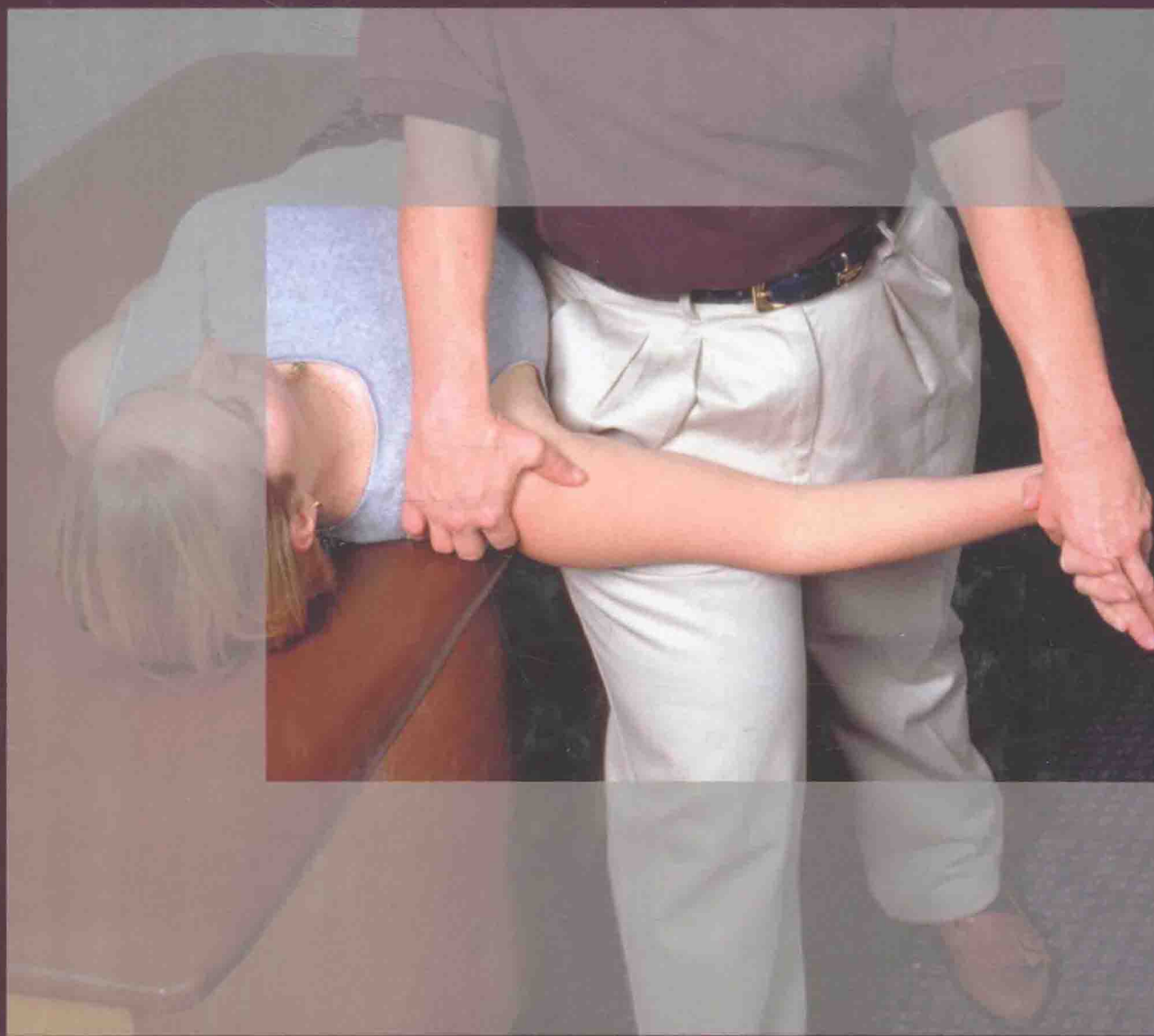


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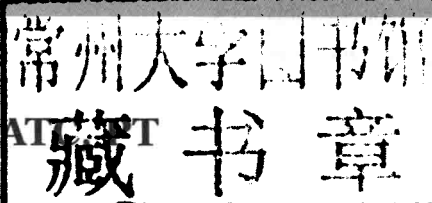
PEGGY A. HOUGLUM

THIRD EDITION

THERAPEUTIC EXERCISE *— for —* MUSCULOSKELETAL INJURIES

ATHLETIC TRAINING EDUCATION SERIES

Peggy A. Houglum, PhD, ATC
Duquesne University



■ ■ ■

David H. Perrin, PhD, ATC
Series Editor
University of North Carolina at Greensboro



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Web site: www.HumanKinetics.com

United States: Human Kinetics
P.O. Box 5076
Champaign, IL 61825-5076
800-747-4457
e-mail: humank@hkusa.com

Canada: Human Kinetics
475 Devonshire Road Unit 100
Windsor, ON N8Y 2L5
800-465-7301 (in Canada only)
e-mail: info@hkcanada.com

Europe: Human Kinetics
107 Bradford Road
Stanningley
Leeds LS28 6AT, United Kingdom
+44 (0) 113 255 5665
e-mail: hk@hkeurope.com

Australia: Human Kinetics
57A Price Avenue
Lower Mitcham, South Australia 5062
08 8372 0999
e-mail: info@hkaustralia.com

New Zealand: Human Kinetics
P.O. Box 80
Torrens Park, South Australia 5062
0800 222 062
e-mail: info@hknewzealand.com

For Dan. I am so very pleased with your willingness to carry on
for the next generation of athletic trainers in health care.

INTRODUCTION TO THE ATHLETIC TRAINING EDUCATION SERIES

The six titles of the Athletic Training Education Series—*Core Concepts in Athletic Training*, *Examination of Musculoskeletal Injuries*, *Therapeutic Exercise for Musculoskeletal Injuries*, *Therapeutic Modalities for Musculoskeletal Injuries*, *Management Strategies in Athletic Training*, and *Developing Clinical Proficiency in Athletic Training*—are textbooks for athletic training students and references for practicing certified athletic trainers. Other allied health care professionals, such as physical therapists, physician's assistants, and occupational therapists, will also find these texts to be invaluable resources in the prevention, examination, treatment, and rehabilitation of injuries to physically active people.

The rapidly evolving profession of athletic training necessitates a continual updating of the educational resources available to educators, students, and practitioners. The authors of the six new editions in the series have made key improvements and have added information based on the fourth edition of the NATA Athletic Training Educational Competencies.

- *Core Concepts in Athletic Training*, which replaces *Introduction to Athletic Training*, is suitable for introductory athletic training courses. Part I of the text introduces students to mechanisms of injury, pathophysiology, and injury assessment. It also includes a chapter with some of the injuries and tests that students should be aware of. Part II introduces topics in injury examination, and part III considers the use of modalities and exercise in the therapeutic rehabilitation process. Part IV covers prevention topics such as conditioning, nutrition, protective gear, and taping and bracing. Part V introduces the managerial and legal issues relevant to clinical practice in athletic training.
- In *Examination of Musculoskeletal Injuries*, new information about sensitivity and specific-

ity strengthens the evidence-based selection of special tests, and an increased emphasis on clinical decision making and problem solving and the integration of skill application in the end-of-chapter activities are now included.

- Two new chapters have been added to *Therapeutic Exercise for Musculoskeletal Injuries*. Chapter 16 focuses on arthroplasty, and chapter 17 contains information regarding various age considerations in rehabilitation. This text also provides more support of evidence-based care resulting from a blend of research results and the author's 40 years of experience as a clinician.
- The new edition of *Developing Clinical Proficiency in Athletic Training* contains 27 new modules, and embedded within it are all the 2006 NATA Athletic Training Educational Competencies. The concepts of progressive clinical skill development, clinical supervision and autonomy, and clinical decision making are introduced and explained. The nature of critical thinking and why it is essential to clinical practice are also discussed.
- The third edition of *Therapeutic Modalities for Musculoskeletal Injuries* continues to provide readers with information on evidence-based practice and includes recent developments in the areas of inflammation and laser therapy.
- The fourth edition of *Management Strategies in Athletic Training* continues to help undergraduate and graduate students master entry level concepts related to administration in athletic training. Each of the ten chapters has been thoroughly updated, with new material added on such topics as evidence-based medicine, professionalism in athletic training, health care financial management, cultural competence, injury surveillance systems, legal updates, athletic trainer compensation, and more.

The Athletic Training Education Series offers a coordinated approach to the process of preparing students for the Board of Certification examination. If you are a student of athletic training, you must master the material in each of the content areas delineated in the NATA Athletic Training Educational Competencies. The Athletic Training Education Series addresses each of the competencies sequentially while avoiding unnecessary duplication.

The series covers the educational content areas developed by the Education Council of the National Athletic Trainers' Association for accredited curriculum development. The content areas and the texts that address each content area are as follows:

- Risk management and injury prevention (*Core Concepts and Management Strategies*)
- Pathology of injury and illnesses (*Core Concepts, Examination, Therapeutic Exercise, and Therapeutic Modalities*)
- Orthopedic assessment and diagnosis (*Examination and Therapeutic Exercise*)
- Acute care (*Core Concepts, Examination, and Management Strategies*)
- Pharmacology (*Therapeutic Modalities*)
- Conditioning and rehabilitative exercise (*Therapeutic Exercise*)
- Therapeutic modalities (*Therapeutic Modalities*)
- Medical conditions and disabilities (*Examination*)
- Nutritional aspects of injury and illness (*Core Concepts*)
- Psychosocial intervention and referral (*Therapeutic Modalities and Therapeutic Exercise*)
- Administration (*Management Strategies*)
- Professional development and responsibilities (*Core Concepts and Management Strategies*)

The authors for this series—Craig Denegar, Peggy Houglum, Richard Ray, Jeff Konin, Ethan Saliba, Susan Saliba, Sandra Shultz, Ken Knight, Kirk Brumels, and I—are certified athletic trainers with well over three centuries of collective experience as clinicians, educators, and leaders in the athletic training profession. The clinical experience of the authors spans virtually every setting in which athletic trainers practice: high schools, sports medicine clinics, universities, professional sports, hospitals, and industrial settings. The professional positions of the authors include undergraduate and graduate curriculum director, head athletic trainer, professor, clinic

director, and researcher. The authors have chaired or served on the NATA's most prominent committees, including Professional Education Committee, Education Task Force, Education Council, Research Committee of the Research and Education Foundation, Journal Committee, Appropriate Medical Coverage for Intercollegiate Athletics Task Force, and Continuing Education Committee.

This series is the most progressive collection of texts and instructional materials currently available to athletic training students and educators. Several elements are present in most of the books in the series:

- Chapter objectives and summaries are tied to one another so that students will know and achieve their learning goals.
- Chapter-opening scenarios illustrate the relevance of the chapter content.
- Thorough reference lists allow for further reading and research.

To enhance instruction, various ancillaries are included:

- All of the texts (except for *Developing Clinical Proficiency in Athletic Training*) include instructor guides and test banks.
- *Therapeutic Exercise for Musculoskeletal Injuries* includes a presentation package plus image bank.
- *Core Concepts in Athletic Training, Therapeutic Modalities for Musculoskeletal Injuries*, and *Examination of Musculoskeletal Injuries* all include image banks.
- *Examination of Musculoskeletal Injuries* includes an online student resource.

Presentation packages include text slides plus select images from the text. Image banks include most of the figures, tables, and content photos from the book. Presentation packages and image banks are delivered via PowerPoint, and instructors can use these to enhance lectures and demonstration sessions. Other features vary from book to book, depending on the subject matter; but all include various aids for assimilation and review of information, extensive illustrations, and material to help students apply the facts in the text to real-world situations.

The order in which the books should be used is determined by the philosophy of each curriculum director. In any case, each book can stand alone so that a curriculum director does not need to revamp an

entire curriculum in order to use one or more parts of the series.

When I entered the profession of athletic training over 30 years ago, one text—*Prevention and Care of Athletic Injuries* by Klafs and Arnheim—covered nearly all the subject matter required for passing the Board of Certification examination and practicing as an entry-level athletic trainer. Since that time we have witnessed an amazing expansion of the information and skills one must master in order to practice athletic

training, along with an equally impressive growth of practice settings in which athletic trainers work. You will find these updated editions of the Athletic Training Education Series textbooks to be invaluable resources as you prepare for a career as a certified athletic trainer, and you will find them to be useful references in your professional practice.

David H. Perrin, PhD, ATC
Series Editor

PREFACE

When Dave Perrin invited me to write the first edition of this textbook, it wasn't the first time someone had broached the topic with me. It was, however, the first time I took the task to heart and decided to pursue the idea. Several years before Dave made his invitation, Pete Koehnke had approached me with the idea. At that time there was no textbook on rehabilitation of athletic injuries. By the time I began writing the first edition, textbooks on the subject had been written or edited. Why, then, did I decide to write the book?

The answer is complex. Although several textbooks are now in print on the topic of athletic rehabilitation, prior to the publication of the first edition of *Therapeutic Exercise for Musculoskeletal Injuries* (formerly *Therapeutic Exercise for Athletic Injuries*), none satisfied the needs of the clinician beyond the technical level. Instructors across the country had repeatedly told me that they did not use a textbook because those available were either incomplete or did not meet their needs. Others told me that they used more than one text because there was no single textbook that addressed all of the content of their courses. In addition to these textbook shortcomings, the past few years have seen a number of advances and revolutionary changes in the rehabilitation of musculoskeletal injuries. Additionally, advancements in surgical techniques have demanded a concomitant advancement of rehabilitation techniques. The rehabilitation process must constantly evolve and become more sophisticated with surgical technique enhancement, equipment development, and newly acquired knowledge in health care.

Overall, available textbooks did not satisfy instructional needs. They addressed how to perform rehabilitation techniques, but they did not discuss what occurs physiologically, why applications are important, and how treatments are effective. As clinicians who rehabilitate musculoskeletal injuries, athletic trainers are health care professionals who are obligated to understand the therapeutic exercise and rehabilitation techniques they use to treat their patients. This textbook differs significantly from other rehabilitation textbooks because it deals with information vital to these concepts. The reader is guided through a progression of information designed to reveal the whys, hows, whens, and whats of rehabilitation—the essential building

blocks that will provide the clinician with the skills to safely and successfully rehabilitate injured individuals.

Instructors using this text in their courses will find an instructor guide, test bank, and presentation package plus image bank available to them at www.HumanKinetics.com/TherapeuticExerciseforMusculoskeletalInjuries. The instructor guide includes chapter and suggested lecture outlines, as well as student activities for the classroom, and the test bank includes numerous questions that can be used to create or supplement tests and quizzes. The presentation package plus image bank offers instructors detailed lecture notes and also includes most of the art, figures, and tables from the text, which can be used to create custom presentations.

STRUCTURE AND ORGANIZATION

This text is divided into four parts. Each part builds on the information presented in previous parts. Part I deals with the basic concepts: what is important in a therapeutic exercise program, what factors affect a program, the team members involved, and the components involved. It also addresses what happens physiologically to the injury site and emotionally to the individual following an injury, as well as principles of physics, assessment techniques, and record keeping.

Part II presents specific techniques and concepts—including manual therapy and concepts involving range of motion, strength, proprioception, and functional activities—to serve as a foundation for parts III and IV. Reporting tools for findings and progressions are also discussed. These techniques are the cornerstone of the establishment, progression, and conclusion of a therapeutic exercise program for musculoskeletal injuries.

Part III contains information on general therapeutic exercise application. These chapters cover topics such as posture evaluation, gait analysis, aquatic exercises, Swiss ball and foam roller exercises, and tendinopathy treatment strategies. These techniques are all used

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throughout a treatment program and can be applied to many different body segments. This material becomes a set of building blocks for the last section of the book, part IV, which deals with specific application to each body segment of the techniques discussed in parts I, II, and III. Specific rehabilitation techniques and progressions are presented for each area of the body, with special attention to common problems or unique programs that a body segment requires.

TERMINOLOGY

As health care professionals, we should be familiar with terms commonly used in the context of identifying, treating, and managing musculoskeletal injuries. Though our patients may be athletes, industrial workers, or computer programmers, as long as a person is under medical care, that individual is considered a patient first. Therefore, individuals needing rehabilitation are referred to as *patients*. Some health care professionals refer to patients as *clients*. I personally have a difficult time with this term since, to me, it implies someone who is obtaining a service for a fee. We should be concerned primarily with the individual's health care, not what we may be paid, so *patient* better reflects what should be our priority—improving that individual's health status. As health care professionals, athletic trainers provide myriad services. Athletic trainers are well-rounded clinicians with education and skills in all aspects of patient care from prevention to immediate care to rehabilitation. Since this textbook deals with the topics of rehabilitation generally and therapeutic exercises specifically, the athletic trainer who offers this treatment is referred to as a *rehabilitation clinician* or *clinician*.

Treatment is offered in a *clinic*. The clinic can be an athletic training room, an outpatient clinic, a conditioning facility, or an industrial clinic; as long as the individual offering therapeutic exercise rehabilitation is a health care professional and the individual receiving that service is a patient, the facility is a clinic.

NEW TO THIS EDITION

This third edition of *Therapeutic Exercise for Musculoskeletal Injuries* contains much of the information that appeared in the former editions, but it also is substantially different from the previous editions. Two new chapters in part III are among the most substantial additions to this edition. Chapter 16 focuses on arthroplasty, and chapter 17 provides information regarding different age considerations in rehabilitation. Both of

these chapters are included because approximately 50% of graduating athletic training students will end up working in orthopedic or sport clinics. This means that they will treat patients older and younger than those seen in high school and university settings. Clinicians must be aware of the issues relevant to young and old patients and of the need to treat them differently from the “average” 18- to 25-year-old. Additionally, we are already seeing athletes undergo joint replacement and return to sport and recreation; this trend will only increase as technological improvements continue and more individuals remain active as they age. Clinicians must also know and appreciate the surgical procedures, precautions, and rehabilitation needs of one of the most frequently performed orthopedic procedures, arthroplasty.

In addition, there is more information in several of the other chapters, in the form of either new information or expansion of existing information. The chapters that address new topics include chapter 2, which presents a more detailed description of articular cartilage healing; this was important to add since so many new surgical techniques are being developed to treat articular surface injuries. Along with this is more detail on the rehabilitation of knee articular resurfacing in chapter 23. Chapter 18 on the spine has an added section on stabilization and another section on McKenzie and Williams' exercises. Since core stabilization is being recognized as important for many other body segments besides the trunk, this topic needed to be expanded in the current edition. It was not long ago that a physician would ask the clinician to instruct a patient in Williams' flexion exercises, but we do not see McKenzie and Williams' flexion exercises prescribed as a group as they were in the past. However, individual exercises from these two groups remain relevant, and since we do use the exercises individually, I thought it was necessary to recognize the foundation of these exercise programs by identifying them with reference to their original authors and the theories they proposed at the time.

Two chapters, 10 and 15, have had name changes. Chapter 10 is now “Functional and Activity-Specific Exercise.” *Functional* exercise is not *specific* exercise, and I feel that it is important to make this distinction. The difference between functional and activity-specific is discussed in this chapter. One of the important and unique aspects of athletic trainers' education that distinguishes athletic trainers from other health care professionals is that their rehabilitation education includes the terminal aspects of rehabilitation. This terminal aspect is the specific activities that the patient will be

required to perform once he or she returns to full and normal function. Since athletic trainers rehabilitate more types of people than just athletes, the specific exercises may be sport-related activities or job tasks. Both “sport-specific” and “activity-specific” are used to refer to that final phase of rehabilitation where the athletic trainer’s role is to prepare patients to return to whatever demands and skills they must perform. Chapter 15 received a significant upgrade. Its title, “Therapeutic Exercise for Tendinopathy,” refers to the terminology changes in the chapter. “Tendinitis” is no longer the common term for common tendon pathology since it is now recognized that the tendon is usually not inflamed. The title, however, is only one small part of the changes in this chapter. As with all the chapters, the information is updated to reflect the most current knowledge and trends in care.

In an effort to facilitate quicker reading of some of the chapters as well as easier location of information, I have described many of the manual techniques and exercises within brief, specially formatted sections. Accompanying photos are easily referred to, but these descriptions are also easy to locate and read. I have divided the techniques and exercises into their various categories for easy distinction among the different types of techniques and exercise groups. I have added at least one other kind of figure to each chapter in part IV. These figures provide a timeline of goals and suggestions for some exercises and identify procedures that may be used within each timeline. Each figure is divided into four segments, based on the healing timeline. Specific days from injury are not the guideline, as would be the case in a cookbook; since each person’s response to injury varies, the timeline is determined by a combination of when the patient reaches established goals and the patient’s evidence of healing. These figures may assist the visual learner in identifying progressions in therapeutic exercise programs.

Finally, this text provides more evidence for treatment programs than in the past. One of the terms frequently used today in health care is “evidence-based” care. We must remember that evidence-based care is an accumulation of knowledge and information gleaned from research as well as from clinical experience. To that end, I have incorporated into this third edition many evidence-based treatment techniques that are a blend of research results and my own experiences as a clinician over almost 40 years of practice. As I continue to read professional journals to grasp current

knowledge in the field, I also use my own clinical techniques to discover what works and what does not work as I provide patient care. Clinical practice must include a routine merger of scholarly literature and clinical treatment with persistent assessment of this amalgamation to identify what is best for the patient; this textbook provides you with the beneficial results of this professional blend.

PURPOSE

This text is a compilation of nearly 40 years of experience in the field of athletic training, as well as in orthopedic, physical therapy, and sports medicine clinics and hospitals; and it provides what I believe is comprehensive information on therapeutic exercise for musculoskeletal injuries. It is meant to be an educational tool for the entry-level student as well as a reference text for the practicing rehabilitation clinician. It is meant to offer established and new information and to challenge both the neophyte and experienced rehabilitation clinician to provide a new level of insight and information about therapeutic exercise and our health care professions.

This text does *not* take a cookbook approach to therapeutic exercise. Instead it provides the knowledge and tools you will need in order to develop the skills for determining what to use for each patient you encounter. It provides the instruments you will need to decide the best course of action, as well as the knowledge about why you are using them; it tells you what to expect when you use a technique and explains the dangers and advantages of various applications, proper progressions, and ways to apply the knowledge and techniques to specific injuries. As each patient is different and responds differently to injury and treatment, it is neither fair to the patient nor realistic for you to believe that a cookbook approach would be helpful to either the patient or to you. The best course of action for you as a rehabilitation clinician is to provide the best therapeutic exercise program you can with your knowledge, skills, understanding, and appreciation of the whats, whys, and hows of therapeutic exercise. If you possess these attributes, you won’t need or want a cookbook. This text offers you the tools to develop your own therapeutic exercise programs for your patients. It is your responsibility to use those tools and your own imagination to provide a sound therapeutic exercise program that is fun for you and your patient.

ACKNOWLEDGMENTS

As with any huge project, this text was completed only with the contributions of many people. These special people are intertwined within three categories: My family, my friends, and my Duquesne University family are at the top of the list of people I must acknowledge. I am fortunate that my siblings are my friends, that my friends seem as close as brothers and sisters, and that the people with whom I work at Duquesne University are more friends than colleagues. Without question, these people have provided me with support and assistance. With sometimes painful frankness, they have told me when I was off base. And most of all, with their own stellar performances they have inspired me to make my own actions worthy of their esteem. They may not feel that they have assisted with this text, but without them, there would have been no first edition, let alone a second or third.

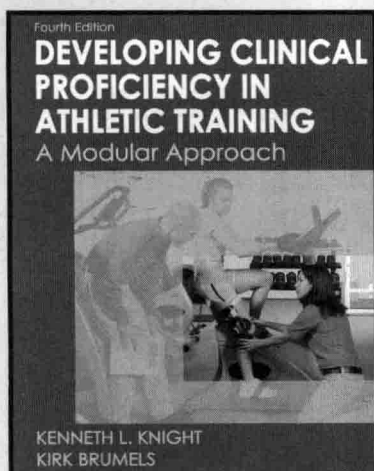
Students and instructors who contact me are a consistent and necessary force that keeps me on my toes. They have noticed items in the text and interpreted segments in a way that provided me with an entirely new perspective on what I have written. Their comments and suggestions gave me a desire to present a better edition, an improved outlook, and another way

of translating information to make it more relevant, more interesting, and more understandable. This is especially true of my students at Duquesne University, who provide me with a daily dose of inspiration and perception. Thanks to each of you who have provided your input into this new edition. You have made a difference.

I would be remiss not to mention the outstanding team of personnel at Human Kinetics. Without them, I would still not be finished rewriting this edition! They tried their best to keep me on task, and they helped me to make this edition the best one yet. A special thank-you goes to Loarn Robertson, whose enthusiasm for this project has never failed. Another special thank-you must go to Amanda Ewing, Developmental Editor for the Athletic Training Education Series, and Jillian Evans and Kate Maurer, Developmental Editors for this text. They each have put up with a lot from me to make this edition a reality. They showed saintly persistence even though I imagined them pulling their hair out because of my incomplete submissions and late deadlines. In spite of a probable urge to wring my neck over e-mail, they were always courteous and showed more patience than I deserved.

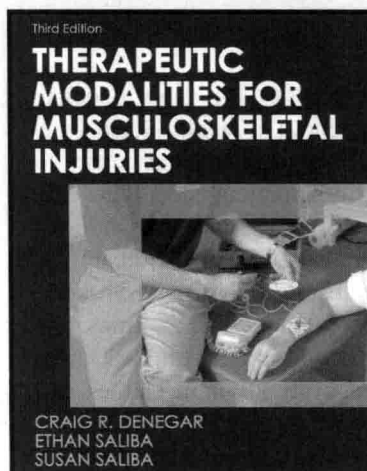
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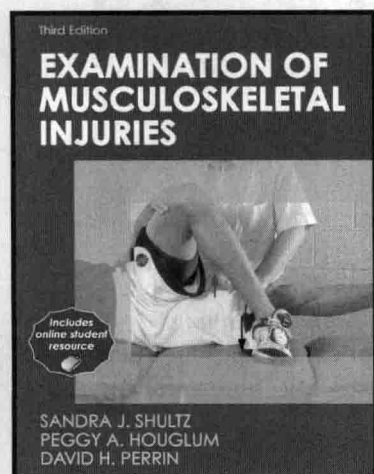
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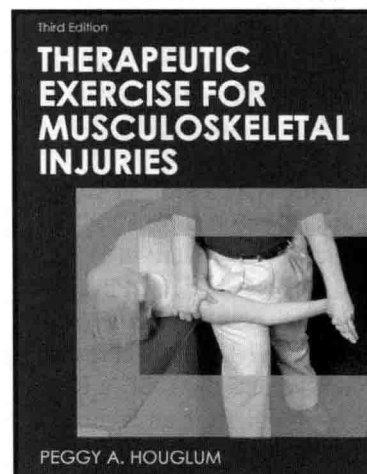
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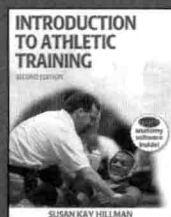
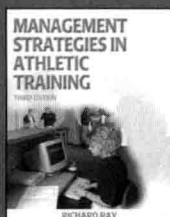
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