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BOOK REVIEWS

A Comprehensive Overview of Mild Traumatic Brain Injury in Children and Adolescents

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Mild Traumatic Brain Injury in Children and Adolescents: From Basic Science to Clinical Management, Michael Kirkwood and Keith Owen Yeates (Eds.). 2012. New York: The Guilford Press, 400 pp., $75.00 (HB).

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Mild Traumatic Brain Injury in Children and Adolescents is an essential book for paediatric neuropsychologists and other professionals working with children who experience a mild traumatic brain injury (mTBI). Although mTBI is the most common neurological disorder in childhood it is not yet well understood. Most neuropsychology textbooks contain at most a small portion of a chapter addressing this topic. In contrast, this timely book presents a comprehensive state of the art review of the science and practice of mTBI in children. There is much in this book that is new and interesting and it will provide clinicians and researchers with plenty to think about.

The book gets off to an excellent start with Chapter 1, by Wilde and colleagues who provide a thought provoking historical overview of the science of mTBI, including controversies in the field and a guide to future directions. The key issue in understanding mTBI is that it is not a simple clinical condition. A constant theme throughout the book is that clinicians and scientists should define what they mean when they refer to mTBI. This is particularly the case in children with mTBI. At present the Glasgow Coma Scale (GCS) score is still the most widely used method used for diagnosis of mTBI. However, as is also noted in other chapters in this book, the relationship between GCS and outcome is not straightforward. As Wilde and colleagues point out, there are particular problems obtaining a GCS score in young children. There are also a significant proportion of children with GCS scores of 13–15 who have complications. Therefore, it is important to assess various clinical factors, such as the impact of a skull fracture or the presence of posttraumatic amnesia (PTA).

Although a clear understanding of the different observable clinical factors that may influence outcome of mTBI is desirable there also needs to be a clear science-based understanding of the underlying physical factors that influence outcome. An important determinate is a good understanding of the biomechanics of injury, addressed in an interesting Chapter 3, by Mihalik, on the biomechanics of sports concussion, addressing the interesting question about how some head impacts cause concussion while others do not. The research in this area is in its infancy but an understanding of head injury biomechanics should be key to understanding mTBI. This work is also important for injury prevention in sports and motor vehicle accidents. The work on biomechanics is difficult to research and much work has been conducted using animal models, which is covered in some detail in Chapter 4, by Obenaus and colleagues.

Another very important area in the scientific understanding of mTBI is the biochemical reaction to neurological trauma. Chapter 5, by Babakian and colleagues, on pathophysiological outcomes shows the progress being made in this area. A cascade of biochemical changes occurs in response to brain trauma, affecting the biochemical functioning of neural cells. Understanding how and why this happens will be another key to understanding outcome following mTBI. Chapter 8 on biochemical markers, by Berger and Zuckerbraun, describes how biomarkers from injured cells may provide a test of damage in mTBI. The research is preliminary with only one study of mTBI in adults, and there are clear directions in this chapter for future investigations. Chapter 6 on neurological outcomes, by Davis, draws a useful distinction between complicated and uncomplicated mTBI and includes useful algorithms for decisions about further investigation.

There has also been interesting work on neurobehavioural outcomes over the last two decades that is nicely summarised in Chapter 7, by Yeates and Taylor, that reinforces the point that there are problems in research due to lack of clear definition of mTBI. This is also a problem for the clinician. For example, although group averages might show no clear cognitive difficulties following mTBI, an individual child who has a complicated mTBI might indeed show cognitive difficulties. This chapter highlights important factors that moderate the outcome of mTBI in children, including premorbid cognitive ability and parental and family functioning. Additionally, there is a helpful Chapter 9 on neuroimaging, by Ashwal and colleagues, that provides a good discussion of different imaging techniques and the relation of imaging to outcome. In particular diffusion tensor imaging shows

promise in identifying those children with mTBI who will have adverse outcomes.

The science-based chapters in this book highlight much of the progress that has been made and offers tantalising glimpses into what may be achieved in the future. In contrast, as is often the case, clinical practice seems to be well behind the science. The practice chapters are more basic and mostly do not offer much that is new. Also they don't seem to link to issues raised in the more science-oriented sections of the book.

Chapter 10 about the physical and neurological examination, by Grubenhoff and Provance, whilst helpful as a guide, presents standard conventional medical practice. There is a reliance on GCS in defining mTBI and the chapter doesn't pick up on the issues raised in the preceding science-based chapters. One of the key problems is that many children with mTBI and complications are missed using standard medical approaches.

The neuropsychological assessment Chapter 13, by Bodin and Shay, is very basic and one of the shortest chapters in the book. This is not totally the fault of the authors and it seems that whilst neuroscience has made many advances, the practice of neuropsychological assessment has remained static and is much as it was 20 years ago. This chapter presents a good review of cognitive screening measures and methodological issues. However an important question is how does a clinician faced with a child with mTBI tackle to the issue of neuropsychological assessment? Clinicians need to understand what are the different factors that would guide you to undertake more detailed assessment. Reading the rest of this book will give you some understanding but it would have been nice to have a summary in this chapter. Once a decision to assess is made what tests are best? A clear approach to this issue is found in Chapter 19 on forensic issues at the end of the book, by Donders.

Again, as in the case of neuropsychological assessment, one gets the sense that the practice of rehabilitation of children who have had a mTBI has hardly moved forward as a field. The first line of Chapter 14, by Iverson and colleagues, summarises the problem, "No evidence-based guidelines exist for treatment and rehabilitation services for children and adolescents who are slow to recover following a mild traumatic brain injury (mTBI)". Therefore whilst the science devoted to looking at causal factors in mTBI is developing there is hardly any work looking at intervention outcome. There are some good suggestions in this chapter but it is basic and focuses mainly on the role of rest and physical exercise. Whilst clearly the research in this area is limited the science as discussed in other chapters in the book gives some clues as to areas that may be helpful in rehabilitation. The Yeates and Taylor chapter, for example, highlights some of the important factors determining outcome. One would have thought that addressing some of these such as family functioning should be a goal in rehabilitation in order to optimise outcome. Also there are interventions such as behavioural management, cognitive training and cognitive behavioural therapy which are not discussed. The conclusion from reading this chapter is that child neuropsychological rehabilitation is still a very poorly understood field.

Chapter 16 on school based management, by Kirk and colleagues, focuses on re-entry to school. There is a review of guidelines for re-entry to schools in the United States, which is not helpful for an international audience. There is little information about how to help children once they are back in school.

There are some interesting developments in intervention described in Chapter 11 on balance testing, by Valovich McLeod and Guskiewicz, which is an increasingly recognised area of practice. Also, in terms of assessment, Janusz and colleagues in Chapter 12 discuss postconcussion symptom assessment, with reviews of various scales available and highlighting good measures for children.

The final section of the book addresses specific topics including sport-related concussion, by Kirkwood and colleagues which whilst interesting is more of an issue in North American schools with football and ice hockey. There are also chapters on injury in preschool children, by McKinlay, and forensic considerations, by Donders, both of which are well written and interesting.

Although overall the book is comprehensive there are a couple of omissions I would have liked to see discussed. There is no discussion of mTBI and criminal behaviour, which is an increasing topic in the research literature and government policy. Also I would like to have seen a discussion on Post Traumatic Stress Disorder and mTBI. The two conditions frequently co-occur in motor vehicle accidents, assaults, and in the military. There are likely psychological and neurobiological interactions between mTBI and trauma, which are important to consider in clinical assessment and rehabilitation.

In conclusion, *Mild Traumatic Brain injury in Children and Adolescents* is an important book for paediatric neuropsychology. It presents a comprehensive review of the science of mTBI, which is advancing quickly. The Editors have done a good job of finding a number of excellent contributors. The chapters are mainly easy to read and informative. The clinical practice chapters are disappointing compared to the science-based chapters and the clinician will have to draw their own links between the emerging science and practice. I look forward to the next edition when hopefully the practice side will have progressed.