

Return to learn after concussion in children

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Abstract

Question Despite recent interest in the pathophysiology and management of concussion in children, as well as the ongoing concern about return to activity, advice regarding the type and length of cognitive rest has been inconsistent. What should I recommend to the children and adolescents in my clinic regarding cognitive rest following mild concussion?

Answer Strict cognitive rest is not needed in those with mild concussion. Evidence suggests a decrease in usual activity to a level that allows children to remain asymptomatic, followed by a gradual return to learning, is appropriate. It is clear that either too little or too much activity is disadvantageous to recovery and can worsen outcomes.

Retour à l'apprentissage après une commotion cérébrale chez l'enfant

Résumé

Question Malgré l'intérêt récent pour la pathophysiologie et la prise en charge des commotions cérébrales chez les enfants, et les préoccupations constantes entourant le retour aux activités, les conseils concernant le type et la durée du repos cognitif demeurent contradictoires. Que devrais-je conseiller aux enfants et aux adolescents de ma clinique concernant le repos cognitif à la suite d'une légère commotion?

Réponse Il n'est pas nécessaire de recommander un repos cognitif strict en cas de commotion légère. Les données probantes font valoir qu'il est approprié de diminuer les activités habituelles à un niveau tel que les enfants demeurent asymptomatiques, puis de reprendre graduellement les activités d'apprentissage. Il est évident que trop ou trop peu d'activités peuvent nuire au rétablissement et aggraver les résultats.

Concussions among children are common and might cause physical, mental, behavioural, and cognitive problems, with as many as 25% of children developing persistent symptoms for several months.¹ Nearly 175 000 children and adolescents are treated annually in emergency departments (EDs) in the United States for sports-related head injuries.² In British Columbia, there were approximately 16 888 ED visits in 2011 alone for concussion, with 40% of them by children and adolescents.³ During the past decade the rate of ED visits by children 8 to 13 years old has doubled, and the diagnosis of concussion has tripled among 14- to 19-year-old adolescents.⁴

The 5th International Conference on Concussion in Sport⁵ defined *concussion* as a brain injury induced by biomechanical forces, with several common features including impairment of neurologic function, possible neuropathologic changes, and a range of clinical signs and symptoms that cannot be otherwise explained.⁵

Medical evaluation can be done in the field or in the clinic using the Standardized Concussion Assessment Tool, 5th edition (SCAT5), in patients 13 years of age and older.⁶ The Child SCAT5 has been developed for use in children 5 to 12 years of age and comprises a parent-based symptom report.⁷ Both tools are designed for assessment of symptoms, balance, concentration,

and memory by a licensed health care professional in the field or in an office.⁵ While not a diagnostic tool, the SCAT5 can aid in clinical decision making.

Cognitive deficit after a head injury

Cognitive functions such as attention, memory, concentration, and reaction time have been shown to be affected soon after concussion, altering school performance and learning.⁸ Animal studies suggest that cognitive and physical activity after concussion redirects highly sought-after glucose away from the brain, thereby slowing its restoration of function.⁹ The neurometabolic cascade that ensues following brain trauma is largely responsible for the subjective symptoms experienced by children.¹⁰ This theory serves as the basis for the general recommendation to limit academic activity shortly after a concussion in order to allow proper recovery and reintegration into school and activities.¹⁰

Prescribing cognitive rest

The extent of cognitive rest needed is currently unclear. Which children should implement a cognitive rest program? For how long? How strict should the cognitive rest be?

Recommendations for cognitive rest include postponement of homework or staggering of tests⁸; rest periods

during school⁸; avoidance of reading, video games, texting, and computer screen time; and for some children in whom it triggers symptoms, no television viewing or school.¹¹ The guiding principle throughout recovery is to try and maintain cognitive activity below the level that triggers symptoms.¹¹

Baker et al examined concussion-related problems in the school setting among student athletes aged 13 to 19 years from Buffalo, NY, and reported that 35 of 91 (38%) students had presenting symptoms, including difficulties paying attention and following directions in class, feeling confused, experiencing light-headedness, and being fatigued.¹² These findings were mostly associated with students who had initial high SCAT scores (severity) and who had greater numbers of symptoms at the initial visit.¹² Scores from the SCAT at the initial clinic visit of those students who reported difficulties with returning to school were higher than scores for those who reported no difficulties after returning to school (23.3 vs 13.5, respectively; maximum score was 132), with the average number of symptoms being 9.5 for those who reported difficulties with returning to school versus 6.2 for those with no difficulties returning to school (maximum number of symptoms was 22).¹² School concerns were not associated with sex, age, or history of previous concussion, which suggests all students should receive return-to-learn instructions, particularly those with high initial scores and total number of symptoms.¹² The initial visit might be an inaccurate representation of the severity of the concussion; children presenting with symptoms at 10 days after concussion are likely to have difficulties in school and might benefit from cognitive rest.¹²

Similarly, Brown et al prospectively followed a cohort of patients aged 8 to 23 years (mean age 15 years) who presented to a sports concussion clinic within 3 weeks of injury.¹³ Symptoms such as headache, drowsiness, irritability, and difficulty concentrating were measured using the Post-Concussion Symptom Scale,¹⁴ and patients were deemed asymptomatic once their symptom score was zero.¹³ Brown et al concluded that those with more severe symptoms at the first clinical visit and those with the highest level of cognitive activity had the longest time to symptom resolution.¹³

How strict should cognitive rest be?

In a 2015 study by Thomas et al,¹⁵ patients from a children's hospital ED who presented with mild concussion were randomized to either a strict cognitive rest approach or to usual care (ie, 1 to 2 days of rest followed by a stepwise return to usual activity). Differences in physical activity levels between the 2 groups were not considerable owing to lack of compliance with the strict regimen; however, those meant to adhere to strict cognitive rest had less mental activity.¹⁵ This group reported more postconcussive symptoms from a 19-symptom Post-Concussion Symptom Scale,¹⁴ which assessed symptoms in 4 domains (ie, physical, cognitive, emotional, and sleep).¹⁵ Those who followed a strict cognitive rest approach had longer time to symptom resolution compared with those who returned to usual activity gradually after 1 to 2 days of cognitive rest (3 days longer for 50% of those in the strict cognitive rest group).¹⁵ Limited school attendance can cause anxiety, and symptoms of depression and anxiety often mimic concussion symptoms,¹⁶ adding to the challenge of determining symptomatology.¹⁶

Buckley et al reported a comparison of postconcussion recovery times between patients who were assigned an average of 40 hours of strict cognitive rest (being withheld from all activity) and those who had no

postinjury accommodations.¹⁰ Participants were included if they had endured a typical concussion (one which had resolved within 1 month), and those with more extensive comorbidity were excluded.¹⁰ After all other factors were controlled for, including initial concussion severity, children who were in the group not assigned to any postinjury accommodations became asymptomatic sooner than those who were assigned strict cognitive rest (mean [SD] of 3.9 [1.9] days vs 5.2 [2.9] days).¹⁰

Majerske and colleagues showed that after varying degrees of concussion, those who participated in moderate levels of activity as opposed to no activity or high levels of activity demonstrated the best outcomes in terms of neurocognitive and symptomatic recovery up to 33 days after concussion.¹⁷ At a sports concussion clinic, the highest level of cognitive activity (top quartile) was associated with the most prolonged course of recovery.¹³ Children with less cognitive activity, in the bottom 3 quartiles, had similar times to recovery, suggesting that complete restriction of activity is likely unnecessary and possibly unfavourable,¹³ as it is associated with anxiety, classroom absenteeism, and a lack of engagement in healthy activities.¹⁶

The most recent International Conference on Concussion in Sport⁵ recommends 24 to 48 hours of both cognitive and physical rest following concussion before beginning the return-to-learn approach.⁵ However, Taubman et al published evidence to support implementation of a return-to-learn approach from the onset of concussion.¹⁸ Children and adolescents aged 11 to 19 who experienced concussion were told to avoid school, homework, and video games but were otherwise allowed to continue normally as long as they remained asymptomatic. In this study, delayed implementation of rest for 1 to 7 days was associated with a 4.6-day prolongation of symptoms on average (mean [SD] of 10.29 [5.83] days for those with immediate cognitive and physical rest vs 14.42 [6.15] days for those with delayed cognitive and physical rest; $P=.005$).¹⁸ By following the prescribed gradual return-to-learn approach from concussion onset, children avoided symptom-provoking activities until they could be accomplished symptom free.¹⁸

Conclusion

In those with mild concussion, strict cognitive rest is not needed, but rather a decrease in usual activity to a level that allows children to remain asymptomatic, followed by a gradual return to learning. It is clear that either too little or too much activity is disadvantageous to recovery and can worsen outcomes. Prospective research is limited and more high-quality studies are needed to determine the ideal recommendations for cognitive rest after concussion. 🌿

Competing interests

None declared

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References

- Varner CE, McLeod S, Nahiddi N, Lougheed RE, Dear TE, Borgundvaag B. Cognitive rest and graduated return to usual activities versus usual care for mild traumatic brain injury: a randomized controlled trial of emergency department discharge instructions. *Acad Emerg Med* 2016;24(1):75-82.
- Centers for Disease Control and Prevention. Nonfatal traumatic brain injuries related to sports and recreation activities among persons aged ≤19 years—United States, 2001–2009. *MMWR Morb Mortal Wkly Rep* 2011;60(39):1337-42.
- Rajabali F, Ibrahimova A, Turcotte K, Babul S. *The burden of concussion in British Columbia*. Vancouver, BC: BC Injury Research and Prevention Unit; 2012. Available from: <http://childhealthbc.ca/sites/default/files/12%2010%20Concussion%20in%20BC%20Report.pdf>. Accessed 2017 Sep 19.
- Halstead ME, Walter KD; Council on Sports Medicine and Fitness. Clinical report—sport-related concussion in children and adolescents. *Pediatrics* 2010;126(3):597-615.
- McCrorry P, Meeuwisse W, Dvorak J, Aubry M, Bailes J, Broglio S, et al. Consensus statement on concussion in sport—the 5th International Conference on Concussion in Sport held in Berlin, October 2016. *Br J Sports Med* 2017;51:838-47.
- Echemendia RJ, Meeuwisse W, McCrorry P, Davis GA, Putukian M, Leddy JJ, et al. The sport concussion assessment tool 5th edition (SCAT5). *Br J Sports Med* 2017;51:851-8.
- Sport concussion assessment tool for children ages 5 to 12 years. *Br J Sports Med* 2017;51:859-61.
- Olympia RP, Ritter JT, Brady J, Bramley H. Return to learning after a concussion and compliance with recommendations for cognitive rest. *Clin J Sport Med* 2016;26(2):115-9.
- Giza CC, Hovda DA. The neurometabolic cascade of concussion. *J Athl Train* 2001;36(3):228-35.
- Buckley TA, Munkasy BA, Clouse BP. Acute cognitive and physical rest may not improve concussion recovery time. *J Head Trauma Rehabil* 2016;31(4):233-41.
- Master CL, Gioia GA, Leddy JJ, Grady MF. Importance of 'return to learn' in pediatric and adolescent concussion. *Pediatr Ann* 2012;41(9):1-6.
- Baker JG, Leddy JJ, Darling SR, Rieger BP, Mashtare TL, Sharma T, et al. Factors associated with problems for adolescents returning to the classroom after sport-related concussion. *Clin Pediatr (Phila)* 2015;54(10):961-8. Epub 2015 Jun 17.
- Brown NJ, Mannix RC, O'Brien MJ, Gostine D, Collins MW, Meehan WP 3rd. Effect of cognitive activity level on duration of post-concussion symptoms. *Pediatrics* 2014;133(2):e299-304. Epub 2014 Jan 6.
- Kontos AP, Elbin RJ, Schatz P, Covassin T, Henry L, Pardini J, et al. A revised factor structure for the post-concussion symptom scale: baseline and post-concussion factors. *Am J Sports Med* 2012;40(10):2375-84. Epub 2012 Aug 16.
- Thomas DG, Apps JN, Hoffmann RG, McCrea M, Hammeke T. Benefits of strict rest after acute concussion: a randomized controlled trial. *Pediatrics* 2015;135(2):213-23. Epub 2015 Jan 5.
- Halstead ME, Brown BE, McAvoy K. Cognitive rest following concussions: rethinking 'cognitive rest.' *Br J Sports Med* 2017;51:141.
- Majerske CW, Mihalik JP, Ren D, Collins MW, Reddy CC, Lovell MR, et al. Concussion in sports: postconcussive activity levels, symptoms, and neurocognitive performance. *J Athl Train* 2008;43(3):265-74.
- Taubman B, Rosen F, McHugh J, Grady MF, Elci OU. The timing of cognitive and physical rest and recovery in concussion. *J Child Neurol* 2016;31(14):1555-60. Epub 2016 Aug 31.



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and Babul are members and Dr Goldman is Director of the PRETx program. The mission of the PRETx program is to promote child health through evidence-based research in therapeutics in pediatric emergency medicine.

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