A new approach to SCI rehabilitation

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In order to maintain postural and locomotor control the central nervous system requires a critical level of proprioceptive sensory input from the lower limbs on the timing and level of load-bearing. Recent research in spinalised animal models has shown that full weight-bearing stepping can be recovered in the presence of spinal epidural stimulation and pharmacological modulation using serotonergic agonists. It has also been observed that progressively increased daily lower limb load-bearing, can further enhance recovery of standing potential, in spinalised rats and in a small number of human spinal cord injury patients. The mechanism whereby motor function recovers with these interventions is slowly being elucidated from a perspective of spinal network responses to combinations of neuromodulatory interventions, utilising implanted or transcutaneous electrical stimulation, exoskeletal robotic entrained walking systems and pharmacological modulation. The aim of this independent case study in one human participant is to further evaluate the potential of exoskeletal bipedal loadbearing, lumbosacral electrical stimulation and a pharmacological intervention in restoration of standing and autonomic nervous system responses after complete paralysis due to spinal cord injury. The participant is currently undergoing baseline pre-intervention medical tests and extensive neurophysiological and biomechanical evaluation during supported standing and robotically assisted ambulation. The participant will then undergo four week intervention phases commencing with exoskeletal walking and standing training alone, followed by walking/standing training in combination with transcutaneous electrical stimulation and a pharmacological intervention. Preliminary baseline and Phase I intervention data will be discussed as well as the use of emerging technologies in SCI rehabilitation.