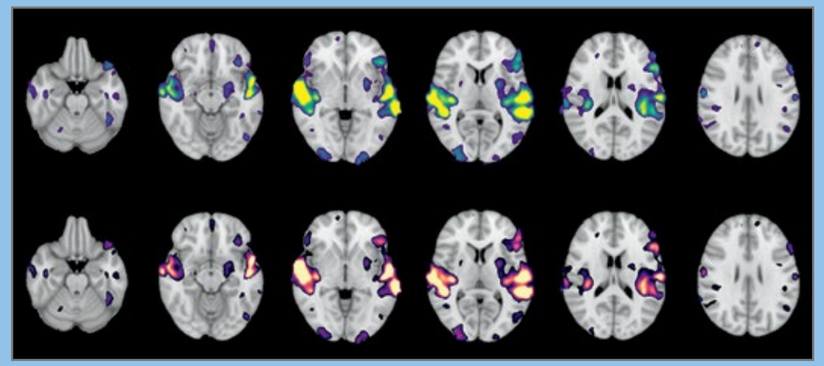
TYLER PERRACHIONE walked out of his office, crossed Commonwealth Avenue, and entered the Rajen Kilachand Center for Integrated Life Sciences & Engineering's Cognitive Neuroimaging Center (CNC). There, he spent two hours scanning a human's brain for a study using BU's new Siemens Prisma 3 Tesla MRI machine. It was the first time Perrachione, director of the Communication Neuroscience Research Laboratory, didn't have to schlep across the river to MIT's brain imaging center. The nine-story, 170,000-square-foot Kilachand Center opened in 2017 thanks to a record $115 million gift from BU Trustee Rajen Kilachand (Questrom'74, Hon.'14).

"Everything went swimmingly," says Perrachione, an assistant professor of speech, language, and hearing sciences, whose enthusiasm is echoed by his colleague Jason Bohland, the center's associate director. The MRI machine—which supplies higher quality scans than older machines in record time—is "especially an advantage for people like Perrachione who are developing new technology or trying something that's a little out of the ordinary," says Bohland. "Just being able to come over here quickly is a huge advantage."

The MRI machine (see "Scanning for Speech," page 10) has been a game changer not just for neuroscientists, but for Sargent researchers working in a range of disciplines; Assistant Professor Deepak Kumar scans his subjects' knees and hips, for example. The machine is just one of many BU technologies that facilitates Sargent's pioneering research.

Here's how Sargent faculty are using tech, from decoding speech to tracking walking patterns.

1 SCANNING FOR SPEECH



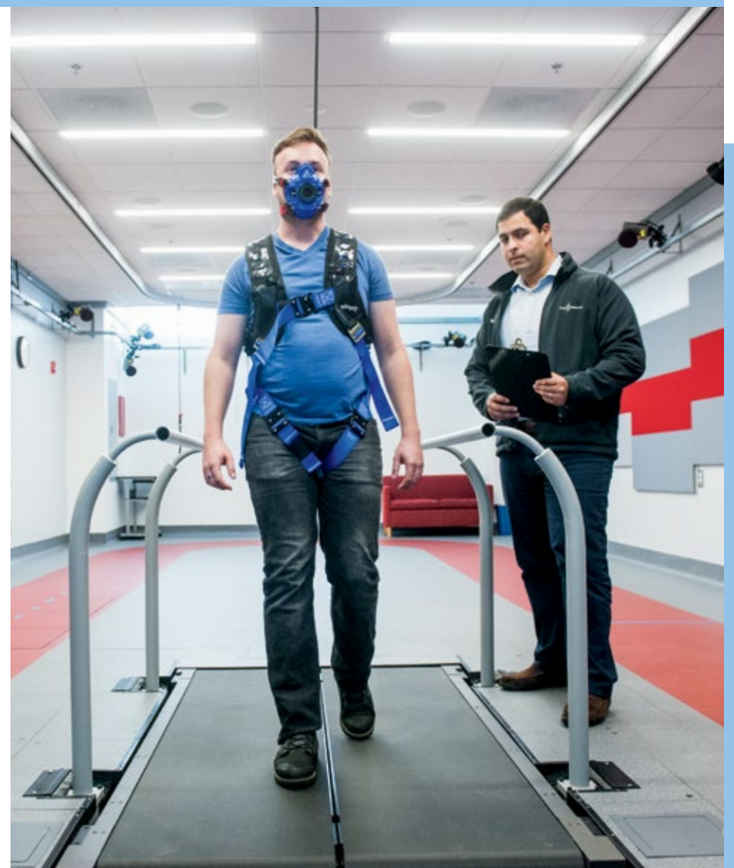
These scans of a human brain—taken by the new MRI machine—show which parts are activated when we listen to monosyllabic words like "boot" and "deck." Tyler Perrachione is collecting the data as part of a project decoding how the brain recognizes the same word when spoken by different people, since every person's speech has a unique sound.

"The new MRI machine lets us get higher quality images of the brain [than older machines] in a smaller amount of time, which is important when we are looking at things that the brain has to do very fast, like understand speech," says Perrachione. "Being able to take high quality pictures faster is also important when doing studies with children, who sometimes don't like to be in the machine for a long time. We are using these new technologies to study which parts of the brain change as you listen to different people talk, how these changes help you understand speech more efficiently, and how this plasticity might be reduced in developmental communication disorders like dyslexia." IMAGE BY TYLER PERRACHIONE

2 WALK THIS WAY

At the Neuromotor Recovery Laboratory, "We use optical and inertial motion trackers in combination with physiological sensors to study how people who have neurological conditions, such as a stroke, walk" and to help them improve their walking ability, says Louis N. Awad, an assistant professor of physical therapy and athletic training and director of the lab. The image to the right features the lab's treadmill and track with 21 sensors to monitor muscle activity, 6 force plates to measure gait, and 18 optical motion cameras to triangulate a subject's position in 3-D. PHOTO BY JANICE CHECCHIO

"The lab is part of the BU Track & Tennis Center, so patients who have trouble walking are working next door to BU's runners and athletes," Awad (far right) says. "They find it inspiring."



3 DETECTING BRAIN ACTIVATION

Swathi Kiran, director of the Aphasia Research Laboratory, typically uses brain imaging techniques (fMRI) to examine how the damaged brain recovers language. Even small head movements can distort the data, however, so in recent studies Kiran has turned to functional near-infrared spectroscopy (fNIRS) to study activation in the brain. The fNIRS technology "is easier to set up and study, and with a clinical population like people who have had a stroke, this is a huge advantage," says Kiran, associate dean for research and a professor of speech, language, and hearing sciences. The technology relies on near-infrared light that, when targeted on the scalp and brain, can detect changes in blood flow as humans think, speak, read, or write. PHOTO BY JANICE CHECCHIO

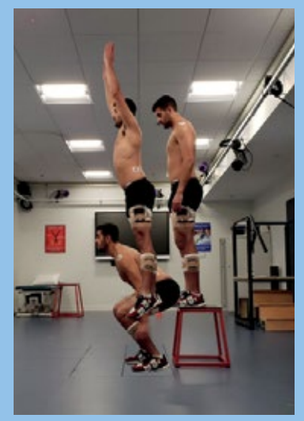
Learn how fNIRS facilitates Kiran's recent research on page 18.

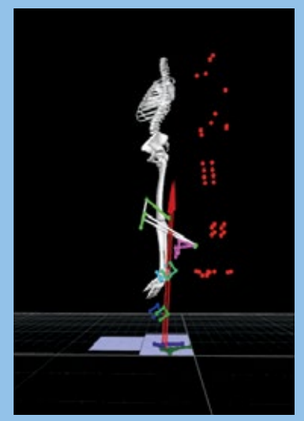
The fNIRS technology evolved from the pulse oximeter that clips to a patient's finger to non-invasively measure the oxygen level of the blood.

4 CAPTURING MOTION

Deepak Kumar, an assistant professor of physical therapy and athletic training, uses a 3-D motion capture system at the Movement & Applied Imaging Lab to "assess movement patterns in people who have osteoarthritis or who may be at risk for developing it," he says. His goal is to "understand how their movement patterns may be interwoven with their disease—and how we can change their movements to help them feel better." Here, a subject drops from a step onto a force platform, then jumps straight up. Data from sensors worn on the body are represented as red dots, and the arrows indicate the force he exerts on the ground.
IMAGES BY DEEPAK KUMAR

Read more about Kumar's work on page 14.



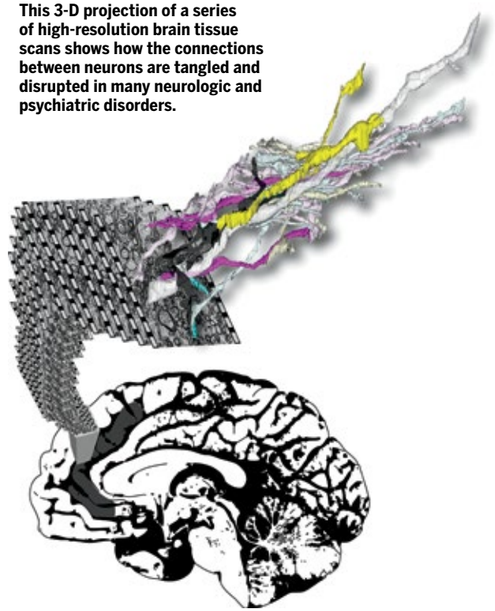


5 ZOOMING INTO THE BRAIN

Sargent researchers are systematically looking at the developing human brain at a higher resolution than ever before. In a 2018 study published in *PLoS Biology*, assistant professor Vasileios Zikopoulos and his health sciences colleagues used the GeminiSEM 300 electron microscope to—for the first time—study the axons, or cables, that connect neurons and facilitate their communication across different areas of the brain. Housed at the Human Systems Neuroscience Laboratory, the microscope enabled researchers to study the organization of various areas of the brain and explore what goes wrong in the connections between them in disorders like autism.

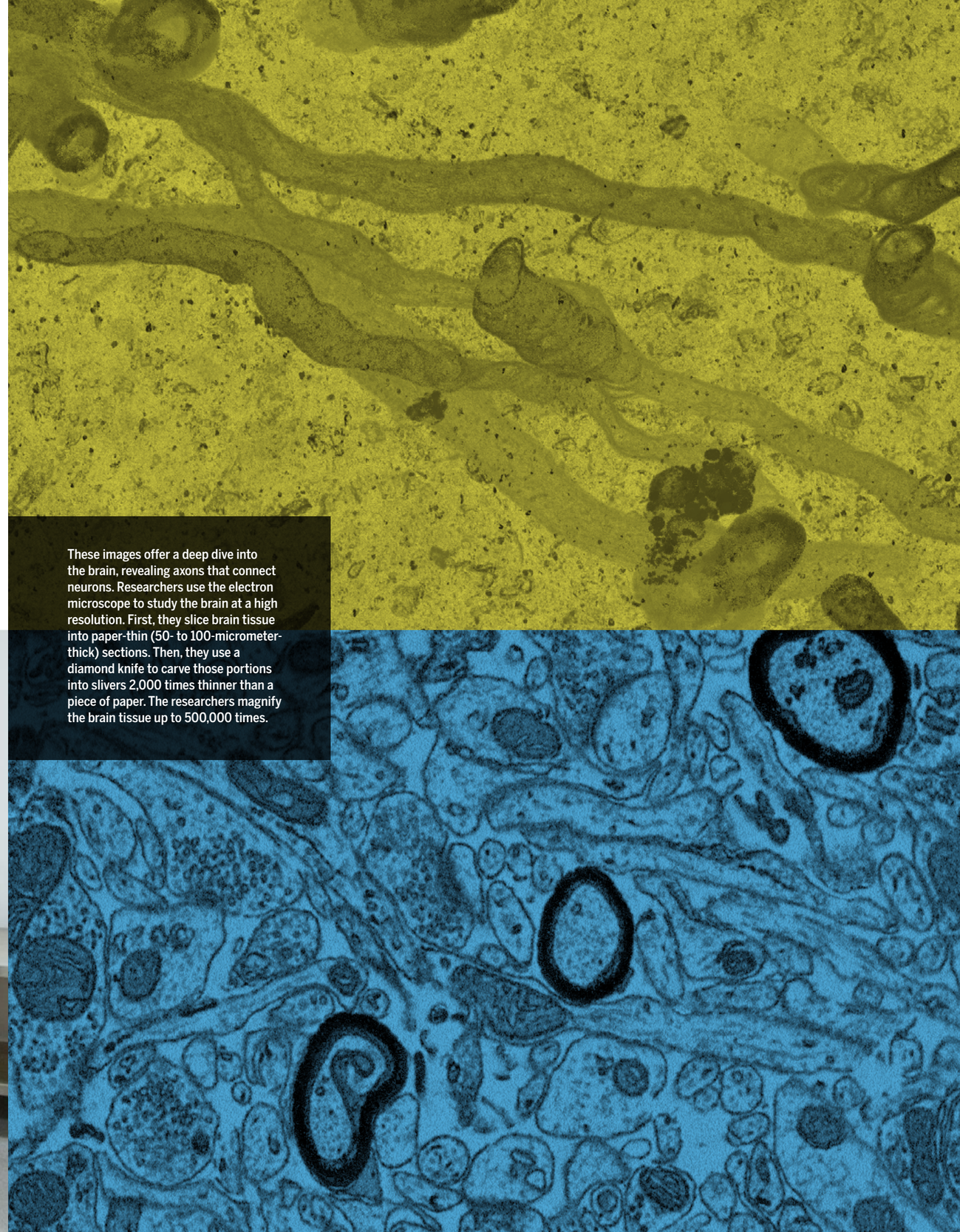
Zikopoulos found that axons are tangled, which scrambles neural signals. This miscommunication causes problems commonly seen in autism, such as extreme focus and inability to shift attention. The researchers are now exploring changes in the brain's organization in schizophrenia, depression, and other disorders.

PHOTO BY DAVE GREEN. SCANS AND IMAGE BY VASILEIOS ZIKOPOULOS.



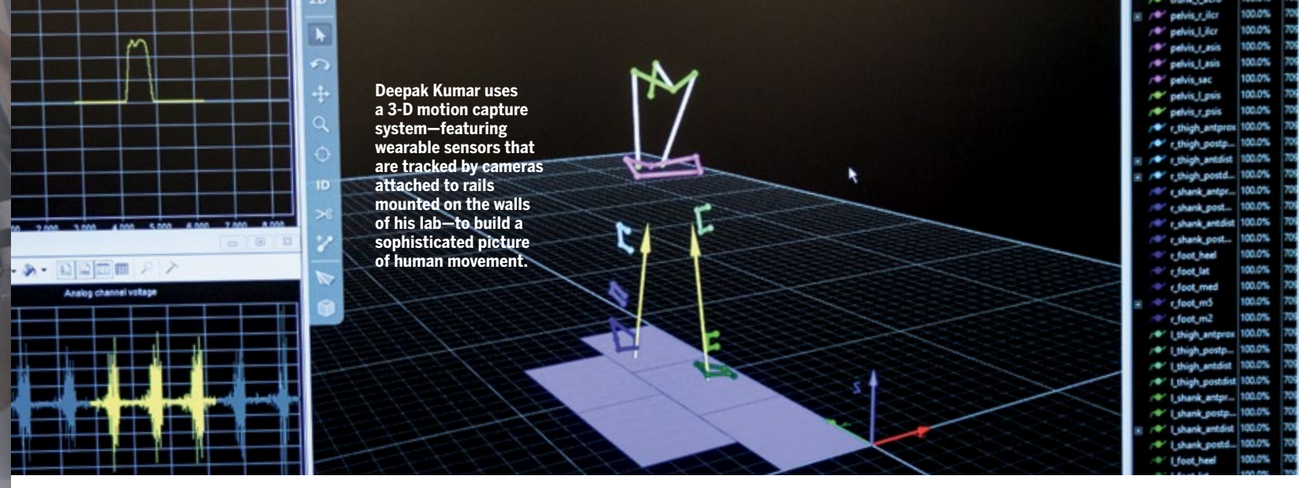
This 3-D projection of a series of high-resolution brain tissue scans shows how the connections between neurons are tangled and disrupted in many neurologic and psychiatric disorders.

Sargent's electron microscope is so sensitive that the train passing along Commonwealth Avenue would cause vibrations in the brain scans. To provide accurate data, the tech is housed in an electromagnetic, acoustic, and vibration-free lab.



These images offer a deep dive into the brain, revealing axons that connect neurons. Researchers use the electron microscope to study the brain at a high resolution. First, they slice brain tissue into paper-thin (50- to 100-micrometer-thick) sections. Then, they use a diamond knife to carve those portions into slivers 2,000 times thinner than a piece of paper. The researchers magnify the brain tissue up to 500,000 times.

Mindful Walking



Deepak Kumar uses a 3-D motion capture system—featuring wearable sensors that are tracked by cameras attached to rails mounted on the walls of his lab—to build a sophisticated picture of human movement.

A TAI CHI–INSPIRED TECHNIQUE COULD HELP PEOPLE WITH KNEE OSTEOARTHRITIS WALK MORE—WITHOUT FURTHER DAMAGING THEIR JOINTS

BY ANDREW THURSTON

"If we target pain and problems with mood and sleep, as well as physical activity, we're more likely to be successful in getting people with osteoarthritis to be more active."
—Deepak Kumar

It's a bit of a chicken-or-the-egg conundrum. People with knee osteoarthritis don't walk enough, which can leave them stiff and put them at a higher risk for other health problems. But, when people with knee osteoarthritis do walk, they tend to be a biomechanical mess, overactivating their muscles, walking bowlegged, or putting more pressure—called joint loading—on the knee. This further damages their cartilage, aggravating the condition and increasing their discomfort. In response, they walk less.

"We have these two problems," says Deepak Kumar, an assistant professor of physical therapy and athletic training. "The trick is, how do we solve them both?"

About 14 million people in the United States have symptomatic knee osteoarthritis, according to a 2016 study published in *Arthritis Care & Research*. The joint cartilage is gradually degrading, the meniscus—the shock-distributing cartilage—getting torn and worn down, and muscles steadily weakening. It adds up to difficulty walking and chronic pain. Physical therapy, weight management, painkillers, and steroid injections provide some relief, but for more than half of sufferers, those limping through the condition's advanced stages, a total knee replacement is probably the only remedy.

Kumar's goal is to limit or delay surgeries, but first he must fix that chicken-or-the-egg problem: helping people become more active and ensuring their newfound enthusiasm for fitness doesn't make their knee osteoarthritis worse.

He got a glimpse of a potential solution while he was a postdoctoral researcher at the University of California, San Francisco. There, Kumar worked with Professor Frederick Hecht on a project testing ways of encouraging people with prehypertension to be more active. As part of the clinical trial, one group of participants was trained in a technique called ChiRunning, which is inspired by tai chi and applies mindfulness practices to improve running form. The fundamental tenets, says Kumar, are "increased body awareness, engaged core, reduced stride length, midfoot strike, increased step rate, and relaxed upper body." His job was to conduct motion analysis on the participants at the beginning of the trial and three months later; he found their biomechanics—how the body and muscles work together to propel someone forward—had shifted.

"The ChiRunning group showed changes in their movement patterns that seemed to suggest their loading on the knee was lower," he says. They weren't putting as much pressure on the joint, particularly the inside of the knee, or putting their foot as far in front of their body; the researchers concluded that the biomechanical differences "may be associated with reduced lower extremity stress."

"I thought, 'OK, this should work for osteoarthritis,'" says Kumar. He started a small second study with healthy subjects to take a closer look at ChiWalking, which uses similar techniques as its running counterpart. He found it also reduced impact forces on the body, and the knee in particular.

Now, with a grant from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, he's launched a feasibility project to see if ChiWalking can help people with knee osteoarthritis. For six months, one group will attend regular ChiWalking sessions, while a second will participate in classes on osteoarthritis and the importance of exercise. At key stages in the study, Kumar will bring the subjects into his Movement & Applied Imaging Lab at Sargent to measure their walking patterns and quantify the amount of force their knees are bearing. The lab has a 3-D motion capture system—subjects wear small sensors that are tracked by cameras attached to rails mounted on the walls—and a force platform built into the floor; participants also wear electromyography sensors that measure muscles' electrical activity. Kumar, who teaches Instrumentation for Analysis of Motion, a course focused on using technology in research, has eight undergraduates in his lab to help him and his research fellow process the data.

But he's aware that for the ChiWalking intervention to be a success—improving gait and helping people get and stay active—it'll need to work without the fancy equipment.

"Traditional approaches on changing how people walk require them to come to a lab like we have and then be shown their data and how to change it," says Kumar. "That's very time and cost intensive. You have to do it one person at a time."

For the second six months of the ChiWalking project, the emphasis will be on helping participants stay active—safely—without visiting the lab. Study participants will be given a fitness tracker and access to a mobile health app. The app, which Kumar is developing in collaboration with BU's Software & Application Innovation Lab, pulls in activity data from the tracker, asks questions about mood, sleep patterns, and pain levels, and sends motivational messages. Users can also set goals, while a physical therapist can monitor progress to help them stay engaged with the program.

"If we target pain and problems with mood and sleep, as well as physical activity, we're more likely to be successful in getting people with osteoarthritis to be more active; people who have these problems tend to be least active and are at greatest risk of developing other health problems," Kumar says.

That fits with his other ongoing research projects, which emphasize finding ways to better monitor patients as they go about their daily lives. In the lab, he says, subjects usually wear light clothing, are plastered in sensors, and watched constantly—and there are no bumpy sidewalks or uneven paths to navigate. "They always end up changing slightly how they're walking."

Kumar recently tested the ability of a small inertial sensor—an inexpensive, eraser-sized gadget that includes a gyroscope—to track movement and gait without the need for all the cameras and force plates. When put on the thigh, the sensor can track the knee as the foot hits the ground, monitoring any varus thrust, a quick, but damaging, outward movement of the knee. He presented the results at the 2018 American Society of Biomechanics annual meeting.

If Kumar's ChiWalking studies are successful, it could provide hope for the millions of people experiencing symptomatic knee osteoarthritis. The combination of consumer technology and a commercially available gait training technique will allow the intervention to be done in group settings at a low cost. "It's very scalable," Kumar says. IS

CONOR DOHERTY

OCCUPATIONAL JUSTICE

DiverseOT empowers incarcerated women to take control of their lives | BY REBECCA BEYER

Jade La Rochelle ('19) (from left), Natalie Petrone ('19), and Emily Briggs ('19) designed DiverseOT for female inmates at the Suffolk County House of Correction.

DAN AGUIRRE

When Natalie Petrone ('19) visited a segregation unit at the Suffolk County House of Correction in Boston, Mass., with two classmates, the experience struck close to home: Petrone has an uncle who suffers from mental illness and has been in and out of jail, sometimes with long stretches in isolation.

"It really illuminated how terrible the prison system is and what we can do better," says Petrone, an occupational therapy doctoral student who wants to work with people with mental illnesses. "Luckily, with my career, I can do something about it."

That something is a program intended to better prepare incarcerated individuals for reentry into society. "People are released into the community and wind up right back in [jail] because they didn't have the support they needed," says Petrone.

With Emily Briggs ('19) and Jade La Rochelle ('19), Petrone designed an occupational therapy program, DiverseOT, for female inmates at Suffolk. Its goal is to empower the women to take control of their lives and improve their chances for a successful transition back to their communities once released. According to the Massachusetts Department of Corrections 2016 prison population report, the 2013 three-year recidivism rate for women was 33 percent.

The jail can house close to 1,900 inmates, about 10 percent of them women, serving sentences typically under two-and-a-half years. In spring 2018, the Sargent students traveled to the jail every week for three months to work with a small group.

"We did our best to learn from the women by asking, 'What barriers might prevent you from being successful?'" says Petrone. Then the students developed activities to help the women think about how to address those barriers. There were weekly lessons for the four to nine participants that focused on life skills, such as setting goals, developing routines, and resolving conflict. In one activity, Fear in a Bag, the women wrote their concerns on slips of paper, which were then drawn from a bag and shared with the group. When one woman expressed her worry about what to say if she came face-to-face with the people affected by her crimes, the students devised a role playing exercise to help her confront that possibility.

"The two women were able to have a great exchange about what might happen," Briggs says. "They realized that sometimes the best thing you can do is apologize, say your piece, and walk away. We talked about how you can only control your actions; you can't control how someone else is going to act." Briggs believes the practice helped relieve the woman's anxiety.

To temper the intensity of these exercises, the students encouraged stretching breaks, positive affirmations ("I am calm in the face of conflict" and "I am enough just as I am"), and five- to seven-minute meditations focused on breathing or compassion. These kinds of activities gave the women a space for peace and self-reflection in the midst of what can be an otherwise oppressive environment. To track their progress, the participants created a collage of their efforts: they wrote accomplished goals on orange triangles; steps taken to help someone else with their goal on yellow triangles; and obstacles on clouds, with rays of sunshine peeking out from behind them.

"It's a little cheesy, but this way they can see what they're doing each week and how they can help each other," Briggs says, noting that one of the most meaningful outcomes of the program was the participants' initiative to devise solutions to potential post-release challenges. They helped each other to develop strategies for finding resources in the community once they're released, and to prepare for interacting with people who may treat them like criminals. Some of the strategies were simple: taking a breath before responding to a negative comment, for example. Others were practical, such as finding professional attire through Dress for Success and other nonprofits.

DiverseOT is the latest community outreach program to emerge from Occupation-Based Practice with Groups, a Sargent College course taught by Ellen Cohn, a clinical professor of occupational therapy. The course, which includes a weekly seminar, has been part of Sargent's curriculum since the early 1970s. In previous years, students have partnered with Boston's Museum of Science to provide inclusive opportunities for children with autism, worked with kids who are obese or at risk for obesity to develop healthy exercise and nutrition habits, and provided services for adolescents with disabilities who are transitioning into adulthood. The DiverseOT students were supervised by Cohn and Christina Ruccio, director of women's program services at the Suffolk County Sheriff's Department.

> "WE DID OUR BEST TO LEARN FROM THE WOMEN BY ASKING, 'WHAT BARRIERS MIGHT PREVENT YOU FROM BEING SUCCESSFUL?'"
> —NATALIE PETRONE ('19)

The Suffolk work falls into an area of occupational therapy known as occupational justice, a term that acknowledges people's right to engage in occupations or activities of daily living that promote health, well-being, and social inclusion.

Occupational therapy in the criminal justice setting is an emerging practice area, Cohn adds; the Suffolk work is Sargent's first foray into that field.

Cohn says she's impressed by the "passion, sensitivity, commitment, and thoughtfulness" of the students, who came up with the idea for the DiverseOT program, collaborating with Ruccio and Anne Escher, a clinical assistant professor.

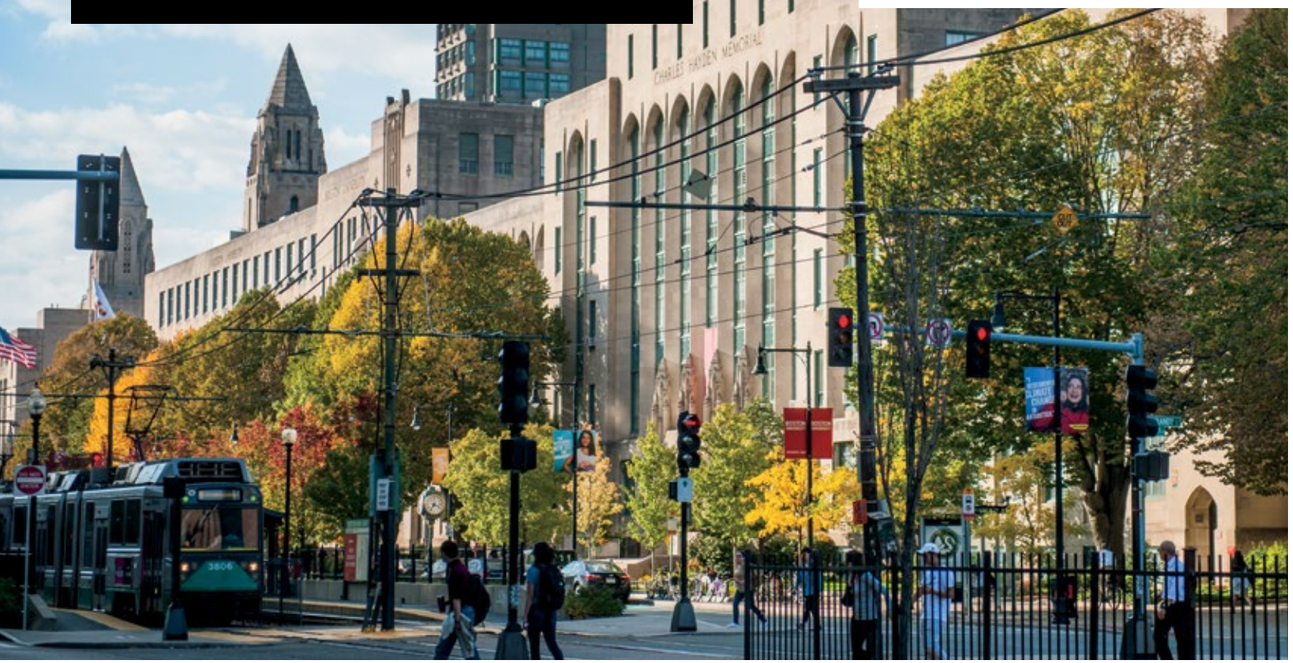
Ruccio says the students' curriculum is a strong fit with the Suffolk County Sheriff's Department's goal of providing "thoughtful, gender-specific, reentry programming to our female inmates and detainees." IS

Briggs, La Rochelle, and Petrone are in the first class of doctoral students in Sargent's Entry-Level Doctor of Occupational Therapy program, which launched in 2016.

A NEW SEMESTER

REHABILITATION PROGRAM HELPS YOUNG ADULTS RETURN TO COLLEGE AFTER A BRAIN INJURY

BY STEPHANIE ROTONDO



The day before Thanksgiving 2009, college junior Drew Sperling got ready for work in the apartment he shared with roommates, walked out of his room, and collapsed from a stroke. The 21-year-old spent five weeks in a coma and was paralyzed on his right side. He was diagnosed with aphasia—a language processing disorder that makes it difficult to speak, understand speech, read, or write—and he had to relearn how to walk.

After five years—and a lot of speech and physical therapy—the former business major gave college another try. He enrolled in a class, but says he found the content and fast pace daunting. By the time he understood a concept in a lecture, the professor had moved on. He dropped the course in its second week.

Sperling's struggles are more common than many people realize. Young adults account for approximately 10 to 15 percent of the nearly 800,000 Americans who have a stroke each year; 15-to-24-year-olds have the second highest rate of traumatic brain injury (TBI) among any age group, often a result of motor vehicle accidents, sports injuries, and falls. And yet there are few rehabilitation programs to help young adults like Sperling overcome the physical, intellectual, and psychosocial barriers caused by stroke or TBI.

Swathi Kiran, a speech, language, and hearing sciences (SLHS) professor and associate dean for research, has developed a new program, Intensive Cognitive and Communication Rehabilitation (ICCR), to help young adults return to college after a brain injury—and to improve their quality of life.

"When you're college-age, everything you're doing—waking up, going to class, remembering your classroom, taking assignments—gets much harder because of the stroke or TBI," says Kiran, director of Sargent's Aphasia Research Lab. "So, most people just drop out of the system."

ICCR is designed to help young adults with brain injuries improve their cognitive and linguistic function and become successful students.

"It's like a practice run to go back to school," says Lindsey Foo, an SLHS clinical fellow and a program facilitator.

JANICE CHECCHIO

ICCR is "like a practice run to go back to school," says program facilitator Lindsey Foo (far right), with Zach, an ICCR student (center).

MICHAEL D. SPENCER

INTENSE STUDY

In 2018, Sperling moved from California to Boston to enroll in ICCR's 15-week spring semester. As a member of the six-student cohort, he came to Sargent four days a week for lectures in four introductory college courses (subjects included English, statistics, psychology, and human anatomy and physiology), lecture review sessions led by clinicians, technology training, and individual therapy. The program began and ended with one to two weeks of clinical and academic assessment to measure participants' improvements from the beginning of the semester.

> "When you're college-age, everything you're doing…gets much harder because of the stroke or [traumatic brain injury]."—Swathi Kiran

The lecture content—open source from Yale University and Khan Academy—isn't watered down, but the pace is calibrated to students' needs. There's no timeline in which participants must complete ICCR; they can continue as long as they show growth each semester.

Kiran developed the program by combining the principles of neuroplasticity—the idea that the brain can form and reorganize connections after injury, particularly in a stimulating environment—with intense treatment. She had seen patients improve using Constant Therapy, an iPad application she codeveloped that allows individuals to engage in therapy anywhere, anytime.

"The more systematic and more repetitive the therapy, the more you're going to improve," she says.

ICCR is more immersive and immediate than a typical speech therapy session because students are learning cognitive strategies in the classroom, where they can implement new skills or strategies on the spot. An ICCR student who is studying the four stages of mitosis, for example, can develop a mnemonic to remember those stages with the help and support of a speech-language pathologist. If they have questions, they can get assistance right away, whereas a student working on those skills in a clinic would need to wait until their next appointment for help.

Master's-level speech-language pathology students, working with ICCR as part of their practicum requirement, help provide this real-time classroom support. Kiran says their involvement enables the program to "infuse every hour with cognitive therapy."

It can be intense. Students take daily quizzes and are encouraged to study every night. They give presentations, write papers, and participate in class discussions. "Having four classes is hard," says Sperling. "But it's actually good for me to work hard."

"It's not going to get better if the work is not tough," says Natalie Gilmore, an SLHS PhD candidate and a program facilitator. "Our students get that. To get up every day and agree to be challenged—they're extraordinarily motivated."

GAINING CONFIDENCE

The program isn't just about academic success; one of its main goals is a better quality of life. During individual speech therapy sessions, students focus on a diverse range of skills and goals, from improving their writing to using an online dating app. The latter is a reminder of the challenges and goals for young adults with brain injuries. "There are so many life experiences they >

haven't had," says Gilmore. "They want to meet people, make friends."

For Sperling, living away from his parents for the first time since his stroke has been "fantastic." He says developing cognitive skills in ICCR has given him self-confidence and independence. By learning to navigate Boston's MBTA system, for example, he was able to travel to the grocery store and to get a haircut.

"He surprised us, and he surprised himself," says Sperling's mom, Shelby. "[ICCR] gave him that much more confidence that he could do the academic part on his own—he didn't need mom and dad to sit with him every night and review questions."

Classmates eat lunch together, connect on social media, and socialize outside of school. Sperling planned a recent student dinner at a Boston restaurant. "A long time ago, I was isolated, and now I'm branching out a little bit," he says. The students are also embracing the wider BU community; Sperling attends a film club and another student joined a BU bible group.

Their assimilation has been particularly gratifying for Kiran who understands the stakes: "If they don't find something like this to change their lives, they're going to fall through the cracks in the system, and they're too young to be written off."

GETTING DATA

The first two years of the program have surpassed Kiran's expectations. Measured by standardized testing, students have shown progress in classroom participation and individual therapy, as well as social communication and participation, which the program didn't specifically target. The more semesters a student participated in ICCR, the more they improved in cognitive-linguistic functions like attention, memory, and verbal expression.

What is particularly surprising, says Kiran, is that students show improvement despite the long-term nature of their injuries. "Time is against them," says Kiran, but that "does not outweigh their motivation and the intensity and functionality of the therapy—that is a scientific achievement."

One of the next steps for Kiran and her team is to use functional near-infrared spectroscopy (fNIRS) to measure changes in brain activity during class. The technology, which David Boas, director of the BU Center for Neurophotonics, helped pioneer, uses light to noninvasively monitor brain activity. Because fNIRS allows brain imaging to be conducted just about anywhere—participants wear what looks like a swim cap fitted with sensors—it solves a common research problem: laboratory tasks don't often mirror real-life scenarios. With fNIRS, "We could be in class collecting data," Kiran says, allowing her team to better determine how the brain is responding to treatment.

ICCR has grown steadily each semester and enrolled eight students in summer 2018. One program graduate is pursuing an associate's degree at a Massachusetts community college; another is attending BU, enrolled in a course at Sargent. "This is a wonderful opportunity for these survivors to move on to another phase of their life—and be able to construct a meaningful life," says the Sargent student's mother, Lisa. "It's a lifesaver. When parents ask me, 'is it worth having my son or daughter do this?' I say it will make a difference and you will see the changes."

Sperling returned for another ICCR semester over the summer, aspires to enroll in college, and is considering a career helping others with aphasia. Kiran projects that in five years, ICCR will be a comprehensive two-year program where, upon completion, all graduates enroll in college.

Seemingly small events have already proven the program's potential for positive change. Heading to a meeting last summer, Kiran stepped outside Sargent's glass doors and saw two ICCR classmates eating lunch on a bench, enjoying the midday sunshine. Surrounded by BU peers, the students waved and talked to passersby. Being part of the University milieu is the essence of what Kiran and her team are trying to achieve.

"They get to feel that they're alive," she says. "People acknowledge them as part of the University community. Yes, we're doing science, we're doing research, but, at the end of the day, they've got their dignity and their identity and their self-confidence back." IS

Swathi Kiran (center) developed ICCR by combining the principles of neuroplasticity with intense treatment. Natalie Gilmore (left) is one of the program's facilitators.

MICHAEL D. SPENCER

Life After High School

ROAD Ahead Study supports high schoolers with autism as they transition into adulthood

BY REBECCA BEYER

Christian Tsetsos, an administrative professional who has Asperger syndrome, credits his mother and an aide-turned-mentor with helping him transition from high school to college and into a full-time career. They made sure he received the necessary support services from his public school system and encouraged him to advocate for himself. Tsetsos believes many students like him aren't as fortunate when it comes to getting the help they need.

"Even among special education teachers and staff," says Tsetsos, "there's a lack of understanding about how best to prepare individuals on the spectrum for post–high school life."

As a member of the advisory board of the ROAD Ahead Study: Responsibilities of Adulthood, Tsetsos champions other young people with autism* who are on track to graduate high school. The four-year study, led by Sargent occupational therapy professors Gael Orsmond and Wendy Coster, investigates how educators and related service providers work with high school seniors to prepare them for adult life. The goals are to improve our understanding of common interventions, identify the predictors and markers of adult success, and develop strategies that schools could adopt—and adapt.

The study, funded by the US Department of Education's Institute of Education Sciences, began with focus groups and an online survey of high school personnel from socioeconomically and ethnically diverse Massachusetts communities to determine what schools are already doing. The biggest takeaway? Incredible variation in the types and duration of services offered. Some schools—especially those with just a handful of students with autism who are academically strong—seemed reluctant to take on the expense of developing programming. Others were creative in meeting students' needs even after the student had fulfilled the graduation requirements; for example, offering support services through the school while students took community college classes.

Wendy Coster and Gael Orsmond

JAKE BELCHER

For the next stage of the study, the research team, which also includes faculty from Boston University Wheelock College of Education & Human Development and the College of Arts & Sciences' psychological and brain sciences department, will collect input from parents and their high school student with autism. A longitudinal survey will examine post–school outcomes, including successful participation in post–secondary education or employment and factors associated with these outcomes. The study will gauge how challenges taking over responsibility for daily life tasks at home, school, and in the community may be related to less successful outcomes.

Parents will complete a standardized assessment examining the extent to which their child has assumed responsibility for managing tasks such as making social plans, meeting health and medical treatment requirements, and managing food needs, first during senior year of high school and then again 18 months later.

"At the top of the scale, the child manages all of a task," says Coster, chair of the occupational therapy department. "That doesn't mean they do it completely on their own, but it means if they need help, they take responsibility for reaching out to get it." As part of the ability to self-manage daily life, Orsmond and Coster are interested in the youths' skills that support functioning; not just the ability to withdraw money from an ATM or balance a checkbook, but to effectively plan and implement a budget.

> "Even among special education teachers and staff, there's a lack of understanding about how best to prepare individuals on the spectrum for post–high school life."
> –Christian Tsetsos

Children without autism might pick up self-management skills by observing their parents or guardians. Students with autism who have an intellectual disability might learn some of these things in special education classes. But youth with autism who primarily take general education classes seem to be missing out on both ends: their disability makes learning by observation difficult, and they aren't in special education classes because they're academically on par with their peers.

"These are kids who graduate with a high school diploma, go to college, but then struggle with social and life skills," says Orsmond, who directs Sargent's Families and Autism Research Lab. A study in the September 2013 issue of the *Journal of the American Academy of Child and Adolescent Psychiatry* found that only about 53 percent of young adults with autism had worked outside the home after high school—the lowest rate among disability groups.

Much of the existing research into post–graduation success for youth on the spectrum has focused on discrete outcomes such as attending college and having a full-time job, says Orsmond. Although the Road Ahead Study will look at those outcomes, Orsmond and Coster hope their work will reveal that success is more fluid and nuanced than that. It's equally important to support young adults in pursuing a range of activities, Orsmond says, like "having a balanced and meaningful life: enjoying college, having a job you like, some recreation, some social activities." IS

*Although professionals and researchers prefer person-first language (i.e., person with autism) and that language is used in this article, many autistic people and their allies prefer identity-first language (i.e., autistic person).

Hearts, Minds & Microbubbles

TECHNOLOGY TO PREVENT THE TINY STROKES THAT CAUSE VASCULAR DEMENTIA

BY DAVID LEVIN

Memory loss in old age starts small, with misplaced keys or wallets. In some people, it can be the sign of a far more serious disorder. Dementia can eventually set in, robbing people of the memories of faces, names, and important events. It's devastating for both patients and family members—and it's distressingly common. According to the World Health Organization, more than 47 million people suffer from dementia worldwide.

While Alzheimer's disease is likely the most well-known form, dementia also comes in other varieties. Vascular dementia, for example, is the result of tiny blood vessels bursting in the brain, leading to microstrokes and minute bleeds. The condition is closely linked with other age-related memory disorders.

"I suspect that vascular dementia and Alzheimer's are really just two different angles on the same disease," says Kathleen Morgan, a professor of health sciences. "There are plaques in the brain tissue of Alzheimer's patients that are visible at autopsy, but we know that if you have them, you'll probably see evidence of microbleeds as well."

And if burst blood vessels are implicated in early-stage dementia, Morgan says, it may be possible to stop that damage before it starts. With a $2.5 million grant from the National Institute on Aging (NIA), she is examining a synthetic prototype drug that could prevent microbleeds in mouse brains. To do so, she's joining forces with Tyrone Porter, a College of Engineering associate professor of mechanical engineering, to develop a new delivery system for the drug. Their solution uses a novel system of microbubbles—tiny bubbles of inert gas smaller than capillaries—along with a focused ultrasound beam to help push the drug into a very specific part of the body: the large blood vessels next to the heart.

Most brain bleeds, Morgan says, actually start in the aorta, the body's largest artery, which connects directly to the heart. With each beat, the heart exerts enormous amounts of pressure straight onto that conduit, which is made of smooth muscle cells that expand and contract like a rubber hose as blood flows past them. "Those smooth muscle cells are very important for controlling the pressure of your vascular system on a beat-to-beat basis," she says.

In younger bodies—both mouse and human—smooth muscle in the aorta expands with each beat, acting as a sort of shock absorber for the pressure coming out of the heart. In older bodies, though, muscle becomes gradually less elastic, meaning that the energy of each pulse travels farther through the vascular system. If the aorta becomes stiff enough, blood can surge at high pressure straight into tiny, sensitive blood vessels in the brain, which may burst under the strain.

Morgan is developing new ways to reverse the stiffening of arteries. If she can restore some of the aorta's elasticity, she reasons, it may be possible to prevent new microbleeds. To test this idea, she's concocted a new peptide—a small chain of amino acids—that can control smooth muscle stiffness.

In smooth muscle tissue, she says, elasticity is determined in part by two types of long, stringy molecules called actin and myosin, which form a web inside each cell. As the two strands latch onto each other, they restrict the cell's movement, stiffening its structure. "It's a bit like a Chinese finger trap," says Morgan. "The harder you tug on actin, the harder it clamps down." The peptide her team has created, however, can effectively stop this process in its tracks by binding to the molecules, preventing them from grabbing onto their counterparts in the first place. As a result, the cell remains relaxed and supple. Morgan can control how stiff or loose the tissue gets by controlling the amount of peptide she administers. >

> "I suspect that vascular dementia and Alzheimer's are really just two different angles on the same disease."
> —Kathleen Morgan

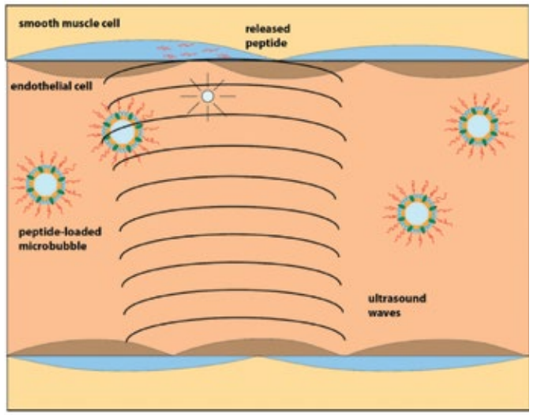
Tyrone Porter and Kathleen Morgan are developing a drug, and a delivery system, that may help prevent blood vessels from bursting and causing early-stage dementia.

JACKIE RICCIARDI

The challenge, she says, is delivering those molecules directly to the smooth muscle inside a living aorta. Unlike other drugs, releasing this one system-wide—or even artery-wide—could be disastrous. "Smooth muscle tissue isn't just in the aorta. It's in your vascular system, urinary tract, uterus, lung tissue, and digestive system," she notes. "If the peptides got into those tissues, it could cause incontinence, premature labor, all sorts of awful things."

To get the drug exactly where it's needed, you first have to dig into the artery itself.

"The cells we need to target don't come in contact with flowing blood. They're behind a layer or two of other cells and connective tissue in the blood vessel walls," says Porter. In order to break through those layers and deliver the drug to smooth muscle cells, he's attaching Morgan's peptides to the outside of each microbubble. Focused ultrasound can be used to push the microbubbles toward the aortic wall and pop them to release the peptide. The "popping" process also subtly and reversibly disrupts the lining of the aorta, making the blood vessel wall temporarily permeable. "Once that happens, the peptide can flow directly into the spaces that open up in the vessel wall, and go straight into the smooth muscle tissue," Porter says.



Morgan and Porter's drug delivery system. The scientists attach the drug to microbubbles smaller than capillaries and use a focused ultrasound beam to guide the bubbles and then burst them, delivering the drug directly into smooth muscle cells. Eventually, they hope their system may be used to deliver drugs to the large blood vessels next to the heart.

TYRONE PORTER (IMAGE); JACKIE RICCIARDI (PHOTO)

With a $2.5 million grant from the NIA, Morgan and Porter are examining a synthetic prototype drug to prevent microbleeds in mouse brains.

This brain is from an aged mouse; Morgan and Porter are using mice to test the prototype drug.

These microbubbles themselves are simple to make, he adds, and the FDA has already approved them for use. "Microbubbles have been used for years as contrast agents for ultrasound. They scatter sound much better than tissue, so they're used to distinguish blood from the chambers in heart and surrounding muscle," he says. They're also tiny enough to fit through the smallest blood vessels in the body and eventually disappear as the gas, which is harmless, escapes into the blood and is expelled out of the body through the lungs.

In addition to being relatively safe, the clinical advantage of this approach is that it can be done with a standard ultrasound probe commonly used in a cardiac echo test. Using a low-powered ultrasound beam, a technician can track where the bubbles are going, then pop them at a specific location by simply turning up the strength of the beam. "[Existing ultrasound tools] can focus the beam down to the millimeter, so it's extremely accurate," says Porter.

Until now, Morgan has only been able to test her peptide and its new delivery system on smooth muscle cells in a petri dish. With the new grant from the NIA, she and her collaborators are looking to scale up their research, and they will use their approach for the first time on a living animal.

"My earlier work was just on the fundamental mechanics of these peptides. Moving into a whole mouse is a big leap for someone used to sitting at a bench dealing with cells," she says, laughing. "The people I've connected with here at BU make it feasible, though. That's how you get basic discoveries translated into practical ones—you have lots of scientists working in parallel. You need teams instead of a single investigator." IS

Conversation Therapy

How Ken Ashin recovered his verve for language after a stroke

BY LARA EHRLICH

Annette Ashin used to teach English at the University of Illinois, but she always thought of her husband, Ken, as the more articulate one of the pair. "I used to call him up when I was struggling to put a sentence together perfectly," she says.

In December 2010, Ken Ashin, a former software engineer, had a stroke that left him with aphasia, a chronic language disorder marked by communication challenges in reading, writing, understanding language, and speaking.

"In the beginning he could hardly say three or four words," says Annette. She researched Boston-area resources that could help Ken with rehabilitation and chose Sargent's Aphasia Resource Center because it was "the most receptive, flexible, and welcoming of all the institutions that we explored," she says.

For the next six years, Ken came to Sargent every couple of weeks to participate in an array of programs and studies designed to improve his language skills and advance our understanding of aphasia. In one ongoing three-year study—the Aphasia Conversation Treatment program led by Elizabeth Hoover, clinical director of the Aphasia Resource Center at Sargent—he helped researchers investigate the effectiveness of two types of conversation-based therapy.

In the study funded in part by a $500,000 grant from the National Institutes of Health (NIH), the first the NIH has awarded for group conversational treatment in aphasia, participants were divided into three groups: the first conversed in pairs moderated by a therapist; the second worked in larger groups, and the third did not participate in therapy (though they did receive treatment later). In both pairs and large groups, the participants worked on personalized skills like word retrieval and speaking in complete sentences.

As a member of the group that worked in pairs, Ken partnered with a fellow study participant, who he credits as "a major catalyst" in his recovery, says Annette. "They were similar in a lot of ways. Both of them are iconoclastic, said what they thought, didn't care what anybody else thought. So, they got along really well. The therapist let the conversation continue and facilitated."

Hoover and the study's coprincipal investigator Gayle DeDe ('02,'08), director of the Philadelphia Aphasia Community at Temple University, have just started analyzing the data. Their initial findings suggest that the participants who worked in pairs showed improvement in specific language skills such as repetition and verb naming, while participants who worked in large groups gained more confidence in functional communication, or how effectively they could perform daily tasks like reading signs in a grocery store and asking for directions.

"In the smaller groups you have more opportunity for conversational turns, so those language tasks—word retrieval, for example—tended to improve more strongly, but in the larger group where you have a broader range of opinions and topics in the conversation, you can glean confidence and psychosocial support," says Hoover, a clinical associate professor of speech, language, and hearing sciences.

> "In [a] larger group where you have a broader range of opinions and topics… you can glean confidence and psychosocial support."—Elizabeth Hoover

In both groups, the participants showed more improvement than those who did not receive treatment.

"I had noticed all along that Ken can say things spontaneously more successfully than when he's pressured," Annette says. "The therapy experience improved that spontaneous response to a situation. We learned not only from the research team and the therapists, but also from the other aphasia patients."

Ken adds, "I appreciated it." IS

When Ken Ashin had a stroke that left him with aphasia, his wife Annette called Sargent's Aphasia Resource Center to help him recover.

JAKE BELCHER

Grant Awards

BU SARGENT COLLEGE'S FACULTY RECEIVED **$15,755,459** IN RESEARCH FUNDING IN 2017–2018. HERE IS A LIST OF OUR PROJECTS AND THE AGENCIES AND FOUNDATIONS SUPPORTING THEM.

SARGENT INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED 2017–2018*	YEAR OF AWARD	TOTAL AWARD
Sudha Arunachalam, associate professor of speech, language & hearing sciences	Improving Child-Caregiver Interactions for Young Children with Autism	Charles H. Hood Foundation	$75,000	3 of 3	$150,000
	Mechanisms Underlying Word Learning in Children with ASD: Non-Social Learning and Memory Consolidation	NIH/NIDCD	$172,195	4 of 4	$688,018
	Verb Processing and Verb Acquisition in Late Talking Toddlers	American Speech-Language-Hearing Foundation	$25,000	2 of 2	$25,000
	Boston University Conference on Language Development	NIH/NICHHD	$6,000	1 of 4	$30,000
	Language Processing and Word Learning in Preschoolers with Autism Spectrum Disorder	NIH/NICHHD	$412,188	1 of 5	$2,062,188
Louis Awad, assistant professor of physical therapy & athletic training	Multi-Modal Evaluation of Walking Function after Stroke	Boston University Clinical & Translational Science Institute	$149,700	2 of 2	$247,441
	A Multi-site, Interventional, Non-comparative, Single-arm Trial to Evaluate the Safety of the ReWalk Restore Device in Subjects with Mobility Impairments Due to Ischemic or Hemorrhagic Stroke	ReWalk Robotics, Inc.	$38,952	1 of 1	$38,952
	Integrating Computer Vision with Wearable Sensors to Improve the Assessment and Delivery of Targeted Locomotor Interventions and Technologies	Boston University Clinical & Translational Science Institute	$20,000	1 of 1	$20,000
Helen Barbas, professor of health sciences	Organization of Prefrontal Feedback Circuits	NIH/NIMH	$514,034	3 of 5	$2,631,120
	Prefrontal Anatomic Pathways in Executive Control	NIH/NIMH	$598,493	1 of 2	$1,203,695
Virginia Best, research associate professor of speech, language & hearing sciences	Spatial Hearing in Speech Mixtures	NIH/NIDCD	$315,403	2 of 5	$1,576,698
Wendy J. Coster, professor and chair of occupational therapy, and Jessica Kramer, associate professor of occupational therapy	The Pediatric Measure of Participation: A Staging and Replenishment Study	Shriners Hospital for Children	$21,067	2 of 2	$41,987
Terry Ellis, assistant professor of physical therapy & athletic training	Human Machine Interaction with Mobility Enhancing Soft Exosuits	NSF Subcontract via Harvard Wyss Institute for Biologically Inspired Engineering	$100,299	4 of 4	$328,803
	Walking and mHealth to Increase Participation in Parkinson Disease (WHIP-PD)	NIH/NICHHD	$681,818	1 of 5	$3,506,222
	Translation of In-Clinic Gains in Daily Life After Stroke	Washington University/ NIH	$187,573	2 of 5	$187,573
Terry Ellis	Development of a Modular Soft Exosuit Platform Suitable for Community-Based Neurorehabilitation	NSF Subcontract via Harvard Wyss Institute for Biologically Inspired Engineering	$121,819	3 of 5	$517,587
Marianne Farkas, director of training & international services, BU Center for Psychiatric Rehabilitation, and E. Sally Rogers, executive director, BU Center for Psychiatric Rehabilitation	Bringing Recovery Supports to Scale Technical Assistance Center Strategy	SAMHSA	$20,000	2 of 4	$388,687
Marianne Farkas	Integrated Scaling Approach: A Model for Large-Scale Implementation of Effective Interventions for Employment	ACL/NIDILRR	$499,412	2 of 5	$2,470,141
Daniel Fulford, assistant professor of occupational therapy	Enhancing Social Functioning in Schizophrenia through Scalable Mobile Technology	NIH/NIMH	$241,204	2 of 2	$458,867
Miguel Garcia-Cabezas, research assistant professor, health sciences	Circuits and Molecular Features of Anterior Cingulate Areas and Depression	Brain & Behavior Research Foundation	$30,000	2 of 2	$65,000
Simone Gill, associate professor of occupational therapy	Massive Weight Loss and Its Effects on Postural Stability and Fall Risks	NIH/NIAMS	$88,686	4 of 4	$270,438
Frank Guenther, professor of speech, language & hearing sciences	Neural Modeling and Imaging of Speech	NIH/NIDCD	$349,651	2 of 5	$1,751,089
	Sequencing and Initiation in Speech Production	NIH/NIDCD	$349,760	3 of 5	$1,811,733
	Minimally Verbal ASD: From Basic Mechanisms to Innovative Interventions	NIH/NIDCD	$394,066	4 of 4	$1,982,833
Elizabeth Hoover, clinical associate professor of speech, language & hearing sciences	A Comparison of the Effects of Dosage and Group Dynamics on Discourse in Aphasia	NIH/NIDCD	$161,022	2 of 3	$498,560
Dorothy Hutchinson, director of services, BU Center for Psychiatric Rehabilitation	The Learning and Working During the Transition to Adulthood RRTC	NIH/NIDRR	$51,363	2 of 3	$201,024
	MA Youth Suicide Prevention Project	HHS/SAMHSA	$12,155	3 of 5	$156,233
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	US Department of Education Subcontract via Kent State University	$85,352	5 of 5	$422,433
Gerald Kidd, professor of speech, language & hearing sciences	Spatial Hearing, Attention, and Informational Masking in Speech Identification	Department of Defense—AFOSR	$190,000	2 of 4	$760,000
	Central Factors in Auditory Masking	NIH/NIDCD	$558,173	1 of 5	$2,797,653
	Top Down Control of Selective Amplification	NIH/NIDCD	$541,979	5 of 5	$2,750,773
Swathi Kiran, associate dean for research and professor of speech, language & hearing sciences	Predicting Rehabilitation Outcomes in Bilingual Aphasia Using Computation Modeling	NIH/NIDCD	$614,920	2 of 5	$3,101,075
	The Neurobiology of Recovery in Aphasia: Natural History and Treatment-Induced Recovery	NIH/NIDCD Subcontract via Northwestern University	$110,024	6 of 6	$1,539,111
Swathi Kiran and Erin Meier, PhD, student of speech, language & hearing sciences	Structural and Effective Connectivity of Re-organized Language Networks in Aphasia	NIH/NIDCD	$44,524	2 of 2	$88,568

SARGENT INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED 2017–2018*	YEAR OF AWARD	TOTAL AWARD
Jessica Kramer, associate professor of occupational therapy	Designing and Evaluating Outcome Assessment Software for Youth with Development Disabilities: The Pediatric Evaluation of Disability Inventory–Patient Reported Outcome (PEDI-PRO)	AbleLink Technologies, Inc./NIH/NICHHD	$77,626	1 of 2	$87,691
	Building a National Partnership to Identify the Mental Health Priorities of Young Adults with Intellectual and Developmental Disabilities (YA with I/DD)	Trailhead Institute/PCORI	$49,845	1 of 1	$49,845
	Disability Mentoring Initiative	Office of Juvenile Justice & Delinquency Prevention	$9,252	2 of 3	$31,235
Deepak Kumar, assistant professor of physical therapy & athletic training	Mind Your Walk Intervention for Community-Based Management of Knee OA: A Feasibility Study	NIH/NIAMSD	$124,462	1 of 5	$622,311
Susan Langmore, clinical professor of speech, language & hearing sciences	Non-Invasive Brain Stimulation for Swallowing Recovery After Dysphagic Stroke	Beth Israel Deaconess Medical Center/NIH	$78,000	5 of 5	$476,591
Cara L. Lewis, associate professor of physical therapy & athletic training	Effect of Femoracetabular Impingement (FAI) on Hip Motion in Young Adults	NIH/NIAMS	$158,890	5 of 5	$653,400
	Movement Screening and Modification in Individuals with Femoracetabular Impingement Syndrome	NIH/NIAMSD	$82,416	1 of 2	$164,916
	Lower Extremity Movement Screening in Individuals with Musculoskeletal Hip Pain	Boston University Clinical & Translational Science Institute	$19,820	1 of 1	$19,820
Megan McCrory, research associate professor of health sciences	Assessing Food Intake with the Automatic Ingestion Monitor	NIH/University of Alabama	$104,473	2 of 3	$414,181
	An Innovated Passive Dietary Monitoring System	Imperial College/Gates Foundation	$96,972	1 of 3	$96,972
Susan McGurk, professor of occupational therapy and senior researcher, BU Center for Psychiatric Rehabilitation	A Dismantling Study of Cognitive Remediation for Supported Employment	NIH/NIMH	$501,212	6 of 6	$2,771,031
		NIH/NIMH	$128,527	2 of 2	$128,527
Uma Millner, research scientist, BU Center for Psychiatric Rehabilitation, and E. Sally Rogers, executive director, BU Center for Psychiatric Rehabilitation	Developing and Validating a Measure of Career Advancement for Individuals with Psychiatric Disabilities	ACL/NIDILRR	$199,946	1 of 3	$599,045
Christopher Moore, dean and professor of speech, language & hearing sciences	Advanced Research Training in Communication Sciences Disorders	NIH/NIDCD	$436,600	2 of 5	$1,860,223
Kathleen Morgan, professor of health sciences	Actin and Focal Adhesion Remodeling as Therapeutic Targets in Cardiovascular Disease	NIH/NIA	$529,023	2 of 5	$2,635,822
Kim Mueser, professor of occupational therapy	Early Stage Identification and Engagement to Reduce Duration of Untreated Psychosis (EaSIE)	NIH/NIMH	$19,359	1 of 3	$58,147
Gael Orsmond, associate professor of occupational therapy	Engaging Siblings of Adults with Autism in Future Planning	NIH/NIMH	$312,797	2 of 3	$877,315
Gael Orsmond and Wendy J. Coster, professor and chair of occupational therapy	Transition Outcomes of High Functioning Students with Autism: How and When Students Learn the Skills Necessary for Self-Management of Daily Responsibilities	Department of Education/ Institute of Education Sciences	$387,399	2 of 4	$1,578,509
Tyler Perrachione, assistant professor of speech, language & hearing sciences	Neural Bases of Phonological Working Memory in Developmental Language Disorders	NIH/NIDCD	$163,700	4 of 4	$491,100
	Dysfunction of Cortical Systems for Language and Working Memory in Autism Spectrum Disorder	Brain & Behavior Research Foundation	$70,000	2 of 2	$70,000

SARGENT INVESTIGATOR	TITLE OF PROJECT	AGENCY/FOUNDATION	FUNDS AWARDED 2017–2018*	YEAR OF AWARD	TOTAL AWARD
E. Sally Rogers and Marianne Farkas	Improved Employment Outcomes for Individuals with Psychiatric Disabilities	SAMHSA/ACL	$874,959	4 of 5	$4,374,848
Elin Roverud, research assistant professor, speech, language & hearing sciences	Weighting of Auditory Information	NIH/NIDCD	$132,607	1 of 3	$393,621
Zlatka Russinova, research associate professor of occupational therapy and director of research, BU Center for Psychiatric Rehabilitation	Testing Effectiveness of a Peer-Led Intervention to Enhance Community Integration	NIMH	$459,814	3 of 4	$2,079,531
	Enhancing the Community Living and Participation of Individuals with Psychiatric Disabilities	ACL	$494,502	3 of 5	$2,499,724
	Recovery 4 US-Development of a Photovoice Based Social Media Program to Enhance the Community Participation and Recovery of Individuals with Psychiatric Disabilities	ACL	$199,966	4 of 4	$599,855
	Advanced Research Training Program in Employment and Vocational Rehab	ACL	$149,908	5 of 5	$749,806
Elliot Lee Saltzman, associate professor of physical therapy & athletic training	Modeling the Behavioral Dynamics of Social Coordination and Joint Action	NIH/NIGMS Subcontract via University of Cincinnati	$24,900	5 of 5	$124,500
	Collaborative Research: Prosodic Structure: An Integrated Empirical and Modeling Investigation	NSF	$14,975	1 of 3	$45,994
Cara E. Stepp, associate professor of speech, language & hearing sciences	Career: Enabling Enhanced Communication through Human-Machine-Interfaces	NSF	$105,843	4 of 5	$537,538
	Collaborative Research: Prosodic Control of Speech Synthesis for Assistive Communication in Severe Paralysis	NSF	$52,590	3 of 3	$217,670
	An Acoustic Estimate of Laryngeal Tension for Clinical Assessment of Voice Disorders	NIH/NIDCD	$413,299	3 of 5	$2,080,252
	Sensorimotor Mechanisms of Vocal Hyperfunction	NIH/NIDCD	$408,743	2 of 5	$818,236
Cara E. Stepp and Gabriel Cler, doctoral student	Optimization and Prediction for Fast and Robust AAC	NIH/NIDCD	$32,135	3 of 3	$103,767
Cara E. Stepp and Frank Guenther	Voice and Speech Sensorimotor Control in Parkinson's Disease	NIH/NIDCD	$542,008	1 of 5	$2,600,995
Cara E. Stepp and Elizabeth Heller Murray, doctoral research assistant	Vocal Motor Control in Children with Vocal Nodules	NIH/NIDCD	$39,536	2 of 3	$119,568
LaDora Thompson, professor and chair, department of athletic training & physical therapy	A Preclinical Approach for the Enhancement of Quality of Life in Patients with Duchenne Muscular Dystrophy	Hanyang University/ National Research Foundation of Korea	$22,000	1 of 3	$22,000
Lawrence Were, assistant professor of health sciences	Providence/Boston CFAR Developmental Award: Insurance Status and Health Outcomes among HIV and HIV TB Co-infected Persons in Kenya	The Miriam Hospital/NIH/ NIAID	$40,000	1 of 1	$40,000
Stacey Zawacki, clinical assistant professor of health science,s and director, BU Sargent Choice Nutrition Center	Randomized Controlled Trial of a Learning Collaborative to Implement Health Promotion in Mental Health	NIH/NIMH Subcontract via Dartmouth College	$6,273	4 of 4	$105,194
Basilis Zikopoulos, assistant professor of health sciences	Organization of Excitatory and Inhibitory Prefrontal Circuits in Children with Autism	NIH/NIMH	$409,250	5 of 5	$2,018,222
TOTAL			**$15,755,459**		**$67,987,505**

* Includes no cost extensions.

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 2017-2018.

HEALTH SCIENCES

Polfuss, M., Sawin, K. J., Papanek, P. E., **Bandini, L.**, Forseth, B., Moosreiner, A., Zvara, K., and Schoeller, D. A. (2017). Total energy expenditure and body composition of children with developmental disabilities. *Disability and Health Journal*. pii: S1936-6574(17)30233-9.

DeMarco, R. F., Brennan-Ing, M., Sprague, C., and **Brown, S. M.** (2017). Ageism, aging and HIV: Community responses to prevention, treatment, care and support. *Interdisciplinary Topics in Gerontology and Geriatrics*, 42, 234–239. New York, NY, and Boston, MA.

DeBiasse, M. A., Bowen, D. J., **Quatromoni, P. A.**, Quinn, E., and Quintiliani, L. M. (2018). Feasibility and acceptability of dietary intake assessment via 24-hour recall and food frequency questionnaire among women with low socioeconomic status. *Journal of the Academy of Nutrition and Dietetics*, 118(2):301–7.

García-Cabezas, M. Á., Joyce, M. K. P.*, Yohan J. J., **Zikopoulos B.**, and **Barbas H.** (2017). Mirror trends of plasticity and stability indicators in primate prefrontal cortex. *European Journal of Neuroscience*, 46(8):2392-2405. doi: 10.1111/ejn.13706. Epub 2017 Oct 4, 2017. PMID: 28921934. PMCID: PMC5656436.

Jackman, R. W., Floro, J., Yoshimine, R.*, Zitin, B.*, Eiampikul, M.*, El-Jack, K.*, Seto, D. N.*, **Kandarian, S. C.** (2017). Continuous release of tumor-derived factors improves the modeling of cachexia in muscle cell culture. *Frontiers in Physiology*, 8:738. doi: 10.3389/fphys.2017.00738. eCollection 2017.

Nicholson, C. J.*, Singh, K.*, Saphirstein, R. J., Gao, Y. Z., Li, Q., Chiu, J. G., Leavis, P., Verwoert, G. C., Mitchell, G. F., AortaGen Consortium, Porter, T. M., and **Morgan, K. G.** (2018). Reversal of aging-induced increases in aortic stiffness by targeting cytoskeletal protein-protein interfaces. *Journal of the American Heart Association*, 7(15), e008926.

Quatromoni, P. A. (2017). A Tale of Two Runners: Athletes' experiences with eating disorders in college. *Journal of the Academy of Nutrition and Dietetics*, 117:21–31.

Were, L., Wamai, R. G., Were, E., Hogan, J., and Galarraga, O. (2017). The impact of health insurance on access and utilization of obstetric health services: evidence from Kenya. *BMC Health Services Research*, 17:454. doi: 10.1186/s12913-017-2397-7.

Zikopoulos, B., Hoistad, M., John, Y., and **Barbas, H.** (2017). Posterior orbitofrontal and anterior cingulate pathways to the amygdala target inhibitory and excitatory systems with opposite functions. *Journal of Neuroscience*, 37(20), 5051–5064. doi: 10.1523/jneurosci.3940-16.2017.

OCCUPATIONAL THERAPY

Fulford, D., Campellone, T. R., and Gard, D. E. (2018). Social motivation in schizophrenia: How research on basic reward processes informs and limits our understanding. *Clinical Psychology Review*, 63, 12–24.

Fulford, D., Piksulic, D., Addington, J., Kane, J. M., Schooler, N. R., and Mueser, K. T. (2018). Prospective relationships between motivation and functioning in recovery after a first episode of schizophrenia. *Schizophrenia Bulletin*, 44, 369–377.

Fulford, D., Treadway, M. T., and Woolley, J. (2018). Social motivation in schizophrenia: The impact of oxytocin on vigor in the context of social and non-social reinforcement. *Journal of Abnormal Psychology*, 127, 116–128.

Gill, S. V., Khetani, M. A., **Yinusa-Nyahkoon, L.**, and Tickle-Degnen, L. (2017). Forging alliances in interdisciplinary rehabilitation research (FAIRR): A logic model. *American Journal of Physical Medicine & Rehabilitation*, 96: 479–86.

Jacobs, K., Leopold, A., Hendricks, D. J., Sampson, E., **Nardone, A.**, Lopez, K. B., Rumrill, P., Stauffer, C., Elias, E., Scherer, M., et al. (2017). Project Career: Perceived benefits of iPad apps among college students with Traumatic Brain Injury (TBI). *WORK: A Journal of Prevention, Assessment, and Rehabilitation*, 58, 45–50.

Kramer, J., and **Schwartz, A.*** (2017). Reducing barriers to patient reported outcome measures for people with cognitive impairments. *Archives of Physical Medicine and Rehabilitation*, 98(8), 1705–1715. doi: 10.1016/j.apmr.2017.03.011.

Baxter, M. F., **Newman, R.**, Longpre, S. M., and Polo, K. M. (2017). Occupational therapy's role in cancer survivorship as a chronic condition. *American Journal of Occupational Therapy*, 71(3), 7103090010P1-7103090010P7. doi: 10.5014/ajot.2017.713001.

Schwartz, A.*, Longo, A., and **Kramer, J.** (2018). Patient reported outcome measures for youth with developmental disabilities: Incorporation of design features that reduce cognitive demands. *Developmental Medicine and Child Neurology*, 60(2), 173–184. doi: 10.1111/dmcn.13617.

PHYSICAL THERAPY & ATHLETIC TRAINING

Awad, L. N., Bae J., O'Donnell, K., De Rossi, S. M. M., Hendron, K., Sloot, L. H., Kudzia, S., Allen, S., **Holt, K. G., Ellis, T.**, and **Walsh, C. J**. (2017). A soft robotic exosuit improves walking in patients after stroke. *Science Translational Medicine*, 9(400): eaa9084. PMID: 28747517.

Plummer, L., **Brown, L.**, and **Riley, E.** (2017). Guillain-Barre. *PTNow* Online Clinical Summary.

Kumar, D., Wyatt, C., Lee, S., Okazaki, N., Chiba, K., Link, T. M., Souza, R. B., and Majumdar, S. (2017). Sagittal plane walking patterns are related to MRI changes over 18-months in people with and without mild-moderate hip osteoarthritis. *Journal of Orthopaedic Research*, 36:1472–1477. PMID: 29044677.

Baumann, C. W., **Kwak, D.**, Ferrington, D. A., and **Thompson, L. V.** (2017). Downhill exercise alters immunoproteasome content in mouse skeletal muscle. *Cell Stress and Chaperones*, a3 (4), 507-517 doi: 10.1007/s12192-017-0857-y. PMID: 29124664.

Lewis, C. L., Loverro, K. L.*, and **Khuu, A.*** (2018). Kinematic differences during single leg stepdown between individuals with femoroacetabular impingement syndrome and individuals without hip pain. *Journal of Orthopaedic & Sports Physical Therapy*, 48(4):270–279.

Mace, K., and Welch-Bacon, C. E. Athletic training educators' knowledge and confidence about competency-based education. *Athletic Training Education Journal*, accepted for publication.

Cusano, A., Curry, E., **Marinko, L. N.**, and Li, X. (2017). Extensor mechanism reconstruction for chronic patella fracture: A case report. *Orthopedics*, doi: 10.3928-01477447-20170810-07.

Vesci, A. S.*, **Webster, K. A.**, Sich, M., and **Marinko, L. N.** (2017). Resistance training in youth improves athletic performance: a systematic review. *Athletic Training and Sports Health Care*, 9(4):184–192.

Wendel, N.*, Macpherson, C. E.*, Webber, K., Hendron, K., **DeAngelis, T., Colon-Semenza, C.,** and **Ellis, T.** (2018). Accuracy of activity trackers in Parkinson's disease: Should we prescribe them? *Physical Therapy*, doi: 10.1093/ptj/pzy054. PubMed PMID: 29718452.

SPEECH, LANGUAGE & HEARING SCIENCES

Abur, D. A.*, Lester, R. A., Daliri A., **Guenther, F. H.**, and **Stepp, C. E.** (2018). Sensorimotor adaptation of voice fundamental frequency in Parkinson's disease, *PLoS ONE*, 13(1): e0191839.

Best, V., Roverud, E., Mason, C., and **Kidd, G.** (2017). Examination of a hybrid beamformer that preserves auditory spatial cues. *Journal of the Acoustical Society of America*, 124, EL369–EL374.

Choi, J. Y., Hu, E., and **Perrachione, T. K.** (2018). Varying acoustic-phonetic similarity reveals talker normalization is obligatory in speech processing. *Attention, Perception, & Psychophysics*, 80, 784–797.

Des Roches, C. A., and **Kiran, S.** (2017). Technology-based rehabilitation to improve communication after acquired brain injury. *Frontiers in Human Neuroscience*, 11:382. doi: 10.3389/fnins.2017.00382.

Jia, N., Brincat, S. L., Salazar-Gómez, A. F., Panko, M., **Guenther, F. H.**, and Miller, E. K. (2017). Decoding of intended saccade direction in an oculomotor brain-computer interface. *Journal of Neural Engineering*, 14, PMID: 28098561.

Kidd, G. Jr. (2017). Enhancing auditory selective attention using a visually guided hearing aid. *Journal of Speech, Language, and Hearing Research*, 60, 3027–3038.

McKenna, V. S.*, Llico, A., Mehta, D. D., **Perkell, J. S.**, and **Stepp, C. E.** (2017). Magnitude of neck-surface vibration as an estimate of subglottal pressure during modulations of vocal effort and intensity in healthy speakers. *Journal of Speech, Language, and Hearing Research*, 60(12), 3404–3416.

Roverud, E., Best, V., Mason, C., Streeter, T., and **Kidd, G.** (2018). Evaluating the performance of a visually guided hearing aid using a dynamic auditory-visual word congruence task. E*ar and Hearing*, 39(4):756–769.

**student author*

BU Sargent College

Who We Are

Students

	Undergraduate	Graduate
Number of full-time students	1,315	447
Average SAT Percentile	96%	n/a
Average GRE Score*	n/a	310

Faculty

Full-time	78
Part-time	32

Alumni

17,855 in 63 countries

Clinical Sites

More than 1,200 in 44 states and 2 countries

Areas of Study

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

Distinctive Programs

- Combined BS and MPH in Public Health
- Combined BS in Health Studies and Doctor of Physical Therapy
- Combined BS and MS in Human Physiology
- Joint Bachelor of Science in Linguistics and Speech, Language & Hearing Sciences
- Combined Doctor of Occupational Therapy/PhD in Rehabilitation Sciences
- Combined Doctor of Physical Therapy/PhD in Rehabilitation Sciences
- Fellowship in Orthopaedic Manual Physical Therapy
- Neurological Physical Therapy Residency Program

*Percentiles for incoming fall 2018

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 6 percent in their respective fields:

1 **Occupational Therapy Program** ranked number 1 out of 164 programs

12 **Speech-Language Pathology Program** ranked number 12 out of 249 programs

14 **Physical Therapy Program** ranked number 14 out of 217 programs

National Certification Board Exam Passing Rates

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

100%	ATHLETIC TRAINING
100%	NUTRITION
92%	OCCUPATIONAL THERAPY
99%	PHYSICAL THERAPY
100%	SPEECH-LANGUAGE PATHOLOGY

ABOUT US Boston University College of Health & Rehabilitation Sciences: Sargent College has been defining healthcare leadership for more than 130 years. Our learning environment fosters the values, effective communication, and clinical skills that distinguish outstanding health professionals, and we continuously enhance our degree programs to meet their future needs. Our curricula includes fieldwork, providing students in every degree program with clinical experience, as well as internships at more than 1,200 healthcare facilities across the country. The college also operates outpatient centers that offer a wide range of services to greater Boston.

Boston University College of Health
& Rehabilitation Sciences: Sargent College

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