FES for Reducing Crouch Gait in CP

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Abstract: Cerebral Palsy (CP) is a non-progressive disorder caused by a lesion of the fetal or infant brain that results in muscle weakness, spasticity and other motor impairments. The overall goal of the proposed work is to prevent the typical downward spiral of walking function of individuals with CP that occurs from adolescence into adulthood; and potentially to reduce the need for surgical interventions that exacerbate weakness, have long recovery times and may or may not enhance gait function. Currently, the status quo of interventions for CP are insufficient to reverse the general trend for loss of function and innovated approaches are needed to enhance functional ability and activity for individuals with CP. This proposal consists of an innovative, physiologically based intervention with scientific-based methodology to produce neuroprosthetic correction of crouch gait, therapeutic benefit of improving cardiorespiratory fitness, and neurotherapeutic effects of motor learning for improving gait for individuals with CP and crouch gait. To accomplish this end, this proposal combines two rehabilitation intervention techniques (fast treadmill training and functional electrical stimulation (FES), concepts from rehabilitation engineering (forward dynamic gait simulation based on anthropometric measures and biomechanical gait analysis), and exercise science (aerobic training) to maximize functional gait in children and adolescents with CP who are at high risks of declines in gait function and detrimental secondary consequences. The specific aims of this proposal are: 1) to assess the feasibility of using a multiple channel FES system to produce an immediate neuroprosthetic effect to reduce crouch gait in children and adolescents with spastic diplegic CP; 2) to assess the feasibility of using a multiple channel FES system as a therapeutic training tool to produce lasting neurotherapeutic effects of diminished crouch gait in children and adolescents with CP. This work has the potential to move FES technology often perceived as a research only application, to one that is a clinical methodology that may promote neurotherapeutic benefits for individuals with CP.