

# Gait Training Strategies to Optimize Functional Ambulation in Adults with Chronic Traumatic Brain Injury: A Review of the Evidence

Joy Iris Schoenherr SPT<sup>†</sup> and Fred Carey PT PhD<sup>†</sup>

<sup>†</sup>UNM Department of Orthopaedics and Rehabilitation

## Introduction

Multiple studies have been conducted to establish the best gait training methods within the scope of physical therapy to improve ambulation function for patients with neurological conditions. However, the studies tend not to focus on patients with traumatic brain injuries (TBIs), but, instead those with conditions such as stroke (CV), spinal cord injury (SCI), and Parkinson's Disease (PD). Also, the studies that have included brain injured patients usually are done with acute TBI patients within a rehabilitation setting, not chronic TBI patients in an outpatient setting. Therefore, the purpose of this investigation is to use current literature to determine which gait training methods yield the most functional gains in ambulation for adult patients with chronic TBI.

## Methods

CINAHL, PubMed<sup>®</sup> (MEDLINE), Cochrane, and PEDro databases were searched. Keywords used were various combinations of 'TBI' and: 'Gait', 'ambulation', 'locomotion', 'rehabilitation, and 'physical therapy.' Reference lists of chosen articles were also searched. Inclusion Criteria: Studies conducted between January 2000 and present, subjects with diagnosis of chronic (> 6 months) TBI, and all subjects were age 18 or older when TBI acquired. Exclusion Criteria: No gait/ambulation related outcomes measured, case studies, any studies that included children, studies in which only 1 or 2 chronic TBI patients were included, studies that did not separate out TBI subjects' results from the results of those with other neurological diagnosis.

## Findings

No single gait training intervention within the scope of physical therapy is superior to any other method for this patient population. The various methods of gait training are each good at targeting and improving a specific deficit involved in the activity of gait. Body weight supported treadmill training is best for increasing self-selected velocity

(SSV), and should be done without upper limb support for the most carry over. Robotic assisted treadmill training is best for improving the mobility domain of the Stroke Impact Scale (SIS). Non-aerobic exercise interventions significantly decrease step length asymmetry when compared to over-ground gait training.

## Discussion

Because of the nature of chronic TBI, it is difficult to obtain a large sample size of homogenous subjects to participate in a study. Further research is necessary to gain a solid conclusion as to which gait training methods lead to the most functional gains for chronic TBI patients. Based on the current available evidence, all methods improve overall gait for patients with chronic TBI, while some target more specific areas involved in gait. Therefore, tailoring a gait training program to a specific chronic TBI patient's areas of weakness, and using more than one intervention, will provide the best outcomes. All studies taken together suggest that gait training should be intensive, repetitious, and task oriented.