# Post-concussion symptoms after mild traumatic brain injury in adults: Management of neuropsychological symptoms

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**Background**
Mild traumatic brain injury (mTBI), or concussion, is common in the adult civilian population and is associated with an array of physical, cognitive and affective symptoms. Many individuals recover from these symptoms rapidly and experience a full return to pre-injury work/study and broader life demands. The proportion of individuals who continue to report elevations in symptoms more than 3 months after injury is substantial, however.

**Objective**
This paper aims to provide clinically relevant, evidence-based advice for general practitioners who are treating patients with post-concussion symptoms (PCS).

**Discussion**
Recommendations are provided to assist with management and treatment of the cognitive, psychological distress, fatigue and sleep disturbance aspects of PCS, as well as considerations relating to returning to work.

**APPROXIMATELY** 150,000 individuals experience a mild traumatic brain injury (mTBI) in Australia every year, making it a highly prevalent condition.[1] Although research has often focused on athletes and military personnel, most mTBI arises in civilian contexts and has a comparatively limited evidence base. Routine care is predominantly provided in general practice from the acute through to the post-acute phase.[1] Common causes of civilian adult mTBI include falls and road traffic accidents.[1] Mild TBI is defined as an acute injury resulting from an external mechanical force to the head with one or more of confusion, disorientation or some other neurological symptom; loss of consciousness (LOC) ≤30 minutes; a Glasgow Coma Scale (GCS) score of 13–15; and post-traumatic amnesia (PTA) of less than 24 hours.[2] Recent consensus work has included an additional criterion that neuroimaging evidence of TBI also suffices to diagnose mTBI.[3] A recent consensus publication provides support to general practitioners (GPs) regarding early clinical management decisions.[4]

Post-concussion symptoms (PCS) represent a constellation of physical, affective and cognitive symptoms that commonly develop in the acute period after injury. Physical symptoms are the most varied and comprise symptoms such as headache, dizziness, nausea, noise sensitivity, photophobia and visual disturbance, fatigue and sleep disturbance. Affective symptoms are typically conceptualised as increases in anxiety, frustration, irritability and impatience, becoming more easily angered, and feelings of depression. Finally, cognitive symptoms comprise reduced memory and concentration, slower processing of information and greater difficulty with executive functions such as organisation and multitasking. A commonly used and widely available tool, the Rivermead Post Concussion Symptoms Questionnaire (www.tbi-impact.org/cde/mod_templates/12_F_06_Rivermead.pdf) is useful to measure these symptoms and monitor their resolution.

## Objective

Although many patients with PCS will experience a complete resolution of symptoms in the days and weeks after injury, up to one-third of individuals who present to hospital will report ongoing PCS at least 3–6 months after injury.[5] Conservatively, it has been accepted that any ongoing symptoms at 3 months post-injury can be considered persistent, but some researchers define persistent symptoms as those continuing beyond 4 weeks post-injury.[6] Clinicians are more likely to diagnose persistent PCS (PPCS) earlier than

researchers, with 53% making this diagnosis between 2 weeks and 3 months post-injury, and only 11% delaying diagnosis until after 3 months.[7] This article will outline post-acute management and intervention strategies for PCS that clinical neuropsychologists routinely diagnose, manage and treat after mTBI: return to work/life demands, fatigue and sleep disturbance, cognitive symptoms and psychological distress.

## Discussion

### Management and intervention of neuropsychological post-concussion symptoms

Targeted intervention to treat individual symptoms has been shown to be successful and should be tailored to the type and severity of symptoms.[8] Treatment timing needs to balance a preliminary delay in intensive symptom treatment to allow natural resolution of symptoms in the first days and weeks, with active neuropsychological symptom intervention as time since injury lengthens beyond 2–4 weeks and/or impact of symptoms remains more functionally problematic. In particular, more specialised intervention by 2 weeks post-injury is recommended if an individual's symptoms remain moderate to severe.[4] This intervention time frame may also need to be considered for individuals with ongoing symptoms in the context of higher risk of developing PPCS. These include past or current psychological distress/psychiatric illness, substance abuse, concurrent physical injury, chronic pain, unemployment, litigation and dysfunctional coping styles.[1,4,9] Recently it has been shown that female sex is also a risk factor,[10] which may be due to biological[11] and/or psychosocial factors. Australian women are more likely to be involved in caring roles and undertake more home-based tasks than men.[12] The home-based and unavoidable nature of many these roles and responsibilities may place an earlier physical and cognitive burden on women in the recovery phase after mTBI. This would likely have adverse consequences on their recovery due to a lack of early recuperation time post-injury.

#### When to return to work/life demands

Traditional measures of mTBI severity, such as LOC, GCS or PTA, are not reliable predictors of recovery trajectory.[13–15] In contrast, while fatigue is very common immediately after injury and will typically resolve over time, it can be useful as a tool to assist with calibrating return to pre-injury demands and responsibilities appropriately. If individuals are finishing their days in, or close to, a state of exhaustion (ie moderate-to-severe fatigue), their re-engagement in their pre-injury demands/responsibilities is likely occurring at too rapid a pace.[4] Similarly, mild increases in other symptom frequency or severity as re-engagement progresses is acceptable, but moderate-to-severe increases in symptoms indicate that a more graded return to pre-injury activities is needed.[4]

To facilitate a graded return to pre-injury activities, it is better to spread working hours into smaller chunks over multiple days rather than work a larger block of time on a single day. This is because recovery from fatigue is not a linear process, with relatively more recovery time required as fatigue becomes severe. As recovery continues, return to work can be increased, with ongoing monitoring of fatigue and symptom levels by the patient at the end of the day to ensure this is calibrated to the individual's personal sense of being able to manage vs feeling overwhelmed. It is important that all demands and responsibilities are incorporated into this process of re-engagement. While consideration of return to work and study is essential, carer and family responsibilities as well as social demands are also important factors to consider, particularly for those individuals who have substantial demands/responsibilities in these areas.

Fatigue/symptom monitoring can be conducted with a simple analogue scale where patients note their levels of fatigue/symptom severity out of 100 at strategic timepoints each day. Psychoeducation from GPs that includes reassurance that mild elevations in symptoms as they return to life demands are acceptable and, importantly, do not represent a worsening of their injury is also often needed. Practical 'recovery tips' from the US Centers for Disease Control and Prevention that GPs can give during psychoeducation are provided online (www.cdc.gov/traumatic-brain-injury/media/pdfs/2024/05/recovery_tips_ENG-508.pdf).

#### Fatigue and sleep difficulties

Fatigue and sleep disruption are distinct constructs. Fatigue constitutes a subjective, multidimensional experience that is not necessarily associated with sleepiness.[16] Sleep disruption refers to a disturbance of sleep itself. Fatigue is very common after mTBI, and patients commonly identify it as one of the more disabling PCS; it is also a strong predictor of reduced quality of life after mTBI.[17] Although research is limited, there has been success in improving post-injury fatigue with a program of graded increased physical activity (walking), with improvements persisting after the intervention ceases.[18] Early intervention is not a requirement for this treatment to be successful. If fatigue onset is delayed after mTBI, exclusion of other causes, such as iron deficiency, should be considered.

Due to its contribution to the maintenance of other PCS, persistent sleep disturbance should be considered a high priority focus for intervention, as it has been shown to delay recovery, albeit in elite athlete populations.[19] Psychological interventions such as cognitive behavioural therapy (CBT), psychoeducation and counselling support to improve sleep hygiene have been shown to result in improvement in sleep difficulties, but the quality of the evidence is variable. Light therapy has also had some success.[8,20] Medications such as melatonin, tricyclic antidepressants and trazodone have been recommended as appropriate for use, but only for short-term treatment while behavioural strategies are being implemented. Despite equivalent efficacy, melatonin is preferred to amitriptyline because of its safety and low risk profile.[21,22] Pharmacotherapy dosage should be guided by safety considerations and patient preference, and benzodiazepines are not recommended.[4] Of note, a recent systematic review recommends CBT as the treatment of choice over pharmacological and alternative interventions.[23]

#### Cognitive difficulties

Cognitive symptoms are among the most common and most disabling of PCS. Although there is little relationship between objective cognitive measures and self-reported cognitive symptoms in the post-acute period after mTBI,[24] approximately 20% of individuals will demonstrate objective

cognitive impairment in the post-acute period.[25] Recent research has shown that post-acute neuropathological changes continue to be evident in individuals with mTBI, and some of these changes are associated with cognitive dysfunction in some individuals.[26]

Irrespective of whether cognitive symptoms are reflective of underlying objective cognitive difficulties, it has been shown that treatment of cognitive symptoms with appropriate interventions is effective in the short and long term. Although computer-based 'brain training tasks' do not result in transferable functional improvements, cognitive rehabilitation intervention has been shown to be effective if it is appropriately targeted to the affected cognitive systems.[27] This process includes direct symptom remediation as well as education regarding managing graded return to work/life demands. Given the interaction between cognitive and psychological factors, successful rehabilitation typically involves both psychological and cognitive intervention, and referral to clinical neuropsychology is warranted in individuals who have ongoing cognitive symptoms after mTBI.

### Psychological distress

Anxiety, depression and post-traumatic stress disorder (PTSD) symptoms are the most common psychological distress symptoms that occur after mTBI. The presence of these symptoms (eg worry, fear avoidance) is not only functionally disabling in its own right but is associated with perpetuating PCS more broadly and so should be considered an important factor for intervention.[28] Reduced frustration tolerance and anger management, and increased irritability are also commonly experienced after mTBI and are often the key psychological symptoms of concern for males. In addition to causing difficulties within key personal relationships, these symptoms frequently engender significant guilt for the individual and so are often not reported by the patient without prompting. Direct questioning about these symptoms is therefore commonly needed, and treatment with psychoeducation and relevant behavioural strategies to manage these symptoms until the patient recovers is often beneficial.

A period of emotional distress can be expected for individuals who have had an unanticipated injury that has resulted in widespread and sometimes disabling symptoms. The adjustment to this experience and ability to cope with the symptoms should improve over time. This period of psychological adjustment will vary on the basis of the severity of symptoms being experienced and the functional impact of these symptoms on an individual's life demands as well as pre-morbid factors such as psychological profile and availability of external supports. Consequently, determining when an individual warrants specialist psychological support is a multifactorial decision that should be guided by a holistic understanding of the individual and their circumstances rather than just details of the injury itself. One caveat to this is that individuals who have had an mTBI as a result of assault are 3.5 times more likely to experience elevations in PTSD symptoms than the broader mTBI population[29] and warrant a lower threshold for referral to a clinical psychologist for intervention.

For most adults who have had mTBI, the presence of risk factors for poor outcomes (refer above) would increase the likelihood that the presence of notable current psychological distress warrants treatment and/or referral for psychological intervention. Formal assessment with brief psychological distress screening tools to monitor for change and assess for severity and risk of harm to self or others may also be appropriate. Psychologists or GPs trained in Focussed Psychological Skills (FPS) may be appropriate to treat individuals with isolated psychological distress symptoms. Patients who have a wider range of PCS in addition to their psychological distress may benefit from psychological intervention with a clinical neuropsychologist, as this discipline has particular expertise with the multifactorial nature of mTBI recovery.

Despite its well-established efficacy, many patients are reluctant to engage in psychological therapy. Therefore, GPs play an important part in providing psychoeducation to patients about the practical benefits of CBT for symptom management. Presenting this type of intervention as a temporary, very practically oriented intervention that focuses on symptom resolution can be helpful. Psychological therapies are the mainstay of management of psychological symptoms after mTBI. In most cases, medication including antidepressants and melatonin should only be considered as additional treatment if the patient is clinically depressed or highly anxious with major disruption in their everyday life based on a thorough mental health assessment. Referral to a psychiatrist may be considered if major psychiatric symptoms are present.

## Conclusion

GPs rightly view mTBI as a condition that is typically associated with a relatively rapid resolution of symptoms and a successful return to pre-injury life. The length of time for symptoms to resolve can be variable, with many normally recovering individuals able to trial undertaking their pre-injury activities immediately or within a day, but others needing more than a week off substantial work/life demands before commencing a graded return. For most patients during this initial recovery period, supportive GP counselling including psychoeducation, validation of suffering and reassurance encourages optimism while promoting realistic paced lifestyle adjustments that facilitate eventual recovery and discourage patients from taking on the 'sick role'.

Referral for non-GP specialist intervention needs to be considered in the context of the individual's life circumstances. A patient who has relatively few demands on them, is showing little improvement and has risk factors for PPCS might warrant earlier intervention than an individual who has significant psychosocial demands on them during the early recovery period and is struggling to manage these. The latter individual may benefit more from early brainstorming of ways to temporarily reduce the demands on them to have a better opportunity to make some progress in their recovery before external referral is pursued. At any timepoint post-injury, determining whether to intervene should include consideration of the nature and severity of the symptoms as well as the broader life and/or work demands the patient is operating within, including other medical conditions, neurodevelopmental considerations, age and cultural factors.

## Key points

- Early psychoeducation and symptom treatment for individuals with PCS who are not showing a recovering trajectory within the first few weeks are important.
- Common symptoms include physical (headache, fatigue, sleep disturbance, vestibular and visual disturbance), affective (depression, anxiety and irritability) and cognitive (attention, memory and executive dysfunction) problems.
- Graded return to work/study/activities is recommended and should be calibrated to the patient's recovery stage.
- Significant and persistent psychological distress is a risk factor for PCS and warrants consideration of a mental health plan/psychological therapy, particularly if the injury was due to an assault.
- An individualised biopsychosocial approach is required to manage patient symptoms and concerns comprehensively.

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