Musculoskeletal Effects of Cycling and/or Electrical Stimulation in Pediatric SCI

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Abstract
Following spinal cord injury (SCI), muscles below the level of lesion atrophy and the skeletal structure modifies itself resulting in weakened bones. Cycling with functional electrical stimulation (FESC) has improved health for adults with SCI, but has not been studied in children. Twenty-five subjects, ages 9.8 ± 2.4 years, with chronic SCI were randomly assigned to FESC, passive cycling (PC), or electrically stimulated exercise (ES), and exercised one hour three times per week for 6 months. Stimulated strength of the quadriceps and hamstrings muscles, and bone mineral density (BMD) of the hip, distal femur and proximal tibia were collected. Quadriceps strength improved for the FESC (129%), PC (53%) and ES (38%) groups. Hamstring strength was also improved for the FESC (14%), PC (49%) and ES (21%) groups. BMD at the hip improved for the FESC (39%) and PC groups (30%) but declined in the ES group (-15%). At the knee, only the FESC group improved (femur 13%, tibia 11%), compared to the PC (femur 6%, tibia -2%) and ES groups (femur -14%, tibia -17%). Results show that all three interventions provided benefits. However, the most changes were seen with FESC, indicating that FESC may achieve better musculoskeletal outcomes than PC or ES in children with SCI.

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