

'Movement retraining' can reduce knee pain (w/ Video)

June 5 2012, By Miles O'Brien and Ann Kellan

Aches and pains got you down? The way you walk could be wearing out parts of your body.

"All of a sudden, I developed pain in my knee and it progressively got worse. I didn't want to walk anymore," recalls Lloyd Manson, a retired contractor and developer who has osteoarthritis in his knee. Manson's pain became so severe he was seriously considering [knee surgery](#), but just before he was about to set a date for the operation, he learned about a study at Stanford University. And, Stanford [mechanical engineer](#) Mark Cutkosky and his team were looking for test subjects.

With support from the National Science Foundation's (NSF) Human-Centered Computing Program (HCC), the research, known as Movement Retraining, focuses on alleviating pain by analyzing and possibly changing a person's stride. One of the major problems at the root of [knee pain](#) is uneven wear and tear on the [knee cartilage](#), which leads to [arthritis](#). "We're trying to slow the rate at which arthritis progresses, and thereby delay the time that you would need a much more expensive, [invasive procedure](#) like surgery," says Cutkosky.

Sounded too good to be true, but Manson decided to give it try. "I didn't know what to think, but I said, 'You know, what the heck.'"

Suzanne Dancer also agreed to participate in the study. "I've had knee pain on and off for a couple of years. I'm not getting younger and it was becoming more and more noticeable."

Suzanne and Lloyd are not alone. "Roughly 50 percent of people as they get older start to show some evidence of [osteoarthritis](#) of the knee," notes Cutkosky.

The research team first outfitted test subjects with sensors and then directed them to walk on a treadmill. When Manson took a step, custom software precisely calculated the forces on his [joints](#). That data helped the team determine if a gait change might help reduce his pain.

"We use a biomechanics model and say, 'Aha! If you were, for example, to turn your toes in just a little bit or maybe your knees out, you could reduce the peak loads, the adverse loads on the knee joint,'" explains Cutkosky. The idea is to shift weight away from the more worn-out area to the more cushioned area of the knee cartilage.

So, instead of Dancer walking with one foot slightly pointed out, the researchers suggested that she turn her foot in slightly. "It was a very strange feeling," she says. "You feel like you're walking pigeon-toed, but you're not. What I couldn't argue with was the fact I did not have as much knee pain. Just recently I walked four miles. It took me 60 minutes and I had no knee pain when I was done!"

Researchers recommended a similar fix for Manson. "I had to work at it to retrain myself. It took weeks, but then it just progressively kept getting better and better. The pain is almost nonexistent. It's amazing. It's truly amazing!" says Lloyd.

But, Cutkosky cautions not to try changing your stride on your own. You could do more harm than good. To help [test subjects](#) learn their new gaits, Cutkosky and his team developed a biofeedback device for [treadmill](#) walking. One misstep and the device vibrates. They're working on a portable version to reinforce the modified [gait](#) outside the lab.

"We've seen amazing changes in the lab. People are able to change the way they walk and they have less pain and greater function," says Pete Shull, a doctoral candidate in mechanical engineering and a key member of Cutkosky's research team.

Movement [retraining](#) isn't just for people in pain. Cutkosky says athletes could improve their moves with this biofeedback technique--everything from golf swings to jump shots. "The next step is a wearable, wireless system that measures peoples' movements, provides haptic feedback, and then transmits the results to a cell phone so that people can use haptic movement training anywhere they go, at home or outdoors," he says.

Provided by National Science Foundation

Citation: 'Movement retraining' can reduce knee pain (w/ Video) (2012, June 5) retrieved 18 April 2024 from

<https://medicalxpress.com/news/2012-06-movement-retraining-knee-pain-video.html>

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