

Authors Year Country Date included in the review Number of articles Level of Evidence Type of Study AMSTAR Score	Method Databases Outcome Measures	Conclusions
Non-invasive Stimulation Methods		
Li et al. 2024 China Reviewed published articles up to April 2022 N = 14 (5 studies were pooled as having lower limb and gait outcome measures) Level of evidence: Cochrane risk-of-bias criteria Type of study: RCTs AMSTAR: 8	Methods: The study aimed to examine the effectiveness of NIBS (noninvasive brain stimulation) (transcranial magnetic stimulation [TMS] and/or transcranial direct current stimulation [tDCS]) in the treatment of motor dysfunction among those with incomplete SCI. Databases: PubMed, Embase and the Cochrane Library. Outcome Measures: Lower limb muscle strength and gait outcomes, among others.	- Meta-analysis of muscle strength outcomes indicated a nonsignificant difference between the real NIBS and sham groups (SMD=0.35, 95% CI=-0.07 to 0.77, P=0.10, I²=26%). However, significant effect was detected in the effect of NIBS versus sham groups on lower limb muscle strength at the one-month follow-up after intervention (SMD=0.69, 95% CI=0.11 to 1.28, P=0.02, I²=0%). - Additionally, the pooled analysis of the gait outcomes showed a similar effect between the groups (SMD=0.16, 95% CI=-0.34 to 0.66, P=0.54, I²=41%).
Shi et al. 2024 China Reviewed published articles up to December 2023 N = 6 (4 studies were pooled as having lower limb and gait outcome measures) Level of evidence: Cochrane Risk of Bias Tool	Methods: The study aimed to consolidate findings from available RCTs regarding the influence of transcutaneous spinal cord stimulation on extremity motor function in patients with SCI. Databases: Medline (PubMed), CENTER (Cochrane Library), Embase (Ovid), Web of Science, Wanfang, and China National Knowledge Infrastructure. Outcome Measures: Upper and/or lower extremity strength (UEMS/LEMS), and walking function (10MWT, 2MWT, 6MWT), among others.	- Pooled results of two studies showed that transcutaneous spinal cord stimulation on the basis of conventional rehabilitation could significantly improve limb strength as evaluated by LEMS (MD: 5.28, 95% CI: 1.46 to 9.09, p = 0.007; I² = 0%). - Pooled results of four studies demonstrated that transcutaneous spinal cord stimulation significantly improved mobility as indicated by walking speed (MD: 0.13 m/s, 95% CI: 0.03 to 0.23, p = 0.009; I² = 0%) and walking distance (standardized MD: 0.62, 95% CI: 0.30 to 0.94, p < 0.001; I² = 0%). In addition, subgroup

Type of study: RCTs AMSTAR: 8		analysis for walking distance in studies with 2MWT and 6MWT showed consistent results.
Megía-García et al. 2020 Spain Reviewed published articles up to December 2018 N = 13 Level of evidence: GRADE, CARE (Case Report Guidelines) and PEDro Scale Type of study: 10 case-series studies 2 clinical trials with crossover designs AMSTAR: 6	Method: This review analyzed the feasibility and efficacy of transcutaneous spinal current stimulation (tSCS) to promote motor activity and function in patients with SCI. In addition, the range of stimulation parameters and spinal site of stimulation are also reviewed to understand the optimal protocol required to promote motor activity. Database: PubMed, Cochrane Registry, and PEDro. Outcome Measures: Motor response (electromyography [EMG], movement, force, assessment of active movement or function) and perceived clinical improvement.	1. Nine studies analyzed the lower extremities, three analyzed the upper extremities, and one assessed motor response in the trunk. 2. The total study sample comprised 55 persons with SCI. 3. Stimulation parameters: a. Level of stimulation: All studies that sought to induce muscle activation patterns in the lower extremities applied stimulation at the level of the T11-T12 interspinous space. Of these, 6 applied stimulation simultaneously at adjacent levels, such as L1-L2 or the first coccygeal vertebra. b. Type of current: i. All studies used a rectangular wave, with the waveform being reported as biphasic in five studies, monophasic in another five, and without specification in the remaining reports. ii. Eight studies applied stimulation currents applied at a carrier frequency of between 2.5 and 10 kHz with a burst frequency of 30 Hz. The remaining studies used isolated pulse protocol, with frequencies of bursts or pulses applied between five and 90 Hz. iii. All studies applied the stimulus with a pulse width of between 0.5 and 2.0 ms. c. Current intensity: There was great variability with most of the studies using high intensities close to the participants' tolerance threshold. Current was, thus,

		applied with an intensity that ranged from 10 to 250 mA. 4. Three studies recorded AEs, and in general, there was good tolerability of the intervention by patients, without any apparent AEs other than cutaneous irritation after repeated stimulation. 5. Effects on motor response during stimulation: a. All studies reported an increase in motor response. b. The reports that studied stimulation at several spinal levels observed a response dependent on the site of application of the current and a summation effect when the stimulus was simultaneously applied at various spinal levels. i. Spinal stimulation at T11- T12 → Quadriceps and hamstring ii. Spinal stimulation at L1-L2 → Triceps surae and tibialis anterior. c. Eight studies used functional variables: 6. Among other improvements in gait outcomes, a decrease in the time needed to cover 10 m has been shown in 4 studies.
Invasive Stimulation Methods		
McHugh et al. 2021 Ireland Reviewed published articles up to June 2020 N = 18 Level of evidence:	Method: The aim of the current review was to pool all of the currently available research regarding the efficacy of epidural spinal cord stimulation (ESCS) for regaining motor function in SCI, and systematically review existing methodologies and results. Database: CINAHL, Embase, Medline and Web of Science.	1. All the studies reviewed were categorized into the poor range (<14) of the Modified Downs and Black Quality Checklist. 2. Thirteen of these studies included patients with motor-complete SCI, with the remaining 5 reporting on motor incomplete patients. 3. The total number of study participants evaluated was 40. However, 7 of these were identified as repeat participants, resulting in

The Modified Downs and Black Quality Checklist Type of study: 8 case reports 10 case series AMSTAR: 7	Outcome Measures: Motor function was assessed with different outcome measures (e.g., ASIA, gait distance, gait speed, PLOA gait, PLOA standing, % body weight during gait, % body weight during standing, ground reaction force, joint/muscle force, joint kinematics [ROM], number of unassisted/assisted, OG walking unassisted/assisted, treadmill walking unassisted/assisted, unassisted/assisted standing [$\pm$ time], EMG, intentional control of motor activity, muscle mass and action research arm test).	cumulative data presented on only 24 persons. 4. Reported AEs in this review were very rare, with just one study reporting a hip fracture. However, 14 studies failed to report any information regarding AEs. 5. All studies reported some level of functional improvement, with 11 studies describing improved locomotor function and eight studies reporting improved standing ability: a. Improvements in ASIA scoring were reported in three studies and re-categorization of ASIA score post- ESCS was achieved by four participants. b. Independent ambulation with a gait aid was reported by four of the 18 studies. While these impressive results were achieved in motor incomplete persons. c. Inconsistencies in the reported methods and presentation of EMG data limit any meaningful interpretation.
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