RESEARCH ARTICLES RELATED TO:

**Spasticity and Range of Motion**


- Comprehensive review of literature on the various medical and functional benefits of standing.


- Updated comprehensive literature review of the medical and functional benefits of wheelchair standing devices.


Boutilier, G; Sawatzky, BJ; et al. (2012). Spasticity changes in SCI following a dynamic standing program using the Segway. Spinal Cord. 50, 595-598.
Study design: A pilot prospective pre- and post-intervention study.

Objectives: To determine whether a dynamic standing program using the Segway Personal Transporter results in any measurable physiological effects in individuals with spinal cord injury (SCI) using both qualitative and quantitative measures of spasticity, pain and fatigue.

Setting: International Collaboration of Repair Discoveries (ICORD) Research Centre, Vancouver, BC, Canada.

Methods: Eight individuals with SCI ASIA (American Spinal Injury Association) A–D, who could stand with or without the assistance of bracing or supports, participated in a 4-week dynamic standing program using a Segway (3 per week, 30-min sessions). The main outcome was spasticity as measured by the Modified Ashworth Scale (MAS). Secondary measures included the SCI-Spasticity Evaluation Tool, Pain Outcomes Questionnaire, and Fatigue Severity Scale.

Results: The dynamic standing sessions were associated with immediate improvements in spasticity (MAS) (Po0.001) and self-reported pain (Po0.05). Fatigue levels decreased, however this was not significant. There is little evidence to suggest that these beneficial outcomes may have lasting effects.

Conclusions: Dynamic standing on the Segway may be effective for short-term spasticity reduction and decreased pain and fatigue. Future work should examine a larger sample size and help to propose mechanisms for potential reductions in spasticity.


The purpose of this study was to document the patterns of use of prolonged standing and their perceived effects in subjects with SCIs.

Subjects. The subjects were 152 adults with SCIs (103 male, 49 female; mean age534 years, SD58, range518–55) who returned mailed survey questionnaires. Methods. A 17-item self-report survey questionnaire was sent to the 463 members of a provincial spinal cord support organization.

Results. Survey responses for 26 of the 152 respondents were eliminated from the analysis because they had minimal effects from their injuries and did not need prolonged standing as an extra activity. Of the 126 remaining respondents, 38 respondents (30%) reported that they engaged in prolonged standing for an average of 40 minutes per session, 3 to 4
times a week, as a method to improve or maintain their health. The perceived benefits included improvements in several health-related areas such as well-being, circulation, skin integrity, reflex activity, bowel and bladder function, digestion, sleep, pain, and fatigue. The most common reason that prevented the respondents from standing was the cost of equipment to enable standing.

Discussion and Conclusion. Considering the many reported benefits of standing, this activity may be useful for people with SCI. This study identified a number of body systems and functions that may need to be investigated if clinical trials of prolonged standing in people with SCI are undertaken.


- Review of current research available in 2010.
- 112 unique studies identified (39 met inclusion criteria)
  - 29 – Adult Neuromuscular; 10 – Pediatric Neuromuscular
- Peer reviewed studies:
  - Bone mineral density (BMD) – moderately strong evidence
  - Decreasing hypertonicity (incl. Spasticity) – some support
  - Range of motion (ROM) – some support
  - Whole Body Vibration (WBV) – promising trend but inconclusive
- Survey Data (PTs and Users) attributed numerous improved outcomes: ROM, bowel/bladder, psychological, hypertonicity and pressure relief/bedsores
- Goal Dosage – total of 1 hour (or more) per day; 5x/wk


- Review of literature – standing can improve ROM at ankle; low dose standing unlikely to improve bone health.

Abstract:

**Objectives:** To evaluate whether supported standing can affect lower limb muscle length, spasticity, bone mineral density or the function of adults with upper motor neurone disorders.

**Data sources:** A search was conducted of MEDLINE, EMBASE, AMED, CINAHL and Cochrane library electronic databases; clinical trial registers via www.controlled-trials.com and complemented with citation tracking.

**Review methods:** Two reviewers independently evaluated eligibility and methodological quality. Class I and II studies of assisted standing for adults with stroke, multiple sclerosis, traumatic brain injury or spinal cord injury were eligible. A domain-based risk of bias approach was used to assess quality.

**Results:** Seventeen studies were included: 11 class I and 6 class II studies involving 540 participants, of whom 73% were non-ambulant. Quality was generally low, with only two high quality trials identified. High quality evidence suggested tilt-table standing has a small effect on preventing loss of ankle dorsiflexion. One high-quality study found a low-dose standing programme did not alter bone loss early after spinal injury. Class II low-quality evidence suggested long-term, higher dose programmes may slow bone loss. Limited evidence for the effectiveness of standing on spasticity and function was inconclusive. **Conclusion:** Supported standing can prevent small losses of ankle mobility but the clinical importance of these effects is uncertain. Low-dose standing is unlikely to protect bone health.


**Purpose:** There is a lack of evidence-based recommendations for effective dosing of pediatric supported standing programs, despite widespread clinical use. **Methods:** Using the International Classification of Functioning, Disability, and Health (Child and Youth Version) framework, we searched 7 databases, using specific search terms. **Results:** Thirty of 687 studies located met our inclusion criteria. Strength of the evidence was evaluated by well-known tools, and to assist with clinical decision-making, clinical recommendations based on the existing evidence and the authors’ opinions were provided.
Conclusions and recommendations for clinical practice: Standing programs 5 days per week positively affect bone mineral density (60 to 90 min/d); hip stability (60 min/d in 30° to 60° of total bilateral hip abduction); range of motion of hip, knee, and ankle (45 to 60 min/d); and spasticity (30 to 45 min/d). (Pediatr Phys Ther 2013;25:232–247)

Key words: bone mineral density, child, disabled children/rehabilitation, dose–response relationship, dynamic weight-bearing, joint instability, physical therapy modalities/statistics and numerical data, range of motion, spasticity, systematic review, weight-bearing.


Methods: Ten studies met the inclusion criteria for this review.

Results: The evidence supporting the effectiveness of static weight-bearing exercises in children with cerebral palsy, except the findings of increased bone density and temporary reduction in spasticity, remains limited because of an inadequate number of studies undertaken, inadequate rigor of the research designs and the small number of subjects involved.

Conclusion: Clinicians should carefully consider all available evidence before making a decision regarding the potential effectiveness of static weight-bearing for the targeted outcomes.


Description: The control of spasticity is often a significant problem in the management of patients with spasticity. The aim of this study was to evaluate the effect of a single session of prolonged muscle stretch (PMS) on the spastic muscle. Seventeen patients with spastic hemiplegia were selected to receive treatment. Subjects underwent PMS of the triceps surae (TS) by standing with the feet dorsiflexed on a tilt-table for 30 minutes. Our test battery consisted of four measurements including the Modified Ashworth scale of the TS, the passive range of motion (ROM) of ankle dorsiflexion, the H/RM ratio of the TS, and the P/RM ratio of the tibialis anterior (TA). The results indicated that the passive ROM of ankle dorsiflexion increased significantly (p < 0.05) compared to that before PMS treatment. Additionally, PMS reduced motor neuron excitability of the TS and significantly increased that of the TA (p < 0.05). These results suggest that 30 minutes of PMS is effective in reducing motor neuron excitability of the TS in spastic hemiplegia, thus providing a safe and economical method for treating stroke patients.


Additional analyses were conducted on a recently published survey of persons with spinal cord injury (SCI) who used standing mobility devices. Frequency and duration of standing were examined in relation to outcomes using chi-square analyses. Respondents (n = 99) who stood 30 minutes or more per day had significantly improved quality of life, fewer bed sores, fewer bladder infections, improved bowel regularity, and improved ability to straighten their legs compared with those who stood less time. Compliance with regular home standing (at least once per week) was high (74%). The data also suggest that individuals with SCI could benefit from standing even if they were to begin several years after injury. The observation of patient benefits and high compliance rates suggest that mobile standing devices should be more strongly considered as a major intervention for relief from secondary medical complications and improvement in overall quality of life of individuals with SCI.