

PREFACE

As the mud kicked up from the moist earth clung within his cleats, the pulse of his breath setting the rate of his stride, the distance between him and the goal narrowed. Hugging the sideline he kept pace looking towards the center to find aid, he stepped back and released. The rotation of his body contorting his spine sent radiating pains pulsing throughout his limbs. Collapsing, cushioned only by the soft earth, he fell to his knees reeling in pain. The game, though far from over, was now finished for him. Making his way to the sideline, the physical pain dulled by the psychological wounds, he braved through the torment. Unfortunately, the events of this day will haunt the memories of a once fearless athlete for a lifetime...

Injury is an unfortunate risk that is still an unavoidable part of athletics today. Over the past decade, the scientific information on athletic injury in general, and integrative models of injury rehabilitation in particular, has increased considerably. As an example, a database search of peer-review articles from Medline, *SportDiscus* and *PsycInfo* between 1970 and 2006, using a variety of search items and combinations of terms (e.g., “return to sport,” “psychology of athletic injury,” “sport injury”) returned more than 2,000 sport injury articles. Using the search engine *PubMed* (National Library of Medicine) for the term “*psychology of injury*” there were 1,990 articles available between the years 1994-2005, compared to 930 for the years 1966-1993. In recent years, a number of models, theories and hypotheses describing the physical, biological, behavioral, cognitive and affective aspects interactively influencing the healing process have been developed. The feasibility of these models, although in most cases contradictory, has been overall justified in a clinical setting. That said, despite dramatic advances in the physical education of coaches, the fields of medicine, athletic training and physical therapy, sport-related traumatic injuries is our major concern. It is a matter of fact that athletic injuries, both single and multiple, have a tendency to grow dramatically. Accordingly, the prediction, prevention, and, if possible, reduction of sport-related injuries are among the major challenges facing the sports medicine world, research and clinical community to-date.

The purpose of this book is to accumulate the latest developments in science of athletes’ training from “injury-free” perspectives, along with psychological analyses, evaluation, and management of sport-related injuries, including traumatic brain injuries. It is this author’s attempt to classify athletic injury with respect to its underlying causes and consequences. Clearly we are still far from a complete understanding of the major causes and multimodal consequences of sport-related injuries. The ***clinical significance*** of research into sport-related injuries stems from the fact that the number and severity of injuries in athletes have a tendency to

grow exponentially, despite advances in coaching techniques, and technological advances in sports equipment and protective devices. For example, it has been estimated that just in high school football alone, there are more than 250,000 incidents of mild traumatic brain injury each season, which translates into approximately 20% of all boys who participate in this sport. The incidence of injury for men's basketball games is 9.9 injuries per 1,000 athlete-exposures. The injury rate in gymnastics is about 15.19 injuries per 1,000 athlete-exposures. These are really "scary" statistics clearly indicating that modern sport is far from safe. Some details of injury epidemiology in athletics are depicted in this book.

Currently, there is no consensus among medical practitioners in terms of a generic definition and classification of injuries in athletics. The existing diversity in definitions of the term "sports injury" is apparent in the relevant literature and most likely accounts for disagreements in reported research findings and clinical practices when dealing with injured individuals. The classification of injuries, such as acute, chronic, etc., should be defined in conjunction with the severity of the injury (mild, moderate, major, sport disabling, catastrophic) to be recognized and fully accepted by coaches, athletes and medical professionals. Obviously, psychological risk factors, athletes' personalities, fear-related issues, adherence toward rehabilitation protocols and numerous other attributes of injury have never been considered within the scope of epidemiological research on the prevalence of certain injuries in certain sports. However, neither proper assessment nor appropriate treatment protocols could be developed unless multiple physical, biological, psychological and sociodemographic substrates are interactively considered when dealing with injured athletes.

It is also important to stress the *conceptual significance* of basic science and clinical research on various perspectives of injury. This issue has been addressed in a number of chapters of this book. For example, the effects of improper balance as a fundamental skill, progressive muscle fatigue, fear of injury and pain issues from both basic neuroscience and clinical research viewpoints will be discussed within the scope of this book. The need for an advanced conceptualization of injury in athletics stems from the fact that not two traumatic injuries are alike in terms of mechanism, symptoms, or symptoms resolution.

There is still confusion among coaches and medical personnel in terms of the criteria for injured athletes' *readiness for sport participation* versus *readiness for competition*. It is important to note that: "*physical symptoms resolution of an injury is not an indication of injury resolution per se.*" Although, the reality of athletics is that return-to-sport participation criteria are defined by presence and/or absence of symptoms of injury. Specifically, physical symptoms resolution (i.e., no evidence of residual tissue damage, restored anatomical integrity of joint, etc.) and functional symptoms resolution (i.e., ROM, strength, stamina) are two major criteria of return-to-

play. Regarding traumatic brain injury, athletes are allowed to return to play when common symptoms of concussion (i.e., headache, fatigue, light or sound sensitivity, etc) are resolved. Is this really the cornerstone for clearance of the athlete for sport participation? In fact, residual dysfunctions and structural damage may still be present, but not observed due to numerous factors, including both extrinsic (i.e., lack of sensitivity of the assessment tools) and intrinsic (i.e., the athlete's desire to quickly return to sport participation because "... an injured athlete is worthless.")

Now, in terms of concussion in modern sport, that indeed should be treated as a "silent epidemic." The need for further understanding of concussion stems from the fact that, according to Dr. Robert Cantu, injury to the brain is the most common cause of death in athletes. It is conventional wisdom that athletes with uncomplicated and single mild traumatic brain injuries (mTBI) experience rapid resolution of symptoms within one to six weeks after the incident with minimal prolonged consequences. However, there is a growing body of knowledge indicating long-term disabilities that may persist up to ten years post injury. Recent brain imaging studies have clearly demonstrated the signs of cellular damage and diffuse axonal injury, not previously recognized by conventional imaging and neuropsychological examinations, in subjects suffering from concussion. It is a most striking fact that progressive neuronal loss in concussed subjects, as evidenced by abnormal brain metabolites, may persist up to thirty-five days post-injury. Note that current clinical practice is that athletes suffering from mild to moderate forms of TBI are usually cleared for sport participation within ten days post-injury. As a result, athletes who prematurely return to play based upon subjective symptoms resolution may be highly susceptible to future and often more severe brain injuries. In fact, concussed athletes often experience a second TBI or even multiple concussions within one year post initial brain injury. Moreover, every athlete with a history of a single mild TBI who returns to competition upon symptoms resolution still has a risk of developing a post-concussive syndrome with potentially fatal consequences.

Humans, in general, and athletes in particular, are able to compensate for mild or even severe physical and functional deficits because of redundancy in human neural, motor and cognitive systems. This in turn, allows for the reallocation of existing resources such that undamaged pathways and functions are used to perform cognitive and motor tasks. This functional reserve and overall capability to accomplish the testing protocols gives the appearance that an athlete has returned to pre-injury health status, while in actuality the injury is still present and hidden from the observer. As a result, premature return to sport participation based upon physical symptoms resolution may put athletes at high risk for recurrent injuries and the development of permanent psychological trauma. In fact, there is still no agreement upon a psychological diagnosis and definition of psychological trauma, and there is no known comprehensive treatment of psychological

trauma in athletes. It is a growing concern among medical practitioners and coaches that athletes with an initial injury are prone to suffering from recurrent and more severe injuries. It is feasible to suggest that one of the major factors of recurrent injuries in athletes is premature return to sport participation based upon questionable assessment of symptoms resolution.

OUTLINE OF THE BOOK

We will now provide a few more details on the organization of this book's content. There are **5** main parts, which provide analysis of the most recent basic science and clinical research on sport-related injuries. This book is focused on both applied and conceptual issues regarding the classification of injuries, common coaches' errors leading to injury, coaches' and athletes' viewpoints on injury, the development of psychological trauma in athletes, traumatic brain injuries and basic principles of rehabilitation.

Currently accepted in clinical practice and research classification of injury, prevalence of injuries in different sports, athletic injuries from coaches' and athletes' perspectives constitute **Part 1**. Several chapters will discuss basic principles of elite athletes' preparation and common coaches' errors including problems associated with:

- Confusing classifications of injury;
- Improper planning and training periodization;
- Whole body postural control and balance;
- Progressive muscle fatigue and overloading;
- Nutritional aspects

Coaches and athletes' viewpoints on injury, including psychological responses to injury, constitute **Part 2**. Numerous interviews with collegiate and professional coaches and athletes, and descriptions of psychological methods and diagnostic procedures well-accepted in clinical practice, case studies, current practices dealing with injured athletes and future challenges are the heart of this section. In addition, a discussion of overuse "abuse" injuries in athletics is included in this part of the book. It is important to note that one of the major coaching errors in modern sport is the lack of appreciation for the proper assessment of physical fitness. This issue will be also discussed within the scope of Part 2.

Current psychological research within the conceptual framework of "psychological trauma" in athletes constitutes **Part 3**, which includes a number of chapters summarizing experimental research on fear of injury and different forms of pain resulting from sport-related injuries. Special emphasis will be given to the aspect of the development of fear of re-injury and fear of movement due to anticipated pain, i.e., "*kinesiophobia*," as a predisposing factor for long-term psychological trauma in athletes. Behavioral indexes of fear/generalized anxiety and the development of

bracing behaviors as a result of injury will be discussed as well. Moreover, factors of age and gender as a predisposition for athletes' individuated responses to injury will be discussed in a special chapter of Part 3.

Part 4 of the book constitutes current information on traumatic brain injuries in athletes. Assessment scales and return-to-play guidelines that are well accepted and currently debated in clinical practice will be discussed within the scope of this section. Pediatric concussion, which is a major concern among medical practitioners today, will be also discussed within the scope of Part 4.

Finally, basic concepts and principles of integrated rehabilitation aimed at a timely return to sport participation will be discussed in **Part 5**. The special chapters of this section will be focused on the specialized treatment and rehabilitation of injured athletes, including the feasibility and applicability of virtual reality (VR), goal-setting and neurofeedback protocols in a clinical setting.

To my knowledge, multimodal perspectives of injury in athletics, including a discussion of the major causes and consequences of sport-related injuries with a special emphasis on coaches and athletes' viewpoints, have never been accumulated in a single source. Since the topic of sport-related injuries is included in most of the Kinesiology, Sports Psychology, Exercise and Sport Science, Athletic Training, Physical Therapy and Neuroscience curricula, it is anticipated that this book will be considered for adoption as a valuable asset and/or supplementary reading source within kinesiology, exercise and medical sciences programs.

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