Cycling With Functional Electrical Stimulation After Spinal Cord Injury: What’s in It for Me?

What is functional electrical stimulation cycling?

Functional electrical stimulation (FES) is an intervention that uses an electrical current to activate weak or paralyzed muscles. The combination of FES with a bike, or cycle, is called FES cycling. The goal is to help people with paralysis or weakness to perform cycling. Sometimes the FES is needed to turn on muscles for motion because the limbs are completely paralyzed; in other cases it may mean that the FES will help weak muscles to get stronger contractions to make it easier to cycle.

There are 2 types of FES cycles. One cycle has you stay in your wheelchair and place your feet on the pedals (fig 1). The other is called a recumbent bike and is similar to what you might see at a gym. The recumbent bike requires you to transfer onto the seat of the cycle. For FES cycling with both cycles, small pads called electrode pads are placed over leg muscles. These electrodes provide the electrical current that makes your muscles contract to allow you to pedal the cycle. FES cycling engages the quadriceps and hamstrings muscles on the front and back of your thigh and the gluteal muscles (buttock muscles).

How can FES cycling help someone with a spinal cord injury?

There are many reports about possible benefits of FES cycling for someone with a complete spinal cord injury (SCI) (no movement below the injury). Most of these benefits focus on improving health and fitness because options for exercise are not as easy to find after SCI. People start cycling with different goals, including to increase their fitness levels, decrease fracture risk, increase muscle size, and exercise around other people. People who have sensation can feel the FES, but there are ways to adjust the settings on the cycle to make it comfortable while still achieving muscle contractions.

What is the evidence for FES cycling?

FES cycling can lead to improvements in bone health, muscle, and cardiovascular (heart) or respiratory fitness for people with complete SCI. These benefits last only when someone continues to perform FES cycling regularly. Less muscle is lost after a new SCI if FES cycling is started early. People who have been injured longer can increase the size of their leg muscles. People with SCI can also increase how fast their heart beats and how much oxygen they use while cycling with FES, showing that FES cycling is a type of exercise. Lipid or cholesterol levels are another way to look at cardiovascular health, but few changes have been seen in people with SCI after they have trained on the FES cycle.

For people with incomplete SCI, less is known about the effect of FES cycling. Small studies have shown increases in strength and walking. More research is needed to understand how people with incomplete SCI can benefit from FES cycling.

How can I get started?

Your best option is to go to a rehabilitation center that has FES cycles to try. You should get clearance from your physician to make sure that you have no health reasons that would prevent you from cycling with FES. In some states, you must get medical clearance and a prescription.

Once you get clearance and/or a prescription from your physician, a physical therapist will evaluate you to determine if you would be a good candidate (table 1). If the evaluation is positive, the physical therapist will have you try the FES cycle and change the settings as needed to try to get your legs to pedal the bike. If you have not been exercising or using electrical
stimulation on your legs, you may not be able to cycle for very long the first day because your legs need to build up their endurance. Over time, you may be able to cycle up to an hour at a time and increase the resistance that you can cycle against.

Working harder may increase the benefits that you can get from using the FES cycle, but you want to be sure that you progress in a safe way. Ask the physical therapist for guidance as you progress.

How often do I need to cycle to get and stay healthy?

Right now we cannot answer this question well. As with other types of exercise, the effects of FES cycling are different for each person. You have to keep exercising to maintain any gains and keep improving. Most research studies have had people with SCI cycle with FES for 30 to 60 minutes, 3 to 5 times per week for 3 to 12 months. For people who cycle on their own at a clinic or at home, the amount of time per session and the number of days per week can vary around other life demands.

The American College of Sports Medicine recommends that healthy adults participate in moderate intensity aerobic exercise for at least 30 minutes at least 5d/wk (at least 150min/wk), vigorous aerobic exercise for at least 20 minutes at least 3d/wk (at least 60min/wk), or a combination of moderate and vigorous exercise. FES cycling may offer a way for you to meet this goal and achieve better health and function. If you have tetraplegia, the maximal heart rate that you can achieve will be lower than before you had your SCI. Regardless of your level of SCI, your physical therapist can talk with you about how to monitor your exercise intensity.

How can I get more information?

It is best to contact a physician or physical therapist at the facility where you get care for your SCI. They can help you decide if FES cycling may be good for you to try.

Authorship

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