

Exercise scientist examines mechanics of movement in MS patients

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Graduate student Faizan Akram encourages study participant Linda Friedrich as she exercises her weaker left leg.

Groundhog Day 1994 is one Linda Friedrich will never forget. That's the day a neurologist told her, "You have multiple sclerosis and there's nothing we can do."

The youngest of her three children was only 2 years old, she recalled, and her only vision of MS was a relative who could no longer walk or talk.

Luckily, she got the new drug, Betaseron, within four months of her diagnosis and has experienced only a couple of recurrences which involved numbness from the waist down. "I've been very fortunate," she said, but admits, "my left leg is weaker."

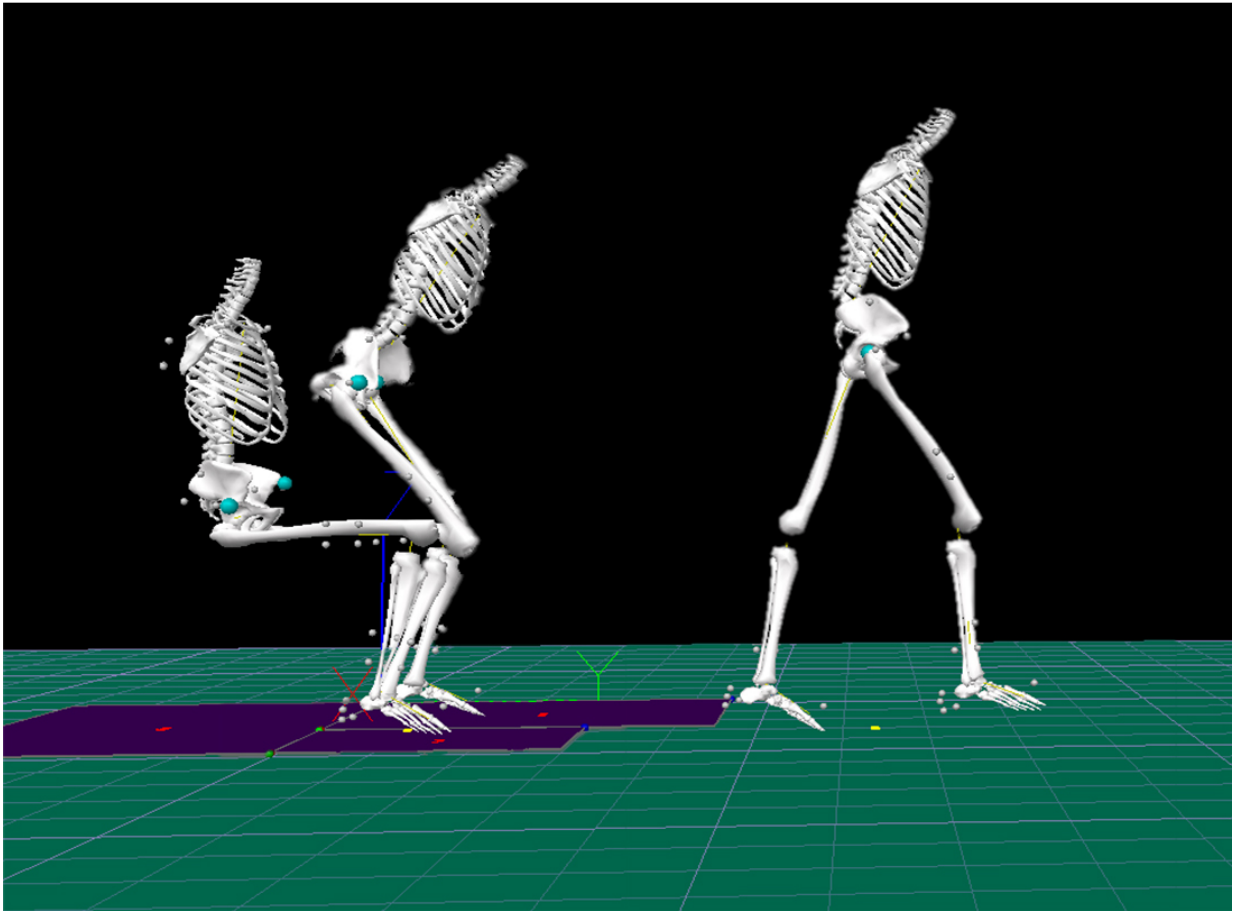
However, when it came to working out in the gym, Friedrich said, "I didn't know what I should be doing." That's why she jumped at the chance to participate a South Dakota State University study to whether [strength](#) and flexibility training could help MS patients.

"We're looking at how we can improve function and, at the same time, quality of life," said assistant professor Bradley Bowser, director of the biomechanics laboratory in the Department of Health and Nutritional Sciences.

He began working with MS patients in 2007 as part of his doctoral research at the University of Georgia.

Though research has shown that exercise can improve strength and balance for those with Parkinson's disease, Bowser said, "Not a lot has

been done in this area with those who have MS, because the disease is not homogenous. Everyone has different symptoms—one person has weakness in one leg, another blurred vision. It depends on where MS attacks the nervous system."



Using reflective markers and electromyography sensors attached to Friedrich's legs and torso, the reserachers are able to create a skeletal model to examine the mechanics of her Timed Up-and-Go movement.

Simple daily living activities, such as handwashing, can become difficult

for MS patients due to balance issues, explained Bowser. "Because of problems with balance and instability, MS patients may become less physically active and, thus, more susceptible to illnesses due to a sedentary lifestyle."

How leg weakness affects movement

When Bowser analyzed the results of a previous study done as part of his doctoral work at the University of Georgia, he found that the participants with MS who exhibited leg weakness took longer to move from a sitting to a standing position than those with MS who had leg strength comparable to the healthy control group. However, it was how that weakness affected their movement that was most striking.

Those with leg weakness displayed greater trunk flexion and were thrusting their upper bodies forward quickly to create the momentum they needed to compensate for decreased leg extensor strength, he explained. The combination of flexion and thrust places additional stress on the lower back, thus increasing the risk of injury.

Measurements showed that MS patients with normal leg strength and the control group had more than 38 percent greater leg extensor strength than those experiencing leg weakness. Less [leg strength](#), in turn, decreased their knee extensor power, he explained. These findings were published last year in *Clinical Biomechanics*.

In addition, Bowser looked at symmetry and stability during dynamic movement comparing the healthy control group with the MS group before and after the intervention. Preliminary results showed that resistance and flexibility training improved balance and symmetry.

Looking at exercise, behavioral therapy

Bowser's most recent study, which began last summer, further examines whether resistance, stability and flexibility training can improve balance and other functional movements for people diagnosed with MS. In addition, it looks at whether [cognitive behavioral therapy](#) can provide additional benefits for MS patients. The research is funded through grants from the Women and Giving Program at the SDSU Foundation and the SDSU Research and Scholarship Support Fund.

During the 10-week intervention, all participants did strength, balance and flexibility training for one hour twice a week to strength their muscles and improve their balance. However, half the participants also completed a one-hour cognitive behavioral therapy session each week.

In the therapy sessions, participants were asked to set specific behavioral goals, which could include exercise. In addition, behavioral therapy can help clients understand their thoughts and feelings, including coping with depression and anxiety. The study is concluding and results are being analyzed.

Friedrich, who was part of the exercise-only group, said, "I felt good afterward. I might have MS but I can still do this." Her weaker left leg improved but then reached a plateau, she said, "but my right leg and upper body strength kept going."

She also noted improvements in balance. Before the training, she pointed out, "if I caught my foot on a rug, I'd be down. Now, I can catch myself and I don't fall."

For Friedrich, keeping up with her family is important. "My goal was to walk up Harney Peak when our family went to the Black Hills and I did."

Provided by South Dakota State University

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