

# **There is evidence to suggest that partial weight-bearing gait training is no more effective than conventional gait training in achieving independent ambulation in a traumatic brain injury population**

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## **CLINICAL SCENARIO:**

Traditional methods of gait training in traumatic brain injury (TBI) clients have been criticized for their lack of task-specificity. The introduction of partial weight-bearing (PWB) gait retraining systems has offered a potentially valuable tool in the rehabilitation of the neurologically-involved patients. The systems generally consist of a treadmill to control very slow walking speeds and a support harness for relief of posture and balance during walking training. These systems are thought to be advantageous by allowing the therapist to be hands free to provide physical feedback which promotes less compensatory movements and allows for the normalization of gait in a repetitive, task-specific manner. While considering the potential advantages of a PWB system it must also be noted that it is a costly intervention from both a financial and human resource perspective.

## **FOCUSED CLINICAL QUESTION:**

Is partial weight-bearing gait training more effective than traditional gait training in achieving independent ambulation in a traumatic brain injury population?

## **SUMMARY OF KEY FINDINGS:**

- Five articles met the inclusion criteria; two randomized controlled trials (RCTs), one systematic review, one case study and one single case design.
- Both RCTs (Brown et al., 2005) (Wilson et al., 2006) found the experimental group using PWB gait training to not show any significant differences in measured outcomes than the control group using conventional gait training methods.
- The systematic review (Teasell et al., 2007) studied these same RCTs and made a similar conclusion.
- Both subjects in the single case design (Wilson & Swaboda, 2002) and the subject in the case study (Scherer, 2007) all showed improvement over time, but there was no control for comparison and the results were not reported in statistical terms.

## **CLINICAL BOTTOM LINE:**

There is evidence that partial weight-bearing gait training does not provide any added benefits over conventional gait training in achieving ambulation.

**Limitation of this CAT:** This critically appraised topic has not been peer-reviewed by any other independent person.

**SEARCH STRATEGY:****Terms used to guide Search Strategy:**

- **P**atient/Client Group: Traumatic brain injured clients in a rehabilitation setting
- **I**ntervention (or Assessment): Partial weight-bearing gait training
- **C**omparison: Conventional gait training
- **O**utcome(s): Independent ambulation as measured by the Functional Ambulation Category (FAC)

<b>Databases and sites searched</b>	<b>Search Terms</b>	<b>Limits used</b>
OVID Gateway * by keyword	brain injur\$ AND gait; partial weight-bearing AND brain injur\$; partial weight-bearing AND gait	English Language Human studies
CINAHL by keyword	brain injuries AND gait; brain injuries and partial weight-bearing; partial weight-bearing AND gait	
CINAHL headings	(brain injuries or head injuries) AND gait; (brain injuries or head injuries) AND weight-bearing; weight-bearing AND gait	
PEDro Simple search	brain injury AND gait; brain injury AND weight-bearing; weight-bearing AND gait	
EBM by keyword	brain injur\$ AND gait; partial weight-bearing AND brain injur\$; partial weight-bearing AND gait	
Medline by MeSH	brain injuries AND gait; brain injuries AND weight-bearing; weight-bearing AND gait	
PubMed by keyword	brain injuries AND partial weight-bearing; partial weight-bearing AND gait; brain injuries AND body weight support	

\*EMBASE, journals at OVID, EBM reviews (ACP journal club), CCRCT, CDSR, DARE), OVID Medline

**INCLUSION AND EXCLUSION CRITERIA:**

**Inclusion criteria-** RCTs, systematic reviews and other non-experimental design studies of adolescents and adults who had sustained a TBI and were receiving partial weight-bearing gait training (alternatively called body weight supported treadmill training).

**Exclusion criteria-** Conference proceedings and unpublished data, non-Human studies, alternate diagnosis groups (e.g. spinal cord injury (SCI) or cerebrovascular accident (CVA)), TBI population with co-morbidity of SCI or CVA.

## RESULTS OF SEARCH:

Five relevant studies were located and categorized as shown in Table 1.

*Table 1: Summary of study designs of articles retrieved*

Study Design/ Methodology of Articles Retrieved	Level *	Author , Year	Source of Evidence
Systematic review	1a	Teasell et al., 2007	PEDro
Randomized Controlled Trial	2b	Brown et al, 2005	CINAHL, PEDro
Randomized Controlled Trial	2b	Wilson et al., 2006	OVID Gateway, CINAHL, PEDro, EBM, Medline, PubMed
Case Study	4	Scherer, 2007	CINAHL
Single Case Design	4	Wilson & Swaboda, 2002	OVID Gateway, CINAHL, EBM, Medline, PubMed

\*(Oxford Centre for Evidence –Based Medicine, Levels of Evidence, May 2001)

## BEST EVIDENCE:

The systematic review (Teasell et al., 2007) was identified as the ‘best’ evidence and has been selected for critical appraisal. Reasons for selecting this review were:

- Highest level of evidence of all cited works
- Includes both aforementioned RCTs as part of its review
- Most recent publication

## SUMMARY OF BEST EVIDENCE:

*Table 2: Description and appraisal of-*

Teasell et al. (2007). A systematic review of the rehabilitation of moderate to severe acquired brain injuries. *Brain Injury*, 21(2), 107-112.

**Aim/Objective of the Systematic Review:** The purpose was to review current practices in acquired brain injury (ABI) rehabilitation and aims to achieve the following: (i) identify effective treatment interventions; (ii) identify gaps in the literature deserving further research and; (iii) serve as an accessible tool for clinicians in an effort to encourage improved evidence-based practice.

**Study Design:** Systematic Review

**Search Strategy:** Extensive search of CINAHL, EMBASE, MEDLINE and PsycINFO from 1980-2005 inclusive. Search was limited to studies dealing with rehabilitation and therapy. All experimental and non-experimental designs as well as systematic reviews, meta-analyses and review articles were included. A citation search of selected articles was also performed.

**Eligibility Criteria:** Any reference title that appeared to involve ABI and a treatment was selected and evaluated by two independent reviewers.

**Inclusion and Exclusion Criteria:** Studies where a minimum of 50% of the population met the review's definition of ABI were included. This definition was reported as "damage to the brain that occurs after birth and which is not related to congenital disorders, developmental disabilities, or processes that progressively damage the brain". Studies dealing with mild forms of ABI (as defined by the level of consciousness at the time of the initial assessment) were excluded.

**Data collection and Analysis:** The methodological quality of all selected articles was rated by two blinded, independent reviewers. All RCTs were rated using the PEDro scale (Physiotherapy, Evidence Database, 1999) and the Downs and Black rating scale (Downs & Black, 1998). All other studies were rated using the Downs and Black scale only. The level of evidence was determined for as many articles as possible based on levels of evidence used by the United States Agency for Health Care Policy and Research Guidelines for Stroke Rehabilitation.

**Main Results:** The reviewers chose 303 articles for complete data analysis and determined a level of evidence for 275; 76 of these were RCTs. They drew 177 conclusions for interventional strategies in the rehabilitation of ABI. With respect to partial weight-bearing gait training the researcher cited two RCTs (Brown et al., 2005) (Wilson et al., 2006). The reviewers stated that there is level 1a or strong evidence that "partial body weight supported gait training does not provide any added benefit over conventional gait training in ambulation, mobility or balance". They define strong evidence as two or more RCTs with a PEDro score of 4/10 or higher. With respect to the Functional Ambulation Category, which was the outcome of interest, Brown et al. (2005) reported no significant improvement on this measure overall ( $P = .331$ ) and no significant difference between groups ( $P = .641$ ) as determined by a paired t test and ANCOVA calculation respectively. Using Wilcoxon's test Wilson et al. (2006) also found no statistical significance on the pre and post-difference scores of FAC scores ( $P < 0.922$ ).

**Conclusions:** The results with respect to PWB gait training are reported in response to only two RCTs. While strong in design, the research that has been conducted is not flawless and strongly implies that PWB gait training is more beneficial than conventional gait training at achieving independent ambulation.

### Critical Appraisal

**Validity:** A systematic review offers the highest level of evidence. A PEDro score cannot be determined for this study as it is a systematic review, however for the articles it evaluated related to PWB the PEDro score were as follows: Brown et al., 2005- 5/10 and Wilson et al., 2006- 7/10. For both studies the sample size was small and there was no blinding of the individuals performing the treatment. Due a high level of variability in the recovery pattern of brain injured clients selecting homogenous sample is a frequently cited limitation in this

population. All outcomes chosen (including the outcome in review) were reliable and well validated with appropriate references provided.

**Interpretation of Results:** This systematic review asked very broad questions and thus the original article provided few specific results related to the 177 conclusions that were drawn. An email to the research team was necessary to garner a specific answer to the clinical question of PWB gait training (Aubut, J., personal communication, November 1, 2007). As noted above the research team felt that there exists level 1a or strong evidence that “partial body weight supported gait training does not provide any added benefit over conventional gait training in ambulation, mobility or balance”.

**Summary/Conclusion:** Based on the results of two RCTs of good or fair quality it appears that PWB gait training methods is not more effective than conventional methods. However, it should be noted that both studies acknowledge the limitations in their research including imperfect treatment protocols and small sample sizes.

### **IMPLICATIONS FOR CLINICAL PRACTICE, EDUCATION AND FUTURE RESEARCH:**

- With increasing demands on health care dollars health care professionals are being asked to be more accountable in their use of time and money.
- All stakeholders require strong evidence to support the acquisition and implementation of costly interventions.
- A partial weight-bearing system is a costly piece of equipment for any facility. It also requires a substantial amount of human resources to operate.
- The efficacy of PWB systems has been well documented in the literature in variety of neurological population, namely SCI and CVA.
- The lack of evidence to support its use in the TBI population may be related to the lack of a homogenous sample that was selected, small sample sizes, outcomes measures that were not specific enough to detect change and lack of uniform treatment protocols.
- Future research should be directed to evaluating the specific parameters of a treatment protocol as well as implementing PWB gait training over a longer period of time to larger samples with proper blinding of assessors.

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