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Comparison of long-term outcomes following traumatic injury: What is the unique experience for those with brain injury compared with orthopaedic injury?

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ABSTRACT

Objective: Whilst it has been well-demonstrated that traumatic brain injury (TBI) results in long-term cognitive, behavioural and emotional difficulties, less is understood about how these outcomes differ from those following traumatic orthopaedic injury (TOI). The aim of this study was to compare self-reported outcomes at 5–10 years post-injury for those with TBI, TOI, and uninjured controls. It was hypothesised that participants with TBI would have greater cognitive difficulties; participants with TOI and TBI would have similar functional and physical outcomes, both being poorer than controls; and participants with TBI would have poorer psychosocial outcomes than those with TOI.

Participants and methods: Eighty-eight individuals with complicated mild to severe TBI and 96 with TOI recruited during inpatient rehabilitation were followed up 5–10 years post-injury, together with 48 controls followed over a similar period. Self-report measures of global functioning (GOS-E), quality of life (SF-36), psychological wellbeing (SCL-90-R, HADS, PCL-S), psychosocial difficulties (SIP), cognitive difficulties (SF-36 COG), pain (BPI), and fatigue (FSS) were administered.

Results: Outcomes for individuals with TBI and TOI differed significantly from controls, with poorer global functioning, and greater psychological distress and interference from pain. Only participants with TBI reported greater cognitive difficulties and anxiety than controls, and were less likely to be employed or in a relationship. Participants with TBI reported greater anxiety, PTSD, psychological distress and psychosocial difficulties than those with TOI.

Conclusions: Both TOI and TBI cause long-term disability, interference from pain, and psychological distress. However, cognitive impairments, unemployment, lack of long-term relationships, anxiety and PTSD are more substantial long-term problems following TBI. Findings from this study have implications for managing risks associated with these injury groups and tailoring rehabilitation to improve long-term outcomes.

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Introduction

Traumatic brain injury (TBI) is a major cause of death and disability, most commonly resulting from traffic accidents and falls [1,2]. Those injured are more likely to be young and male [1,2]. Studies report that while the majority show relatively good physical and functional recovery, many experience poor psychosocial outcome [3–5]. TBI is associated with long-term cognitive, behavioural and emotional changes that impact work, study, leisure activities, relationships and quality of life (QoL) [4,6–8]. Cognitive and behavioural changes following TBI include difficulties with attention, memory, executive functioning, fatigue and irritability, which may persist 10 or more years post-injury [3,9–11]. High rates of depression, anxiety and posttraumatic stress disorder (PTSD) are seen following TBI [12] and may be evident up to 30 years post-injury [13].

Poor outcomes have also been observed following traumatic injury without brain injury [14–16]. There is evidence that physical recovery following trauma tends to stabilise about 2 years post-injury [16]. However, ongoing difficulties with pain, employment,

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anxiety, depression, PTSD, and relationships are reported [15,17], with a disparity between functional and psychosocial measures [18]. The similarity of symptoms following general traumatic injury with those following TBI has led to the suggestion, especially in the context of mild TBI, that outcomes may be more related to the experience of trauma than brain injury per se [19–21]. Individuals with uncomplicated mild TBI do, however, report more cognitive difficulties in the early post-injury period than trauma controls [22].

Studies to date show outcomes are generally poorer than comparable norms or pre-injury status for both TBI and non-neurological traumatic injury groups. Investigations have varied, however, with respect to the types and severity of injury included. Most TBI studies do not consider the influence of other bodily injuries, and general trauma studies vary in the nature and extent to which they consider brain injuries. It is therefore difficult to identify the specific contribution of TBI, although effects of injury location and presence of comorbidity have been demonstrated [23,24]. Understanding aspects of outcome unique to TBI can be enhanced by comparison with a trauma control group. However, apart from greater cognitive impairment associated with TBI, studies making such comparisons have had mixed findings to date.

Compared with trauma control groups at 1–2 years post-injury, individuals with TBI have been reported as having more symptoms of depression, poorer mental QoL, less work capacity, greater disability, and less likelihood of living independently [25–27]. In contrast, other comparative studies have found no differences in levels of anxiety, depression, or neurobehavioural symptoms [28], and similar patterns of difficulty with emotional and behavioural adjustment [29] and health-related QoL [30]. Little difference in physical symptoms such as physical QoL and pain have been identified between individuals with TBI and trauma controls [26].

Some investigations of PTSD following traumatic injury have shown lower levels of symptoms reported by individuals with moderate or severe TBI relative to those without TBI at 1 [31] and 2 [32] years post-injury. This supports the premise that individuals with more severe TBI are less likely to experience PTSD [33]. However, Williams and colleagues [34] found that PTSD symptomatology was related to degree of insight and external attribution of causality, but not TBI severity. It has also been suggested that impaired self-awareness, which can reduce the likelihood of depression following TBI, may contribute to the lack of differences in depression levels reported by trauma control and TBI groups at 1–2 years post-injury [29,35].

In longer-term cross-sectional studies conducted over 2–4 [36] and 1–5 [37] years, no differences were identified between individuals with TBI and trauma control groups in terms of mental health, anxiety, depression or handicap except for the expected cognitive difficulties associated with TBI. However, predictors of mental health differed between the groups [36], with poor mental health for participants with TBI predicted by being female, lower social support, and self-reported cognitive problems, whilst for those without TBI, pain was the only significant predictor. These differing influences may lead to differences in longer-term outcomes between TBI and trauma control groups as, for example, pain may reduce over time whilst cognitive difficulties may persist.

There has been very limited investigation of long-term outcomes following TBI compared with a trauma control group at 5 years or more post-injury. In a sample of multiple trauma patients at least 10 years post-injury, Steel et al. [38] found that individuals with TBI reported similar physical health, but poorer mental health and more chronic pain than those without TBI. With matched subsets of these groups, greater disability was reported by individuals with TBI, although there were no group differences in pain or physical or mental health [39].

Studies to date have differed in terms of measures, definitions and methodology, including categorisation of TBI, and the extent of comorbid injuries, which may have contributed to the differing findings. Outcome measures may differ in their sensitivity and no previous study has incorporated a wide range of these measures simultaneously. It remains unclear how long-term physical and mental health status following TBI differs from that following traumatic injury – specifically orthopaedic trauma – and from healthy populations. It is possible that, with the stabilisation of orthopaedic recovery, settlement of litigation in individuals with traumatic injury, and growing awareness of persistent cognitive symptoms in individuals with TBI, reported outcomes following TBI and traumatic orthopaedic injury (TOI) may diverge over the longer term.

The aim of the present study was, therefore, to compare self-reported outcomes of QoL, global functioning, psychological wellbeing, physical wellbeing, employment status, relationship status and cognitive difficulties 5–10 years following traumatic injury, for a group with complicated mild or moderate to severe TBI, a group with TOI, and an uninjured control group. It was hypothesised that:

1. Participants with TBI would show greater self-reported cognitive difficulties than those with TOI and the control group;
2. Participants with TBI and TOI would have similar functional and physical outcomes, both being poorer than the control group; and
3. Participants with TBI would have poorer psychosocial outcomes than those with TOI, due to persisting cognitive impairment following TBI.

Methods

Participants

Participants with TBI or TOI had received inpatient rehabilitation at Epworth HealthCare in Melbourne, Australia, in the context of a no-fault accident compensation system providing funding for hospital, medical and rehabilitation costs. During their inpatient stay, they were invited to participate in either the Orthopaedic Trauma Outcome Study or the Longitudinal Head Injury Study. Participants were included if they were aged 16 years or over, and had sufficient English and cognitive abilities to complete the questionnaires. Individuals were excluded if they had sustained spinal cord injuries, major burns, or traumatic amputations. Participants in the TBI group had complicated mild to severe TBI, and were excluded if they had any neurological disorder other than TBI. Participants in the TOI group were excluded if they had sustained a brain injury other than uncomplicated mild TBI (i.e., GCS score of 13–15 on acute hospital admission with no abnormal CT findings). An uninjured control group of similar age, gender and educational background was recruited via contacts of participants with TOI and advertising within the community.

Participants were followed up between March 2010 and October 2012, at approximately 5 or 10 years post-injury for participants with TBI, 10 years post-injury for those with TOI and 10 years since baseline for controls. Eighty-eight participants with TBI (24% of those who initially consented) completed the follow-up, 37 of whom were 10 years post-injury, and 51 of whom were 5 years post-injury. There were no significant differences between the groups of participants with TBI at 5 and 10 years post-injury on any measures other than time post-injury. It was therefore decided to combine all participants with TBI to form a larger single group for subsequent analyses. Follow-up was completed by 96 (29%) of the 330 participants initially recruited with TOI, and 48 (35%) of the initial 139 controls.

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