

BOOK REVIEWS

Why Should We Care About “Fluent Aphasia?” The Importance of Studying Connected Speech in Aphasiology

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Fluent Aphasia, by Susan Edwards. 2006. New York: Cambridge University Press. 230 pp., \$75.00 (HB).

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The 21st-century aphasiologist may be surprised to find a new book with such a title as *Fluent Aphasia*. Three decades of cognitive neuropsychology advances would seem sufficient to relegate a fuzzy concept like “fluent aphasia” as a relic of the past, or, at best, restrict it to the realm of shorthand descriptions meant to facilitate daily communication among clinicians. Even among those accustomed to strict collaboration, a concept like “fluent aphasia” may cause misunderstanding. I personally learned about aphasia directly from the Boston school. Yet, when I speak with my Italian colleagues from Milan, whom I have known for most of my professional life, and with whom I have written quite a few papers on aphasia, I am often unsure about what they mean when they label an aphasic patient as “fluent.” I still remember Harold Goodglass telling me, in almost the same words Susan Edwards quotes from him, how “fluency is best rated in terms of the *longest occasional uninterrupted strings* of words that are produced.” My own understanding of his teaching included the concept that the presence of phonetic problems and/or abnormal articulation effort was not so essential in drawing the fluency-non fluency distinction: according to his rule of thumb, fluent aphasia should be diagnosed when a patient can produce at least *five connected words*. This rule derived from observations made in Goodglass, Quadfasel, and Timberlake’s (1964) study on phrase length and type of aphasia, whereby it was shown that aphasics can be dichotomized on the basis of the number of words that they can typically utter as an uninterrupted string. Edwards reports that other people entertain different beliefs about what is fluent aphasia. Surely several, heterogeneous criteria such as phrase length, verbal agility, melodic line, amount of articulation effort, and grammatical form are differently weighted by different aphasiologists as they consider their diagnosis.

This said, for what is a diagnosis of fluent aphasia ultimately meant? To this simple question I could not find an explicit answer anywhere in this book. In other words, we

are never told exactly for what reason, beyond wanting to indicate with a general term all conditions resembling the classic categories of Wernicke, conduction, anomic and transcortical sensory aphasia (and not global, Broca’s or transcortical motor), an aphasiologist should take some pain in setting more or less rigid criteria for isolating fluent aphasia as a concept. This is not exclusively Edwards’s fault, since nowhere else can I find an answer to this question. Yet, numerous aphasiologists intuitively, it seems, find the concept useful. In my own experience, I always found Goodglass’s rule helpful in telling me something about the lesion and the prognosis: if, no matter how bad the articulation is, an acute patient can produce, within a reasonably long conversation or piece of narrative, five grammatically connected words, then the bulk of the lesion is not likely to be in Broca’s area but would be somehow more posterior. In the presence of articulation problems, I would regard this condition more likely to evolve in a positive way. But I cannot now easily locate these notions in Goodglass’s writings, and they may not have come from him but from my doubtful memory. This is just an example of how, based more upon intuition and oral transmission rather than upon secure empirical and theoretical grounds, the notion of fluent aphasia may serve, rather idiosyncratically, different purposes for individual aphasiologists. Then why, with this degree of variability and arbitrariness, should one care about “fluent aphasia” at all?

Susan Edwards takes a theoretically oriented clinician’s approach, and in so doing, manages to convince the reader that, indeed, the notion of fluent aphasia is currently useful and may have a future. I think she succeeds in her intent insofar she shows how much there is to be gained in studying aphasics’ connected speech. She starts, in fact, with the provoking statement that “fluent aphasia is . . . commonly seen in clinics but (about it) . . . little is written (p. 1).” One understands to what extent she is right as soon as she makes clear that she considers drawing on connected speech data

the pivotal means of obtaining new and important information on aphasia. The best part of the book is indeed that portion devoted to connected speech, and it may be true that studies of connected speech are much less numerous for fluent aphasia categories compared to those available for non-fluent categories.

In the first chapter she tries to identify fluent aphasia as a self-standing concept from Wernicke's time onward. Due consideration, here as well as very often throughout the whole book, is paid to the work of Goodglass and of the Boston school. Notably, however, no mention is made of the work of Norman Geschwind, of his revival of the old aphasiology masters, and of the anatomically based interpretative framework that so heavily influenced thinking at the Boston V.A. Aphasia Research Center and elsewhere. Indeed, according to Goodglass (1993, p. 33), it is Geschwind who deserves credit for introducing the terms "fluent" and "non-fluent" to designate the two major subtypes of aphasic syndromes. Nevertheless Geschwind is mentioned, *en passant*, only later in Chapter 3, whereby his contribution to the concept of fluent aphasia is briefly acknowledged, and, oddly, Goodglass is said to have been his student (sic). Other 20th-century descriptions of fluent aphasia are reported, overwhelmingly within the Anglo-Saxon tradition, whereas important contributions from the Russian, the French, the German, and the Italian schools do not receive much mention. This is the author's choice and a comprehensive review of available literature on fluent aphasia is clearly not within the scope of this book. Issues including the utility of syndromes, the syndrome-lesion site relationship and converging evidence brought about by studies with normal subjects complete the chapter.

The second chapter describes fluent aphasia in the context of the most popular psycholinguistic models, whereby the origin of the most distinctive errors made by fluent aphasics is located. A description of such errors is provided with examples and with a long discussion of how lexical problems may interfere with grammatical problems in producing the characteristic pattern of fluent aphasic speech. Chapter 3 is devoted to assessment and contains a critical description of most commonly used aphasia batteries. It also contains an updated description of several diagnostic instruments recently developed for assessing aphasia within theoretically driven research projects. A final note warns the reader about several limitations of aphasia assessments as clinical and as research tools.

The book enters its most interesting and original part with Chapter 4. Anybody wanting to study connected speech in aphasia could profitably start by reading this chapter. Ways of collecting representative samples, their strengths and weaknesses, and problems in qualitative as well as quantitative analysis of data are thoroughly reported. As Edwards notes, different perspectives yield different interpretations. Examples are provided of how recently developed, sophisticated coding schemes can capture interesting, revealing details about disorders of sentence structure when applied to fluent aphasic production. In Chapter 5, Edwards leads

the reader to consider current debates over the nature of production and comprehension problems in agrammatism. In doing so she manages to render palatable and balanced descriptions of theoretical stances that have been furiously challenged in recent years. While agrammatism is most often, but not necessarily, associated with non-fluent aphasia, this discussion is justified in the context of this book since findings in fluent aphasia have been frequently used as a meaningful contrast.

Comprehension problems in fluent aphasia, remarkably more severe and frequent (but how different in quality?) than in non-fluent, non-global varieties, are described in Chapter 6. Clinical phenomena are reported along with their interpretation since Wernicke's time. The contribution of non-linguistic factors to comprehension deficits is also discussed. Comprehension at the single word level and comprehension of sentences has been found to be influenced by various factors like argument structure and movement that are generally ignored in clinical reports, but, Edwards shows, have increasingly captured researchers' attention for the last two decades. Chapter 7 reports a single paradigmatic case of fluent aphasia, underlining the fact that no linguistic dimension may be considered unimpaired. Concluding remarks and some interesting afterthought constitute the bulk of the last chapter.

This book may be in many ways a useful one. It is not omni-comprehensive, in that it does not review, as the potential customer may be led into believing, all issues concerned with fluent aphasia. For example, it ignores, as mentioned earlier, very significant contributions from non-Anglo-Saxon literature. Also, while phonological disturbances are described, the account of research on segmental and supra-segmental phonology in fluent aphasia is kept to a minimum with respect to the generous spaces allotted to lexical and grammatical aspects. This is to some extent surprising, since phonological disturbances may interact in non-obvious ways with the production of fluent aphasic speech. Moreover, the study of phonologically related phenomena like, for example, hesitations has been used to draw inferences on the nature of lexical and grammatical disorders in fluent aphasia. However, this book comes forth with a very strong message: studies of connected speech will make the future of aphasiology. Edwards lays down for the reader, in a relatively simple way, the theoretical ground for further, effective, studies of lexical and grammatical aspects of connected speech in fluent aphasia. And, in dealing with both the productive as well as the receptive side, she provides abundant indications of ways to exploit the outcome of such investigations in an interesting way.

A few remarks on readability and ideal readership must be added as a conclusion. The vivid and occasionally colloquial style does not in itself make this book easy to read. The intent to discuss clinical phenomena and theoretical and research issues on the same time accounts for some difficulty in keeping the thread of several arguments. For this reason I would hesitate in recommending this book to beginners, maybe with an exception for one or two chapters

(notably Chapter 3). I recommend it to any expert neuropsychologist wanting to start exploring connected speech in aphasia and to linguists and psycholinguists curious about where aphasiology is nowadays on several issues within their respective interests. They should, however, be aware that there is much more recent and interesting material about aphasia than they can learn from this book. Finally, the expert 21st-century aphasiologist will find in Edwards's book plenty of hidden and less hidden inspirational tips for very

interesting research. Reviving the concept of fluent aphasia may not have been, indeed, a waste of time.

REFERENCES

- Goodglass, H. (1993). *Understanding aphasia*. San Diego: Academic Press.
- Goodglass, H., Quadfasel, F., and Timberlake, W. (1964). Phrase length and the type and severity of aphasia. *Cortex*, *1*, 133–153.

Mental Retardation: Is It in the Genes?

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Mental Retardation and Developmental Delay: Genetic and Epigenetic Factors, by Moyra Smith. 2006. New York: Oxford University Press, 344 pp., \$49.95 (HB).

Reviewed by LYNN BENNETT BLACKBURN, PH.D., *St. Louis Children's Hospital, St. Louis, MO*.

Most of us have had the experience of evaluating a child who looks just like other children, whose MRI scan is read as normal, and whose test performance results in a diagnosis of mental retardation. Such children cause us to ponder the question, "How can a brain look so normal, yet work so abnormally?" As the results are presented, parents ponder a different question. They want to know why this has happened to their child. What makes the question a hard one to respond to is that we ask ourselves the same question but often do not have an answer. The neuropsychological conceptualization of mental retardation starts with skill patterns and works backwards through neural networks looking for cause. *Mental Retardation and Developmental Delay: Genetic and Epigenetic Factors* begins with the inner workings of the cell, examining genes, gene products, and cell metabolism as the basis for the observed disruption of learning and memory.

Following the provision of an historic perspective (Chapter 1), Dr. Smith moves into an overview of brain development and neurotransmitters (Chapter 2). The reader is taken from territory familiar to the neuropsychologist up to the cell wall. From this point on, the reader enters into the inner workings of the cell systems and individual cells, through a discussion of the impact of gene defects on cell migration, gene transcription factors and cell metabolism. As Chapter 2 ends, the reader is rapidly introduced to a large number of abbreviations for gene products and proteins. Without a recent course in cell biology to serve as a context for this information, the discussion that follows places high demands on working memory to track the referents of these abbreviations.

In the chapters that follow, Dr. Smith provides a comprehensive review of disorders in which mental retardation is a core feature. Attempts are made to group disorders by the presumed mechanism underlying the retardation. Underlying mechanisms range from structural defects to disorders

of metabolism and are linked to current knowledge regarding responsible chromosomes, genes, and/or gene products. The organization of this information differs depending on the disorder under discussion. Chapter 3 reviews syndromes that result in major malformations of the neural tube or cortex. The reader is introduced to the role of specific genes and gene products in normal and abnormal cell migration. This material provides a context for understanding what has gone wrong in the disorders that are subsequently described.

In Chapter 4, most of the disorders discussed are associated with dysmorphic features and an identified chromosomal abnormality. The syndrome is described first in terms of presenting features followed by a description of the chromosomal abnormality. Unlike the disorders in Chapter 3, the mechanism by which the chromosome abnormality results in the presenting features of the syndrome remains unknown for many of these disorders. This chapter provides a fascinating look at familiar and rare syndromes from another perspective. Chapter 4 ends with a brief description of Fetal Alcohol Syndrome (FAS). This appears to have been included to complete a comprehensive look at retardation syndromes associated with dysmorphic features, although it clearly deviates from the book's basic theme.

The majority of Chapters 5 and 6 focus on inborn errors in metabolism, many of which can be treated through dietary adjustment. If untreated, the disorders typically result in mental retardation. Disorders in Chapter 5 are primarily associated with failures to develop normal cognition while disorders in Chapter 6 involve a period of normal development followed by skill loss (i.e. neurodegenerative disorders). The dietary treatments that significantly alter cognitive outcome for many of the disorders discussed in Chapter 5 are further described in Chapter 10. For some disorders in Chapter 6, treatments such as bone marrow transplantation are effective in halting the degenerative process. Whereas

the majority of Chapters 5 and 6 focus on metabolic disorders, each chapter also contains information about other conditions. Chapter 5 includes epilepsy syndromes accompanied by mental retardation for which a genetic cause has been identified, genetic disorders in which sensory impairment or movement disorder accompanies the mental retardation, and muscular dystrophy. The depiction of cognitive outcome for epilepsy and muscular dystrophy is oversimplified, failing to capture the variability evident in clinical practice. In Chapter 6, there is a brief discussion of environmental toxins as a cause of retardation following a period of normal cognitive development. As for information provided on FAS, the treatment of these disorders is superficial.

Chapter 7 begins with content strongly linked to the book's main theme (e.g., non-syndromic X-linked mental retardation), and progresses with discussions of disorders potentially having a genetic basis (autism, developmental language disorders). These discussions provide the reader with an overview of the process of discovery (i.e., the work that may lead to the detailed information available for earlier discussed disorders).

The final three chapters address the larger picture, in terms of understanding genetic research, in diagnosing mental retardation, and in treatment of mental retardation. In Chapter 8, Dr. Smith examines both the relationship of the human genome project to advances in identification of target genes for disorders and current understanding of how a gene or gene sequence may impact function. In my opinion, this chapter's content would have been helpful to build a context upon which readers could base their understanding of the data presented in Chapters 3 through 7. Chapter 9 includes a discussion of the diagnosis of mental retardation from the physician's perspective. Whereas the chart listing "Formal Tests of Development and Cognition" seems inadequate when reviewed by a neuropsychologist, the overall

thought process underlying recommendations for history, physical exam, and sequencing of diagnostic procedures is excellent. In addition to information on treatments for some metabolic syndromes, Chapter 10 describes new methods being developed for early identification of metabolic disorders. This information rounds out the diagnostic process presented in Chapter 9.

Overall, this book will provide a challenging cover-to-cover read for neuropsychologists not actively involved in genetics research or well versed in cell biology. The author's assumptions regarding the knowledge of the reader varies widely, from providing basic information (e.g. males have an X and Y chromosome) to the use of terms or abbreviations before giving their definition. The organization of the material is also somewhat challenging, with a single disorder discussed in more than one chapter, requiring a multi-chapter scan to obtain the complete picture.

Mental Retardation and Developmental Delay: Genetic and Epigenetic Factors will make a good addition to the reference materials in a pediatric neuropsychology laboratory. The book achieves the author's goal of broadening the reader's view of mental retardation by emphasizing the richness in the variety of presentation, developmental course, and underlying pathology that results in impaired cognitive development. The book reinforces the importance of a thorough family history, as well as the importance of looking carefully for abnormalities of facial features, hair distribution, and stature to uncover clues that may lead to syndrome identification. When children come with a syndrome diagnosis, the book provides the cell level picture of the cause. Whereas information may still be missing to bridge the gap between the cell level dysfunction and the resulting cognitive profile, it does provide one more piece to consider in solving the puzzle of the normal MRI scan and abnormal neuropsychological test results.

Progress in Sports Neuropsychology

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Sports Neuropsychology: Assessment and Management of Traumatic Brain Injury. Ruben J. Echemendía (Ed.). 2006. New York: The Guilford Press, 324 pp., \$45.00 (HB).

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Sports Neuropsychology: Assessment and Management of Traumatic Brain Injury, edited by Ruben J. Echemendía, brings together a variety of experts in the area of sports concussion, in an effort to introduce psychologists and neuropsychologists to the rapidly developing area of sports neuropsychology. The book is organized into five parts. Part I, *Sports Neuropsychology in Context*, outlines the historical context for the development of sports neuropsychology as a professional endeavor. Chapter 1 (Barth, Broshek, and

Freeman), introduces the readers to a number of important definitions that are used throughout the book, including concussion, post-concussion syndrome, second-impact syndrome, and the system of grading concussion severity. Importantly, Barth, a pioneer in the study of sports-related concussion, describes his early efforts at the University of Virginia using pre- and posttrauma assessment with the Sports as a Laboratory Assessment Model (SLAM)—a method of examining concussion in a controlled environ-

ment, which has become a standard for current practice. Chapter 2 (Zillmer, Schneider, Tinker, and Kamineris) provides a fascinating historical account of sports-related injuries, dating from the 8th century B.C. (ancient Olympic games) to the present. Their account chronicles the medical and behavioral assessment of head trauma (beginning with Hippocrates, who wrote extensively about head injury), to the modern-day three-tiered grading system introduced by Cantu (1986) and the American Academy of Neurology (1997), and provides a unique perspective on how neuropsychologists have come to play such a critical role in sports medicine. Chapter 3 (Echemendía) takes on the important task of highlighting the potential pitfalls inherent in consulting with athletes, including those at the collegiate and professional levels. Echemendía directly confronts the different “rules” associated with athletic consultation (e.g., flexibility of scheduling, dealing with the media) and challenges psychologists to examine their motivation for pursuing this type of specialty practice (i.e., the need to be around “celebrities”). The chapter even describes the down side of sports neuropsychology practice, including not being treated with the same level of professional respect that they are accustomed to receiving from their clients.

Part 2, *Concussion Assessment and Management*, outlines the state of practice in concussion management. Chapter 4 (Webbe) addresses in greater detail the definition of concussion, including physiology and severity grading. This is a valuable chapter, which can potentially be a useful teaching tool outside the area of sports neuropsychology. Webbe reviews the historical literature on potential mechanisms of injury, including biomechanics (linear and rotational force) and pathophysiological theories (including vascular, reticular, pontine cholinergic and convulsive theories). He then addresses our current understanding of the physiology of injury in concussion including changes in cerebral blood flow, ion flux (neurotoxicity), glucose hypometabolism, electrical changes, and mitochondrial swelling. The chapter concludes with a review of injury caused by physical force, with a recommendation (based on animal studies) that an injury with peak accelerative force of 200 g should be considered a threshold for single impact to cause “significant brain injury” in humans. In Chapter 5 (Macciocci) the extent and epidemiology of sports concussion is delineated in greater detail, including the challenges associated with variable terminology used in epidemiological research. Much of the initial section of this chapter repeats information presented earlier in the book. The chapter contains specific sections on incidence of injury in football, soccer, hockey, and a combined section on baseball, lacrosse, basketball, and wrestling; however, interestingly, there is no mention of other popular sports with high likelihood of concussion, including skiing/snowboarding, boxing, gymnastics/cheerleading, and “extreme” sports (e.g., skateboarding, BMX biking, motocross). Chapter 6 (Barr) addresses components of sideline assessment of concussion and specific procedures (including review of history, orientation, concentration and memory tests, and motor/gait/

balance assessment) that are used in making return to play decisions. The chapter makes several crucial observations. First, it is the athletic trainer and team physician who typically make sideline assessments—not neuropsychologists. Secondly, sideline assessment requires great caution, especially because of the non-ideal (i.e., noisy) setting for assessment, the incidence of pre-existing learning disorders/ADHD among athletes, and base rates of proficiency on tests of attention (e.g., he cites a study in which only 50% of healthy high school athletes could accurately perform serial seven subtractions). Chapter 7 (Echemendía) introduces the reader to the complex, dynamic, decision-making process regarding return-to-play. The neuropsychologist frequently has a significant role in the process although it is usually the team physician or athletic trainer making the final decision. A very useful element of this chapter is the diagram of Echemendía’s return to play model (p. 122), which includes: medical factors, neuropsychological data, concussion factors, player factors (e.g., age, personality, style of play), team factors (elite vs. recreational), and extraneous factors (e.g., playing surface, field condition).

Sports concussion is a public health concern, and management occurs at all age levels. Part 3, *Testing Programs*, outlines concussion management programs for school age, high school, college, and professional athletes. In Chapter 8, Brooks reports that 30 million children and adolescents participate in out-of-school sports programs in the United States each year. As such, she emphasizes general surveillance and preventative education. Pardini and Collins (Chapter 9) address the unique challenges of concussion management in high schools. They provide useful, “high school relevant” methods for on-field screening, and raise the important issue of estimating an athlete’s pre-injury cognitive ability using available data (level of coursework, grade point average, SAT scores). Three case studies are provided, although it is not clear whether these are actual cases, or composites used to illustrate points in the chapter. In Chapter 10 (Schatz and Covassin), the challenges of concussion management in college are described. This chapter also reviews general issues in concussion that are described earlier in the book, but is particularly useful for psychologists who have never worked with athletes in the college setting. One important point emphasized in the chapter is the variability in approach, depending on sport (e.g., football vs. lacrosse), or depending on size and scope of the athletic programs (e.g., Division I vs. Division III). Part 3 concludes with the section on working with professional athletes by Mark Lovell (Chapter 11). Lovell highlights two decades of experience working with professional football and hockey teams to this chapter, and addresses the role of neuropsychology not just in working with individual players but also in developing guidelines for prevention. The unique challenges of working with professional athletes are discussed, including athletes’ minimizing of symptoms, the potentially opposing priorities of coaches, and the prevalence of athletes for whom English is not a primary language.

Within professional neuropsychology, concussion management is unique because of the need for brief, serial assessments. As a result, computerized neuropsychological assessments have become standard for larger scale concussion management programs. They are cost-effective, can usually be administered in 30 minutes or less by personnel other than neuropsychologists, and they were designed to be used repeatedly and to be sensitive to subtle changes in cognitive skills relevant to concussion. Each of the chapters in Part 4, *Computerized Testing Batteries*, outlines programs used in concussion management today, including ImPACT Neuropsychological Test Battery (Chapter 12), HeadMinder Concussion Resolution Index (Chapter 13), CogSport (Chapter 14), and the Automated Neuropsychological Assessment Metrics (ANAM; Chapter 15) developed by the United States Department of Defense (DoD). Three of these four computerized batteries are commercially available (ImPACT, HeadMinder, and CogSport), and one or more of their developers wrote the respective chapters. The ANAM is owned by the DoD and is available free of charge. This section is essential to the book, because it provides an in-depth overview of each of the computerized programs. Unfortunately, the reader is left to compare and contrast the utility of each program since no real attempt is made to draw conclusions about the populations who would be best served by each tool. Each battery certainly has its own unique strengths. ImPACT (Chapter 12, Lovell) incorporates a symptom rating scale with performance-based testing; HeadMinder (Chapter 13, Kaushik and Erlanger) is Internet based; CogSport (Chapter 14, Collie et al.) uses familiar playing cards as stimuli, minimizing language demands; and, ANAM (Chapter 15, Bleiberg, Cernich, and Reeves) has the added benefit of cost efficiency. The computerized model is one that can potentially be adapted for use in other areas of neuropsychology (e.g., response to medication or behavioral treatments). Nevertheless, after reading these four chapters, there are two issues that need to be better resolved. First, all four computerized batteries have reported test-retest reliability coefficients averaging around .70. Using regression or reliable change index (RCI) methodology, relatively large standard score changes would be required to be declared “significant” or “statistically rare,” given this level of reliability. Secondly, all four programs rely on timing mechanisms of individual computers (sometimes down to 100 msec intervals and below) in measuring change scores. None of the authors address the potential variability in scores due to the *between-computer* differences in millisecond timing that should be considered (Schatz & Browndyke, 2002).

The book concludes with Part 5, *Views From Within the Sports Medicine Team*, which includes a chapter by an athletic trainer (Furtado, Chapter 16), and a team physician (Putukian, Chapter 17). These chapters are an important addition to the book. They emphasize the interdisciplinary nature of concussion management and delineate the background and training of the other professionals involved in working with athletes. Athletic trainers and team physicians often work as an integrated unit. Knowing this professional landscape is

crucial to the neuropsychologist aspiring to work in sports concussion management. Chapter 17 concludes with three case studies that illustrate (from the team physician’s perspective) the added benefit of neuropsychological assessment over and above sideline screening and initial physical assessment, showing how return-to-play decisions rely on more than initial presentation of symptoms.

I recommend *Sports Neuropsychology: Assessment and Management of Traumatic Brain Injury* as a starting point for neuropsychologists interested in potentially subspecializing in sports concussion management. The book is also potentially useful for professionals in other fields (athletic trainers, physical therapy, sports medicine) who deal regularly with concussion management. The rapidly developing area of sports neuropsychology is evolving, and this text represents a good overview of the field. Nevertheless, to quote Barth and colleagues from Chapter 1; “Twenty years of scientific inquiry in this area have only begun to scratch the surface in our attempt to understand sports concussion and identify interventions to reduce morbidity associated with these injuries” (p. 7). Clearly there is much to learn about the role of neuropsychology in concussion management. The problems with computerized assessment of sports concussion are, in many ways, the same problems associated with neuropsychological testing in general (normative data, limited reliability, mixed results in validity studies). In general, the book addresses the limitations of computerized neuropsychological assessment batteries in a straightforward manner; however, continued development of tests with higher reliability is necessary along with a greater emphasis on validation of these instruments. Widespread use of baseline testing is potentially costly. Most cognitive symptoms associated with concussions that are detected by computerized assessment remit around the same time as self-report of symptoms. Thus, as neuropsychologists, we will need to continue to justify the “value added” by these comprehensive assessment programs, over and above careful screening programs by athletic trainers and physicians (Randolph, McCrea, & Barr, 2005). Finally, as mentioned in several chapters, the role of the neuropsychologist in concussion management should go beyond testing and include education and reassurance regarding recovery, and assessment of psychosocial factors that could complicate recovery.

REFERENCES

- American Academy of Neurology (1997). Practice parameter: The management of concussion in sports (summary statement). *Neurology*, *48*(3, Pt. 2), 581–585.
- Cantu, R.C. (1986). Guidelines for return to contact sports after a cerebral concussion. *The Physician and Sports Medicine*, *14*, 75–83.
- Schatz, P. & Browndyke, J. (2002). Applications of computer-based neuropsychological assessment. *Journal of Head Trauma Rehabilitation*, *17*, 395–410.
- Randolph, C., McCrea, M., & Barr, W.B. (2005). Is neuropsychological testing useful in the management of sports-related concussion? *Journal of Athletic Training*, *40*, 136–151.