You were taught to read and write. You were taught to do arithmetic. But chances are, you taught yourself to walk. And quite possibly you got it wrong, and are now walking in a way that could damage your hips. If that’s the case, says Cara Lewis, an expert on gait and the musculoskeletal causes of hip pain, you could be the recipient of one of the 250,000 hip replacements that are performed in this country each year. Lewis is developing methods—including a robotic device—to teach people how to correct a hip-battering walk.

“My goal is to intervene early on, so that osteoarthritis doesn’t progress—or doesn’t even develop,” says the Sargent College of Health & Rehabilitation Sciences assistant professor of physical therapy.

Lewis has been honored for her research with a Peter Paul Career Development Professorship (see page 36), and with a $275,000 grant from the National Institutes of Health. Her research has convinced her that hip pain can’t be written off as a burden of old age. That wouldn’t explain the increasing number of young people, especially runners and other athletes, who suffer from acetabular labral tears, an injury to cartilage in the hip socket that increases the risk of developing arthritis.

The repetitive stress from an improper gait, Lewis believes, will cause hip pain, “which then progresses to a labral tear; you then start losing stability in the joint, which then leads to the arthritis—which [may result in the need for] a hip replacement. The replacement might be happen-
ing when you’re 60, but it’s because of something you did when you were 30.”

The 20- and 30-somethings are the population to target. “If you change the way they’re walking now, you can change their pain after they already have a tear—or maybe change it before they get the tear,” she says.

But how do you change the mechanics of a person’s gait?

For Lewis, the answer came at the University of Michigan, Ann Arbor, where she did postdoctoral work on robotic exoskeletons for the ankle joints. She built a robotic orthosis, a pneumatically powered exoskeleton consisting of a brace each for the waist and two legs.

In a newly built lab at Sargent College, where Lewis has been teaching since fall 2009, healthy subjects wear the orthosis while walking on a custom treadmill with two plates measuring force separately for the left foot and the right foot. Electrodes on their legs record their muscle activity. And they are covered in reflective markers monitored by several motion-capture cameras.

“The computer system picks up the marker positions and then can re-create a model of the skeleton,” she says. “From that we can tell differences in angles and figure out when we want to apply the robotic force, and how much.”

When the subjects exhibit what Lewis calls “the lazy walk”—straining their hips by using them to swing one leg forward while the other leg lags far behind—she presses a button. Air from a large pressurized air tank bursts into the orthotic actuators and corrects their gait.

“It’ll start bringing your leg forward sooner,” Lewis says. “It keeps you out of that bad position. I can wean people off of the bad position, and they can walk normally on the street.”

Lewis has also had success correcting lab subjects’ gait with decidedly low-tech verbal cues. “Some of it is just saying, ‘Hey! The way you walk doesn’t work; push more with your foot!’” Lewis says with a laugh. “Or ‘Change your posture’ or ‘Take shorter steps.’”

Lewis’ lab is now focusing on research, rather than intervention, but she envisions a time when her systems are put to work in clinics. People recovering from hip injuries could work out on the treadmill until they trained themselves to walk properly. And healthy people could use the orthosis to improve their walking and prevent a hip injury.
Nurturing Junior Faculty

The Peter Paul Career Development Professor Program awards, known simply as the Peter Paul Awards, are given to professors with no more than two years of teaching experience and no prior professorship. They are meant to boost junior faculty members at a time in their academic careers when many struggle to find research funding. The awards, which give recipients

Peter Paul Awards help fund research, as well as study-related travel

**2011**

COLIN FISHER, a School of Management assistant professor of organizational behavior, studies how to structure and coach teams that foster creativity, learning, and effective decision-making.

XUE HAN, a College of Engineering assistant professor of biomedical engineering, is using the award to develop light pulse technologies that make it possible to study how the brain’s ultrafast information processing works.

JOHANNES SCHMIEDER, a College of Arts & Sciences assistant professor of economics, researches the costs and benefits of longer and more generous unemployment benefits during a recession.

**2010**

PIETRO COTTONE, a School of Medicine assistant professor of pharmacology and psychiatry, uses integrative molecular biological, pharmacological, and behavioral methods to study the neurobiology of food intake, addiction, and stress.

CARA LEWIS, a Sargent College assistant professor of physical therapy, is an expert on gait and the musculoskeletal causes of hip pain (see page 36).

DELVON PARKER, an SMG assistant professor of operations and technology management, examines the relationship between asset efficiency and financial performance in the manufacturing sector. He used the award to fund his research during the summer and for study-related travel and resources.

SIMON RABINOVITCH, a CAS assistant professor of modern Jewish and European history, examines Jewish politics in revolutionary Russia, Jewish nationalistic thought, and Jewish and European folkloristics and ethnography. He has used the award for many things, such as research assistance and travel. He recently returned from a year of writing and research in Europe and Israel.

**2009**

MARGARET LITVIN, a CAS assistant professor of Arabic and comparative literature, researches modern Arabic literature and performance. The Peter Paul Award has allowed her to travel and conduct research on the impact of cultural ties with Russia and the Soviet Union on communities of Arab intellectuals from Syria and Egypt to Morocco. Next year it will help fund a scholarly conference exploring this topic.

ABIGAIL MONCRIEFF, a School of Law associate professor of law, focuses her research on structural governmental barriers to efficiency in health care payment and delivery, and more broadly, on structural constitutional law. She has become a leading expert on the litigation surrounding the constitutionality of the Patient Protection and Affordable Care Act’s so-called “individual mandate.”

CATHARINE WANG, a School of Public Health associate professor of community health sciences, is working on studies related to the translation of genomic discoveries into programs that will improve human health.

**2008**

EMINE FETVACI, a CAS assistant professor of history of art and architecture, researches the arts of the book in the Islamic world, and Ottoman, Mughal, and Safavid art and architecture. She used the award to finish and publish her book *Picturing History at the Ottoman Court* and launch a new research project on manuscripts from Mughal India by traveling to manuscript collections in Europe and to India.

ASSEN MARINTCHEV, a MED assistant professor of physiology and biophysics, studies the mechanisms of protein synthesis in human cells.

YESIM TOZAN, an SPH assistant professor of international health, used the award to continue her research on the burden and socioeconomic consequences of childhood malaria and the economics and financing of malaria control interventions in resource-poor settings.

**2007**

HATICE ALTG, an ENG associate professor of electrical and computer engineering, researches nanoscale photonic materials and devices. She led the development of a new generation of biosensor that uses tiny optical nanostructures to manipulate light to detect a virus, a protein, or a cancer cell in a drop of blood, opening up the possibility of accelerated drug development as well as of detecting diseases sooner.

KRISTIN COLLINS, a LAW professor of law, writes about federal courts, civil procedure, citizenship, and gender equality. She is currently writing a history of public marriage-based entitlements that will trace the concept of marriage equality from the early decades of the American republic to the present.

CARRIE PRESTON, a CAS associate professor of English, is a dancer and a literary scholar. She used the award to study Japanese Noh performance technique in Tokyo. Her research considers the influence of Noh plays, which combine music, dance, and acting, on early 20th-century literature, particularly the writings of William Butler Yeats, Ezra Pound, and Samuel Beckett.

**2006**

BROOKE BLOWER, a CAS assistant professor of history, used the award to complete her first book, * Becoming Americans in Paris: Transatlantic Politics and Culture Between the World Wars* (Oxford University Press, 2011), and to travel to a number of archives in Europe and the United States for her current research on Americans abroad during World War II.

SUCHARITA CHANDRAN, an SMG assistant professor of marketing, researches behavioral pricing, online consumer behavior, health marketing and judgments of risk, and social marketing.

JOHN CONNOR, a MED associate professor of microbiology, studies how viruses dominate their cellular hosts. Connor used the award to facilitate collaborations between his lab on the Medical Campus and researchers on the Charles River Campus.

MARAH CURTIS, a School of Social Work associate professor of social welfare policy, studies the effect of public policy on the well-being of families, with particular emphasis on housing policy, incarceration, and poverty.
$40,000 for three years, are named for Peter Paul (GSM’71), a BU trustee and president of the mortgage banking company Paul Financial, LLC. In 2006, Paul gave the University $1.5 million to fund 10 professorships over five years. He has since increased his overall commitment to the program to $2.5 million. Candidates for the professorships are nominated by deans and department heads, and the final selections are made by President Robert A. Brown and Provost Jean Morrison.