PHYSICAL THERAPY INTERVENTIONS FOR IMPROVING BALANCE IN INCOMPLETE SPINAL CORD INJURY: A SYSTEMATIC REVIEW

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ABSTRACT

Objective: Evaluate the efficacy of physiotherapy interventions for improving balance in patients with incomplete spinal cord injury.

Data Sources: A systematic search was performed for randomized controlled trials available from January 2009 until June 2019, using Cochrane Database of Systematic Reviews, PubMed, and Physiotherapy Evidence Database. Relevant systematic reviews and references were also searched.

Study Selection: Studies evaluating the efficacy of physiotherapy interventions in improving balance outcomes in adult patients with incomplete spinal cord injury grades C or D (more than one 1-year post-injury) were elected and evaluated by authors, excluding robotic-assisted therapies or technological devices.

Data Extraction: Eligible studies were critically appraised by Physiotherapy Evidence Database scale and Cochrane Risk of Bias scale. Sample characteristics, intervention, control, outcome measures, and results were evaluated with regards to balance.

Data synthesis: Only five studies were included in this systematic review. Sample sizes were too small in all included trials. Interventions used to improve balance were divided into three categories for better analysis of results; Whole Body Vibration, Mental Practice, and Body Weight Support. Interventions were compared to conventional physical therapy. Improvement in balance was greater after Whole-Body Vibration compared with conventional physiotherapy, Body Weight Support with fixed track showed significant balance improvement, while Body Weight Support using treadmill did not indicate a significant balance improvement. Mental practice was not effective when added to conventional physiotherapy techniques in balance improvement.

Conclusion: Insufficient evidence was found for the efficacy of physiotherapy interventions in improving balance in incomplete spinal cord injury patients. Studies with larger sample sizes are needed with deeper evaluation of physiotherapy treatments focusing specifically in improving balance in incomplete spinal cord injury patients.



BIOGRAPHY

Msc. Blanca F. Vellve is a Neurorehabilitation Professor at the Autonomous University of Yucatan, currently working as a clinician in the Integrative Rehabilitation Laboratoy at the University Rehabilitation Unit; along with a multidisciplinary team composed of physiotherapists, physiatrists, and nutritionists.

Her work with neurodegenerative and neurological conditions has developed clinical and community projects in the Neuro-rehabilitation field.

She is a social advocate looking to enhance inclusion and independence as part of the rehabilitation process in neuro-disabilities, and promotes projects that include the use of new technologies and interventions.

She is an active member of Open Source Assistive Devices (OPAD) from the University of Nottingham, UK, and an international speaker in the neuro-rehabilitation field.

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ABOUT RESEARCH TOPIC

Spinal cord injury (SCI) affects approximately 250,000 to 500,000 people globally per annum [1]. The severity of SCI is calculated according to the American Spinal Injury Association Impairment Scale (ASIA or AIS). ASIA C-D Incomplete Spinal Cord Injuries (ISCI) represent the population with higher probability of recovering ambulation; it is considered that around 80–100% of ISCI ASIA D individuals have gait recovery after the first year of injury [2], however, for ambulation recovery to happen, individuals must have certain abilities, in particular, adequate dynamic balance [3].

Many studies have highlighted the relation between balance impairment in ISCI, risk of falls, independence, and Quality of Life (QoL). Consequently, approaches to improve balance should be a key focus of physical therapy rehabilitation [4].

Technological devices, such as exoskeletons and robot-assisted therapies, continue to be a consistent theme in recent literature, however, this approach has a cost- limitation when compared to other conventional therapies, furthermore, there is insufficient evidence of the superiority of technological interventions over conventional physiotherapy techniques in terms of improving balance outcomes [5].

Physical therapy options for improving balance in ISCI are diverse, including for instance: Functional Electrical Stimulation (FES) , Sensory Feedback Mechanisms, Locomotor Training (LM), Kinesiotaping for Sensory Inputs, Whole Body Vibration (WBV), Virtual Therapy Feedback, and Body Weight Support (BWS).

Balance is not commonly considered a primary outcome, and RCTs in ISCI have small sample sizes to create a clinical impact, accordingly, carrying out quality reviews on balance outcomes in ISCI is necessary, with summarised updated information, and analysis of different options and methods, aiming at improving gait capacity, QOL, and therefore, reducing the economic burden that this global health problem represents.

REFERENCES

- A. M. Rubiano, N. Carney, R. Chesnut and J. C. Puyana, Global neurotrauma research challenges and opportunities, Nature 527 (2015), no. 7578, S193.
- E. Desrosiers, S. Nadeau and C. Duclos, Balance during walking on an inclined instrumented pathway following incomplete spinal cord injury, Spinal Cord 53 (2015), no. 5, 387-394.
- H. Barbeau, S. Nadeau and C. Garneau, Physical determinants, emerging concepts, and training approaches in gait of individuals with spinal cord injury, Journal of Neurotrauma 23 (2006), no. 3-4, 571-585.
- K. Chan, K. Guy, G. Shah, J. Golla, H. M. Flett, J. Williams and K. E. Musselman, Retrospective assessment of the validity and use of the community balance and mobility scale among individuals with subacute spinal cord injury, Spinal Cord 55 (2017), no. 3, 294-299.
- G. Scivoletto, M. Miscusi, S. Forcato, L. Ricciardi, M. Serrao, R. Bellitti and A. Raco, The rehabilitation of spinal cord injury patients in europe, Trends in Reconstructive Neurosurgery: Neurorehabilitation, Restoration and Reconstruction 124 (2017), 203-210.
- N. Kapadia, K. Masani, B. C. Craven, L. M. Giangregorio, S. L. Hitzig, K. Richards and M. R. Popovic, A randomized trial of functional electrical stimulation for walking in incomplete spinal cord injury: Effects on walking competency, Journal of Spinal Cord Medicine 37 (2014), no. 5, 511-524.
- J. Ditunno and G. Scivoletto, Clinical relevance of gait research applied to clinical trials in spinal cord injury, Brain Research Bulletin 78 (2009), no. 1, 35-42.
- D. Barthelemy, M. Willerslev-Olsen, H. Lundell, F. Biering-Sorensen and J. B. Nielsen, Assessment of transmission in specific descending pathways in relation to gait and balance following spinal cord injury, Sensorimotor Rehabilitation at the Crossroads of Basic and Clinical Sciences 218 (2015), 79-101.
- A. Piira, A. M. Lannem, M. Sørensen, T. Glott, R. Knutsen, N. Gjesdal, N. Hjeltnes and S. F. Knutsen, Effects of locomotor training in subjects with incomplete sci–a randomized controlled trial, Archives of Physical Medicine and Rehabilitation 98 (2017), no. 10, e60-e61.
- A. Piira, A. M. Lannem, M. Sorensen, T. Glott, R. Knutsen, L. Jorgensen, K. Gjesdal, N. Hjeltnes and S. F. Knutsen, Manually assisted body-weight supported locomotor training does not re-establish walking in non-walking subjects with chronic incomplete spinal cord injury: A randomized clinical trial, Journal of Rehabilitation Medicine 51 (2019), no. 2, 113-119.