

Research In Focus: A Weekly Digest of New Research from the NIDILRR Community

Better, Stronger, Faster: How Exercising Harder May Help People with Incomplete SCI Improve Their Ability to Walk

A spinal cord injury (SCI) is damage anywhere along the spinal cord after an accident or other trauma. According to the National Spinal Cord Injury Statistical Center, more than half of people with SCI have an “incomplete” injury, meaning that nerve pathways to control movement below the injury are still partially intact. Although outcomes vary substantially, these individuals may retain the ability to walk. Previous research has shown that stepping or walking exercises, particularly at faster speeds or during difficult tasks (e.g, stair climbing or wearing weights) may help them improve speed and endurance while walking. In a recent NIDILRR-funded study, researchers looked at the connection between exercise intensity and walking speeds in people with incomplete SCI. Specifically, the researchers wanted to find out whether walking speeds improved more after high-intensity walking exercises than after low-intensity walking exercises.

Researchers at the [Midwest Regional Spinal Cord Injury Care System Center](#) enrolled 15 people with incomplete SCI in a study. The participants were an average of 49 years old (range: 18-75 years) and had their SCI for an average of 7.7 years. All participants could walk independently, some unsupported and others with the use an assistive device like a brace, cane, or walker.

All of the participants went through two walking programs: a low-intensity walking program and a high-intensity walking program. Seven of the participants did the low-intensity program first, while the other eight did the high-intensity program first. Each program lasted four to six weeks, and the participants took a four-week break between the two programs.

Each walking program consisted of up to 20 1-hour sessions, done 3-5 days per week at a training facility. During each program, the participants practiced walking on a treadmill at varying speeds, stepping in different directions or over obstacles, walking on an inclined surface or overground, and stepping on stairs.

Although the participants in both the low-intensity and high-intensity programs did the same exercises, the intensity level varied between the two programs. The intensity was adjusted by adding leg weights or changing the treadmill speed or incline settings. Specifically, for the low-intensity program, the intensity was adjusted until the participant had a heart rate around 60% of the maximum for a person their age (about 102 beats per minute for a 50-year-old) or until the participant said the exercise felt “somewhat hard.” For the high-intensity program, the intensity was adjusted until the participant had a heart rate around 70% of the maximum for their age (about 119 beats per minute for a 50-year-old) or until the participant said the exercise felt “hard” or “very hard.”

To find out how the low-intensity and high-intensity walking programs affected walking speed, all of the participants met with an assessor four times for fitness tests: at the beginning of the study; after finishing their first walking program; after the four-week break between programs; and after finishing their second walking program. During each assessment, the participants completed a “treadmill speed” test to see how quickly they could walk on the treadmill for 1 minute without needing to stop. The researchers also measured how quickly the participants could walk when not on a treadmill. To find out how the programs affected the participants’ metabolism, the researchers measured how much oxygen the participants used during the last 30 seconds of their fastest treadmill walk. Finally, they completed a “6-minute walk test” to see how far they could walk on a path in a 6-minute time period as they would usually walk-- with or without an assistive device.

The researchers found that the participants increased their treadmill speeds more after they completed the high-intensity walking program than after the low-intensity walking program, regardless of which program they did first. Their fastest treadmill speed increased by an average of 25% after they completed the high-intensity program, but only 3% after the low-intensity program. The participants also increased their fastest speed off the treadmill more after they completed the high-intensity program (19%) than after the low-intensity program (10%) regardless of which program they did first. All participants also improved the distance they could walk in 6 minutes after they completed both programs, with more improvement after the high-intensity walking program (14% after high-intensity walking and 7% after low-intensity walking). The researchers also found that after the high-intensity walking program, when the participants walked at the same speed as their fastest baseline speed, they used less oxygen than they did before they started the program.

Based on the results of this study, the authors noted that increasing the intensity of a walking program, without adding more sessions, can increase the benefit of these exercises for people with incomplete SCI. The authors noted that high-intensity exercise like the walking program tested here may help rebuild connections between nerves and muscles that may have been disrupted after injury, making it easier to keep up a faster walking speed. Future research with larger samples may be useful in better understanding the effects of high-intensity exercise on walking abilities in people with incomplete SCI.

To Learn More

Gait training can be an important therapy for people with incomplete SCI to improve their walking ability. Learn more about who can benefit from gait training, what it entails, and what the research shows about its effectiveness in this factsheet from the Model Systems Knowledge Translation Center: <http://www.msctc.org/sci/factsheets/Gait-Training-and-SCI>

To Walk or Roll is a forum discussion video from the Northwest Regional SCI System Center examining the complex issue of research on walking and SCI
http://sci.washington.edu/info/forums/reports/research_boninger.asp

The Paralysis Resource Center offers a comprehensive collection of information and resources on rehabilitation, research, technology, and support for people living with paralysis from spinal cord injury and other conditions.

<https://www.christopherreeve.org/living-with-paralysis/rehabilitation>

[To Learn More About this Study](#)

Bragz, G., et al (2017) [Effects of training intensity on locomotor performance in individuals with chronic spinal cord injury: A randomized crossover study.](#)

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