

Foreword

It is an undisputed scientific fact that sports not only promote the enhancement of physical fitness, regardless of age or gender, but are also the most effective way of preventing most cardiovascular diseases, diabetes, obesity, and many types of cancer (as outlined by Prof. Steven Blair in the *British Journal of Sports Medicine* 2009;43 : 1–2). Extensive promotion of recreational sports for all ages is the best way of improving public health and reducing health-care costs.

If this health potential of competitive and recreational sports is to be fully exploited, the risk of injuries has to be reduced as much as possible. Particularly in sports that are widely popular, every effort has to be made to prevent injuries and their late sequelae. This should include adequate initial examinations, warm-up routines based on special exercises, and concepts of fair play, as well as optimal management of any injuries that are sustained.

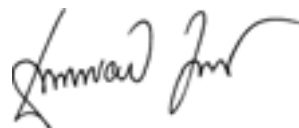
Football (soccer) is unquestionably the most popular sport in the world. With almost 300 million players worldwide, any divergence from good practice is inevitably magnified on a tremendous scale.

On the basis of comprehensive epidemiologic studies conducted by the FIFA Medical Assessment and Research Center (F-MARC) of the International Federation of Association Football (FIFA), the average soccer player sustains approximately two injuries per year. Not only do these injuries incur primary treatment costs, but significant secondary costs also arise due to lost productivity and absence from work. The most common sports-related injuries involve the muscles, and even apparently minor injuries may have serious consequences when they occur on a repetitive basis. As the world's largest international sports association, FIFA has taken a keen interest in the prevention, diagnosis, and treatment of sports-related injuries. Trainers, physical therapists, and sports physicians at the recreational and amateur level must have sufficient knowledge to provide optimal diagnostic and therapeutic care.

The editors of this book, Hans-Wilhelm Müller-Wohlfahrt, Peter Ueblicher, Lutz Hänsel, and William Garrett, as well as the contributing authors, have had decades of practical experience in caring for thousands of professional and amateur athletes. As a result, *Muscle Injuries in Sports* offers state-of-the-art diagnostic and treatment information from the perspective of prominent sports physicians. The book includes a new system for the clinical classification of muscle injuries based on the history, physical examination, and imaging findings. The book's therapeutic focus is on conservative treatment, both in the setting of acute muscle injuries and in rehabilitation. As readers will see, the authors have gathered together the best and most useful information on the basis of decades of experience, with the goal of hastening the recovery of every injured athlete.

I personally know little about interference fields or energy emission analysis, but these chapters clearly warrant critical evaluation. This superbly illustrated book is completed by a chapter on preventive measures, which are definitely as important as treatment and may be far more important. Scientific studies with football players (Soligard et al., *BMJ* 2008;337:a2469) have shown that injuries can be reduced by 30–50% when preventive measures such as the 11+ exercise program, with proven efficacy, are applied as an integral part of warm-up routines before training and competition (<http://f-marc.com>).

In summary, everyone involved in the care of athletes should not only read this book but also implement the practical recommendations by seasoned experts that it offers on the prevention, diagnosis, treatment, and rehabilitation of sports-related muscle injuries.



Prof. Jiri Dvorák, MD

Chief Medical Officer, FIFA; Chairman, F-MARC

Preface

More than one-third of all injuries that occur in soccer involve the muscles; thigh muscle injuries represent the most common diagnosis in track and field athletes, American football, and basketball. However, muscle injuries are also common in recreational sports, where overlooked or misunderstood muscle injuries may lead to persistent problems.

It is also a fact that injuries to the skeletal muscles are often underestimated, misinterpreted, and improperly treated. The reasons for this include a lack of training and continuing education in this area, a lack of research, the absence—so far—of a practical, comprehensive, universal classification system for muscle injuries, and even a lack of uniform terminology. Moreover, guidelines for clinical or imaging diagnosis and treatment are lacking. For the sake of all injured athletes, this situation must change!

In the past, the specialized knowledge needed to diagnose and treat muscle injuries could only be obtained from individual publications, with considerable inconsistency in the use of muscle injury terminology. So far, there have been no textbooks providing a comprehensive, understandable description of the anatomy and physiology of the skeletal muscles or the clinical diagnosis, imaging, treatment, rehabilitation, and prevention of muscle injuries.

Having long planned a book on diagnosis and treatment, we felt it was time to undertake a comprehensive project of this type. The result is *Muscle Injuries in Sports*, which draws upon more than 35 years of practical experience in caring for professional soccer players and other top athletes from track and field and many other sports from all over the world.

The main problem in evaluating skeletal muscles is that they are so heterogeneous, from both the physiological and pathological standpoints. This makes it all the more difficult to establish a comprehensive classification that covers all injuries, as there are more borderline cases than in other types of injury such as fractures.

Only very few studies have been published on muscle injuries. Much of the information in this book—particularly the chapters on classification, clinical diagnosis, and treatment—is thus admittedly based more on empirical knowledge than on scientific data. But isn't it also true that other medical classifications are evidence-based only to a limited degree, due to a lack of scientific research? However, the empirical data used in this book are based on a large number of muscle injuries, as the authors and editors regularly see and treat competitive athletes.

Interestingly, while the musculature is the largest parenchymal organ in the human body, representing roughly 40% of the total body weight in adults, the muscles have been relegated to a secondary role in the past. It is only recently that they have become a focus of growing interest in research work, professional journals, and the press. More and more, the muscles are being recognized as a central organ that is responsible for numerous disorders and complaints and that is also accessible to treatment.

This textbook is being published at a time when greater attention is being given to the muscles in “musculoskeletal medicine”—the field that in the past dealt extensively with joints, ligaments, tendons, and bones. Our aim is to stimulate discussion about athletic muscle injuries in order to promote a new and improved understanding of the diagnosis, treatment, and prevention of these frequent and interesting disorders.

The original publication of this book in German in June 2010 was very successful, with a positive response from many physicians and therapists in the field of the diagnosis and treatment of muscle injuries who had been looking for a book like this for a long time. This led us to discuss the possibility of producing an English edition with the publishers.

The present English edition is a further development of the German one, based on the following events: In early 2011, we conducted a survey based on the hypothesis that the existing terminology for muscle injuries in the English language is highly inconsistent. Scientists and team doctors from national and first-division professional soccer teams, native English speakers, were asked to complete a questionnaire. The responses confirmed our hypothesis that there is marked variability in the use of medical terminology relating to muscle injury. The results emphasized the need for a more uniform terminology and classification system.

On the basis of these findings, we organized a consensus meeting of international sports medicine experts in Munich, Germany, on March 3, 2011. The following members took part in the meeting (in alphabetical order):

- Prof. Dieter Blottner (Associate Professor, Department of Vegetative Anatomy, Charité University Hospital, Berlin, Germany)
- Prof. Jan Ekstrand (Head of the UEFA Injury Study Group, Vice-Chairman of the UEFA Medical Committee, University of Linköping, Sweden)
- Dr. Bryan English (team physician of Chelsea Football Club, UK)

- Prof. William E. Garrett, Jr. (Duke Sports Medicine Center, Durham, North Carolina, USA)
- Dr. Lutz Hänsel (editor of this book, team physician of Bayern Munich Football Club, Germany)
- Dr. Gino M.M.J. Kerkhoffs (Department of Orthopedic Surgery, Orthopedic Research Center, Amsterdam, Netherlands)
- Dr. Steve McNally (team physician for Manchester United, UK)
- Dr. Kai Mithoefer (Harvard Vanguard Medical Associates, Harvard Medical School, US Soccer Federation, Boston, Massachusetts, USA)
- Dr. Hans-Wilhelm Müller-Wohlfahrt (editor of this book, team physician of Bayern Munich Football Club, Germany, and team physician of Germany's national football team)
- Dr. John Orchard, MD, PhD (Associate Professor, School of Public Health, University of Sydney; team physician of the Australian cricket team and Sydney Roosters rugby league team)
- Dr. Patrick Schamasch (Medical and Scientific Director of the International Olympic Committee, Lausanne, Switzerland)
- Dr. Leif Swaerd (Associate Professor, University of Göteborg, Sweden; team physician for Sweden's national football team and previously for England's national football team)
- PD Dr. Peter Ueblicher (editor of this book, team physician of Bayern Munich Football Club, Germany)
- Dr. Niek van Dijk (Head of the Orthopedics Department, Academic Medical Center, Amsterdam, Netherlands)

Practical and systematic terms for athletic muscle injuries were established at the conference.

It was decided not to recommend the use of the term *strain* anymore, as it is a biomechanical term that is not defined and is used indiscriminately for anatomically and functionally different muscle injuries. Instead of *strain*, the consensus panel proposed the use of the term *tear*, used for *structural muscle injuries*—i.e., injuries in which there is macroscopic evidence of muscle damage.

In addition, a comprehensive new classification system was developed that differentiates between:

- *Functional muscle disorders*—referring to disorders with no macroscopic evidence of fiber tear (type 1, overexertion-related; and type 2, neuromuscular muscle disorders)
- and
- *Structural muscle injuries*—with macroscopic evidence of a fiber tear, i.e. structural damage (type 3, partial tears; and type 4, [sub]total tears/tendinous avulsions)

Subclassifications were defined for each type.

The aim of the new classification system is to improve the clarity of communication for both diagnostic and therapeutic purposes. This is intended to serve as the basis for future comparative studies to address the continued lack of systematic information on muscle injuries in the literature. The results of this consensus conference have been published in the *British Journal of Sports Medicine* (with open access on bjsm.com).

We are very proud that the classification has been included in the UEFA Champions League Injury Study. We hope that our work will stimulate research—based on the suggested terminology and classification—to prospectively evaluate the prognostic and therapeutic implications of the new classification system, which is based on clinical experience.

This book has been written for all sports physicians, sports scientists, physical therapists, and many others who are interested and involved in the care and treatment of competitive and recreational athletes. Our hope is that by describing our own experience, we may be able to advance the diagnosis and treatment of these frequent and interesting injuries.

Our special thanks go to Dr. Albrecht Hauff, CEO of the Thieme Publishing Group, for his enthusiastic response to our idea of writing a comprehensive textbook on skeletal muscle injuries. We are particularly grateful for his foresight and his support.

We are also very grateful to the staff at Thieme Publishers—particularly Angelika Findgott, for generous and professional planning; and to Anne Lamparter, Deborah Cere, and Sophia Hengst, for their tireless help and support in seeing the project through to completion. Our thanks also go to Gertrud Champe, Ruth Gutberlet, Alexandra Kuhn-Thiel, and Terry Telger for the professional translations. The entire staff at the Thieme Publishing Group consistently looked after our needs with a great deal of effort and commitment and were able to find answers for our most challenging questions. They provided the high degree of collaboration that is essential for completing a project of this kind.

Our sincere thanks also go, of course, to all of our authors, whose contributions reflect the very highest level of technical competence and expertise. We are grateful to them for their dedicated and comprehensive work on the project, and particularly also in the translation and editing tasks needed for this English edition. We are proud to have worked with such an accomplished and experienced team of experts.

Hans-Wilhelm Müller-Wohlfahrt
Peter Ueblicher
Lutz Hänsel