

TRANSCUTANEOUS SPINAL CORD STIMULATION PARADIGM FOR IMPROVING MOTOR FUNCTIONS

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Value Proposition: *Novel non-invasive multielectrode transcutaneous spinal cord stimulation (tSCS) technique capable of selectively activating specific joints.*

Technology Description

Researchers at Washington University in St. Louis have developed a new non-invasive stimulation paradigm for transcutaneous spinal cord stimulation (tSCS) aimed at improving motor function in individuals with neuromotor disorders. Spinal cord stimulation (SCS) is an emerging technology to help people with neuromotor disorders improve their motor function. Two technologies currently exist: epidural SCS (eSCS), which is an invasive approach implanting an array of electrodes on top of the spinal cord, and transcutaneous (tSCS), which is a non-invasive technique using surface electrodes over the skin. Current tSCS techniques use high currents to recruit both leg and arm muscles; because of this, turning the stimulation from off to on is not feasible, as people feel pain and discomfort from this sudden and drastic change in amplitude.

This new approach involves a gradual increase to a baseline stimulation amplitude (e.g., 80% of the effective level) across all electrodes, followed by a quick ramp-up to the effective amplitude (100%) during specific movement phases. This method enables spatiotemporal control of muscle activation without causing discomfort, making tSCS therapy more tolerable and effective.

Stage of Research

Early device testing

Publications

Bryson N, Lombardi L, Hawthorn R, Fei J, Keesey R, Peiffer JD, Seáñez I. Enhanced selectivity of transcutaneous spinal cord stimulation by multielectrode configuration. *J Neural Eng.* 2023 Jul 25;20(4):10.1088/1741-2552/ace552. doi: 10.1088/1741-2552/ace552. PMID: 37419109; PMCID: PMC10481387.

Applications

- Improving spinal cord stimulation
- Improving motor function in individuals with neuromotor disorders

Key Advantages

- Can alternate between active electrodes without causing discomfort
- Allows tolerance to sudden increases in stimulation amplitude
- Gradually increases baseline stimulation amplitude across all electrodes

Patents

Patent application filed

Related Web Links – [Imael Seáñez Profile](#); [Seáñez Lab](#)