

# Multiple Sclerosis

## Functional Electrical Stimulation

In recent years, there has been a substantial increase in evidence supporting the use of peroneal nerve functional electrical stimulation (FES) to alleviate drop foot in people with multiple sclerosis (MS). A 2017 systematic review and meta-analysis shows a statistically significant initial orthotic effect (mean increase in gait speed of .05m/s) which continues to improve over time (increase of .08m/s).<sup>23</sup> Other evidence supporting the use of FES now includes four randomized trials,<sup>1,2,3,25</sup> one controlled trial (healthy controls),<sup>4</sup> two treatment device comparison trials (FES, AFO, no device; two FES devices, no device),<sup>5,6</sup> nine single intervention studies (subjects as their own controls),<sup>7-12,14-16</sup> a retrospective review of medical records,<sup>13</sup> a case series<sup>24</sup> and a phenomenological study.<sup>22</sup> Increased gait speed, improved gait quality, decreased energy cost, improved functional mobility and quality of life, and neuroplastic change are all outcomes reinforcing the use of FES in the treatment of individuals with MS.

Benefits of FES found in the published research for individuals with MS include:

### Increased Gait Speed

- Increased gait speed<sup>1,3-8,10-15,19,21,23</sup>
- Significantly faster 25 Foot Walk Test<sup>18</sup>
- Significantly faster 5-min Self-Selected Walk Test<sup>18</sup>

### Decreased Energy Cost with Gait

- Decreased energy cost with lower O<sub>2</sub> consumption<sup>4,8</sup>, decreased O<sub>2</sub> consumed per unit distance<sup>4</sup>
- Increased endurance with gait<sup>1,14</sup>
- Significantly increased distance walked during both a timed 2 minute<sup>14</sup> and a timed 3 minute walk<sup>1</sup>
- Decreased Physiologic Cost Index (PCI)<sup>7,10-12</sup>; energy cost considering heart and respiratory rates

### Functional Mobility and Quality of Life (QOL)

- Improved functional mobility<sup>2,9,19</sup>; Modified Emory Functional Ambulation Profile (mEFAP)<sup>9</sup>, functional activity
- Significant improvement on the stair component of the mEFAP<sup>9</sup>
- Trend towards improved navigation of the obstacle course<sup>9</sup>
- Significantly decreased incidence of falling<sup>2</sup>
- Increased performance scores on the self-report Canadian Occupational Performance Measure (COPM)<sup>2</sup>
- Increased satisfaction scores on the self-report Canadian Occupational Performance Measure (COPM)<sup>2</sup>

- Increased scores on both the MS Walking Scale and the MS Impact scale<sup>15</sup>
- Improvements in 25-foot Walk Test Score, MS Walk Score-12, SF-36 Physical Function domain and SF-36 Role Limitation/ Physical Health Domain Scores<sup>19</sup>

### Gait Quality

- Improved gait as measured by the Rivermead Observational Gait Analysis (ROGA)<sup>3</sup>
- Statistically significant increased ankle dorsiflexion during swing<sup>21</sup>
- Reduction in falls<sup>21</sup>
- Improved peak dorsiflexion<sup>13-14</sup> and peak knee flexion<sup>13</sup> during swing
- Improved ankle dorsiflexion at initial contact<sup>5</sup>
- Increased stride length<sup>14</sup>
- Improved Psychosocial Impact of Assistive Devices Scale (PIADS)<sup>25</sup>
- Improved Multiple Sclerosis Impact Scale (MSIS-29)<sup>25</sup>
- Positive changes in gait kinematics during the use of FES<sup>5,13-14,21</sup>



Though the ankle foot orthosis (AFO) continues to be the standard of care for drop foot caused by multiple sclerosis, there is evidence that the AFO is not always effective for this population.<sup>16</sup> Recent studies have investigated the effect of FES on the quality of gait for people with MS. FES is an active approach to treating drop foot and may have advantages over the passive AFO. MS is a condition that responds favorably to FES, and the literature supports that people with MS are excellent candidates.<sup>26</sup> FES has proven to be an effective means of eliminating drop foot, increasing gait speed, improving gait quality and functional mobility, with some studies supporting positive neuroplastic effects post FES wear. It has also been shown to be an effective long-term solution with a beneficial impact on not only the perception of disability and quality of life but also on cost of care.<sup>15,17</sup> Changes noted with the utilization of FES have direct implications for healthcare costs, workplace productivity and quality of life for persons living with MS. Subjectively, the impacts of FES devices on improving activities and participation were more important for participants than practical barriers, highlighting the importance of understanding individual experiences and preferences as well as clinical decision-making when prescribing a device to manage drop foot.<sup>22</sup> FES should be considered as a viable alternative to the current standard of care, an AFO.

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