

**Traumatic Brain Injury**  
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## **Traumatic Brain Injury and Walking**

Traumatic brain injury (TBI) is the leading cause of death and disability amongst adolescents and young adults<sup>1</sup>. Traumatic brain injury generally occurs as a result of a high-velocity impact to the head. In Australia, motor-vehicle accidents and falls are the two most common mechanisms of injury. The nature of the mechanism of injury means that there are often associated orthopedic injuries. Despite many people sustaining extensive orthopedic injuries, it is usually the extent of the injury to the brain that determines a person's overall outcome.

Traumatic brain injury may result in a diverse range of symptoms and severity of symptoms. Cognitive sequelae may include problems with memory, planning, insight, concentration, and problem solving. Fatigue, anxiety, depression and irritability are also common. Physical problems include muscle weakness, poor balance, spasticity, reduced coordination and dexterity, muscle and joint stiffness and difficulty swallowing. Vision, communication, smell and taste are also commonly affected.

Given the diverse and complex nature of TBI, a comprehensive rehabilitation team is required to manage all aspects of a person's care. The rehabilitation team for a person with TBI would typically include a rehabilitation physician, nurse, physiotherapist, occupational therapist, speech pathologist, neuropsychologist or clinical psychologist, and social worker. Dietetic input may also be required in the acute and chronic rehabilitation phases.

Currently, despite intensive rehabilitation, over 75% of survivors of moderate and severe TBI never return to full independence and function<sup>2</sup>. This causes ongoing societal problems and reduced quality of life (QoL)<sup>3</sup>. Considerable clinical investigations have been conducted in relation to treatment of cognitive, communicative, social and behavioural disorders following TBI<sup>4</sup>. Physical impairments and mobility limitations are prevalent, yet there are no evidence-based clinical practice guidelines for managing TBI<sup>5</sup> since limited evidence exists for any physical interventions following TBI<sup>6</sup>.

Many people with TBI have difficulty walking. Early studies suggested that the main reason people with TBI walked slowly related to balance disorders<sup>7-9</sup>. However, recent studies have identified that the main cause of mobility limitations is muscle weakness<sup>10, 11</sup>, and great muscle strength is the key physical factor associated with better patient outcomes<sup>10</sup>. Muscle weakness is implicated in many neurological conditions such as stroke, cerebral palsy and Parkinson's disease. Clinical trials over the past 10 years have been surprisingly ineffective at helping to improve a person's ability to walk. A recent systematic review has found that the most likely reason for this is strength training programs have not been sufficiently targeted to the key muscles responsible for walking<sup>12</sup>.

Strength training programs for people with TBI are promising for improving functional outcomes. However, greater specificity and targeted intervention is required to realise the potential of strengthening programs for people with TBI. Further research is required to determine whether advances in other neurological conditions may be applicable for TBI where some commonality exists. Recent knowledge in neuroplasticity and technological advances also provide potential for optimizing functional outcomes.

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