2-12-2016

**Locomotor Training in the Pediatric Spinal Cord Injury Population: A Systematic Review of the Literature**

Katelin Gorski, SPT  
*Department of Physical Therapy, Thomas Jefferson University*

Kelsey Harbold, SPT  
*Department of Physical Therapy, Thomas Jefferson University*

Katelyn Haverstick, SPT  
*Department of Physical Therapy, Thomas Jefferson University*

Emily Schultz, SPT  
*Department of Physical Therapy, Thomas Jefferson University*

Stephanie E. Shealy, MS, SPT  
*Department of Physical Therapy, Thomas Jefferson University*

Follow this and additional works at: [https://jdc.jefferson.edu/dptcapstones](https://jdc.jefferson.edu/dptcapstones)

**Recommended Citation**


This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University's Center for Teaching and Learning (CTL). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in Department of Physical Therapy Capstone Posters by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: JeffersonDigitalCommons@jefferson.edu.
Authors
Katelin Gorski, SPT; Kelsey Harbold, SPT; Katelyn Haverstick, SPT; Emily Schultz, SPT; Stephanie E. Shealy, MS, SPT; and Laura Krisa, PhD

This book is available at Jefferson Digital Commons: https://jdc.jefferson.edu/dptcapstones/3
Locomotor Training in the Pediatric Spinal Cord Injury Population: A Systematic Review of the Literature

Katelin Gorski, SPT, Kelsey Harbold, SPT, Katelyn Haverstick, SPT, Emily Schultz, SPT, Stephanie E. Shealy, MS, SPT, Laura Krisa, PhD

Thomas Jefferson University, Department of Physical Therapy

Background

Currently there is very little evidence to support the natural progression of recovery in children with spinal cord injury (SCI) lacking the restoration of walking ability an increasingly important goal in physical therapy. Locomotor training (LT) is a rehabilitation strategy that aims to restore both walking and postural control after an SCI. This strategy uses functional training with the goal of facilitating activity-dependent neuroplasticity by providing sensory input to the damaged nervous system. Through neuroplasticity, neurons in the central nervous system change their structure and function in response to development, learning, or injury. Several different types of LT exist, including body weight supported treadmill training and robotic, which aim to provide appropriateafferent information for the desired motor pattern.

Purpose

The aim of this review was to investigate the effects of LT on pediatric SCI and develop recommendations for pediatric LT guidelines.

Methods

Preliminary Search

- Databases searched: PubMed, Scopus, Ovid, and CINAHL
- Search terms: children, pediatric, locomotor training, gait training, treadmill, spinal cord injury
- Search conducted: individually by the five primary authors

Article Selection

- Limits: limited to human studies published in English
- Exclusion criteria: duplicates, reviews, commentaries, book chapters, editorials, and commentaries on other articles

Inclusion Criteria

- Human studies
- Abstracts
- Published in last 10 years
- Adult studies
- Spinal Cord Injury
- Ability to extract specific pediatric data

Types of Locomotor Training

- Overground (OG)
- Breezy Walking Supportive Treadmill Training (BWSTT)
- NeuroRecovery Training System (NRTS)

Results

- Intervention Descriptions
  - Intervention: BWSTT & OG Therapy
  - Maintenance: BWSTT & OG Therapy
  - Exercise: BWSTT and OG Therapy
  - Training: BWSTT and OG Therapy
- Time to participate: 60 minutes
- Time to discharge: 20 minutes
- Recurrence: 0% of participants
- Relapse: 0% of participants
- Training: BWSTT and OG Therapy
- Exercise: BWSTT and OG Therapy
- Maintenance: BWSTT and OG Therapy

Discussion

- The results of the discussed studies indicate that the pediatric SCI population can benefit from LT.
- Several measured parameters indicate that participants made gains in the ability to ambulate, regardless of change in the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) level.
- No clinically best guide for the pediatric population can be determined from this review, however, it’s worth noting the similarities and the differences among the studies that have majorly impacted patient progression.
- Five of the six studies focused on segmental control and the ability of the participant to maintain proper trunk, pelvis, and lower extremity alignment.
- As a patient’s independence in trunk alignment and limb position increased, BWS decreased. As BWS abstracted and segmental independence increased, gait speed also increased, allowing for a more normalized walking speed and functional gait pattern.
- Every participant also progressed to a change in environmental practice at some point in his or her treatment (e.g., over-ground training).
- In the pediatric population, the nervous system is continuously developing, therefore, the adult guidelines for LT in the SCI population must be altered to fit the needs of the pediatric population.
- It can be noted from this review that improvements in ambulation can be seen even when initiated in the chronic phase of injury disrupting the “somedo the better” philosophy.
- Principles of neuroplasticity can help explain the comparable gains seen across various treatment implementations, as it appears most important to simply participate in task-specific training regimens.

Limitations

- No randomized control trials
- Small, specific participant population with bimodal age distributions 4.5-5.5 years and 13-17yrs.
- Lack of a standardized protocol for the pediatric population
- Questionable reliability when using the ISNCSCI classification system in the pediatric SCI population
- Varying time period between injury and intervention
- No consistency among outcome measures with many not being tested for reliability in the pediatric population

Conclusions

Currently, studies investigating the benefits of LT in pediatrics with SCI are based on results found within the adult SCI population. Presently, there are no established guidelines specifically for the pediatric population. While this review showed positive results for gait speed, distance, and participation, further research is needed to determine whether or not prior level of ambulation and time since injury plays a role in the ability to regain function following a SCI. Future research designs should utilize controlled research trials to determine a causal relationship between LT and the return to ambulatory function.

References