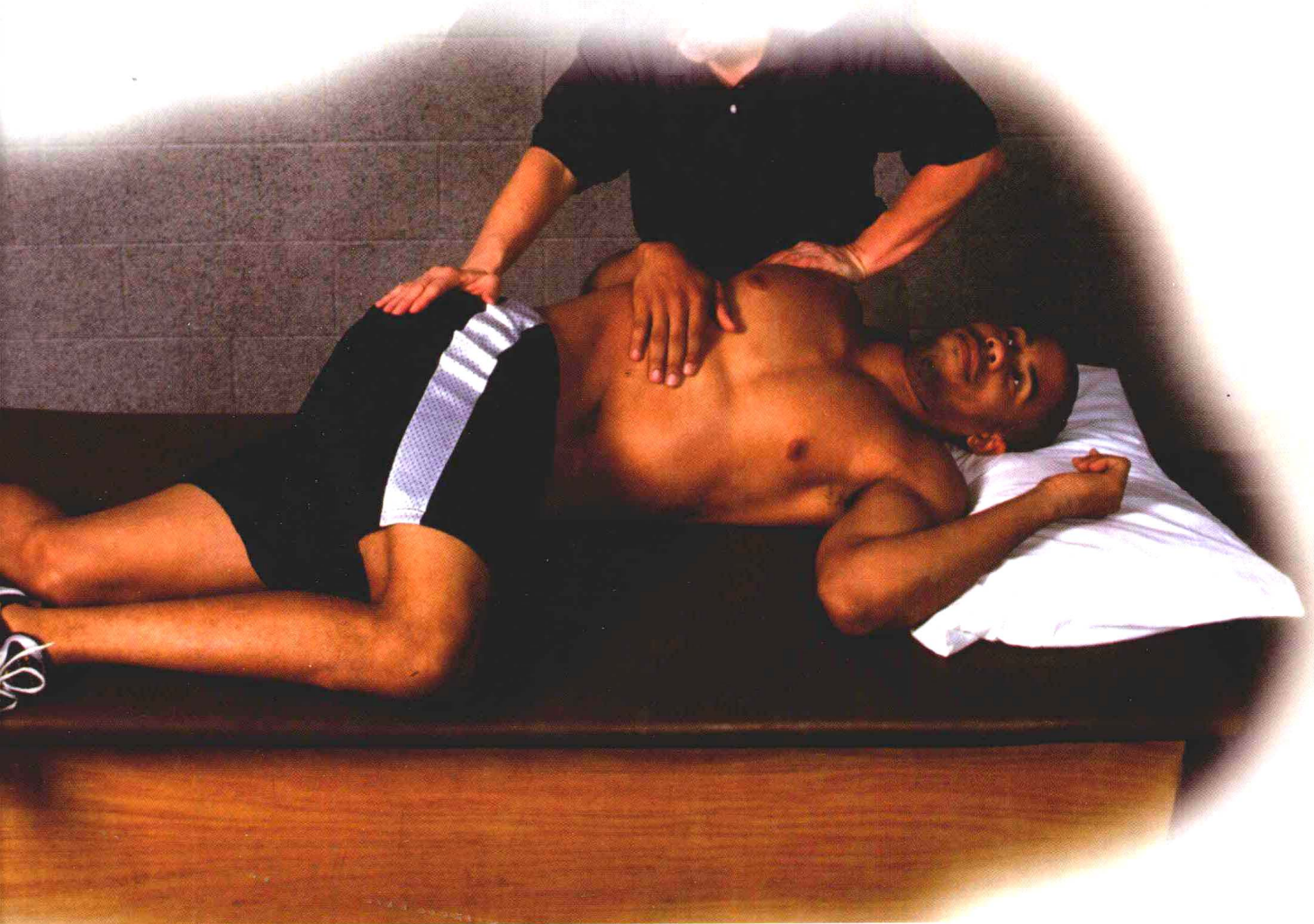


# THE THERAPEUTIC EXERCISE FOR MUSCULOSKELETAL INJURIES

SECOND EDITION



**PEGGY A. HOUGLUM**

# Therapeutic Exercise for Musculoskeletal Injuries

Second Edition

**Athletic Training Education Series**

**Peggy A. Houglum, PhD, PT, ATC**  
Duquesne University

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



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**Human Kinetics**

Web site: [www.HumanKinetics.com](http://www.HumanKinetics.com)

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P.O. Box 5076

Champaign, IL 61825-5076

800-747-4457

e-mail: [humank@hkusa.com](mailto:humank@hkusa.com)

*Canada:* Human Kinetics

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Windsor, ON N8Y 2L5

800-465-7301 (in Canada only)

e-mail: [orders@hkcanada.com](mailto:orders@hkcanada.com)

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107 Bradford Road

Stanningley

Leeds LS28 6AT, United Kingdom

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e-mail: [hk@hkeurope.com](mailto:hk@hkeurope.com)

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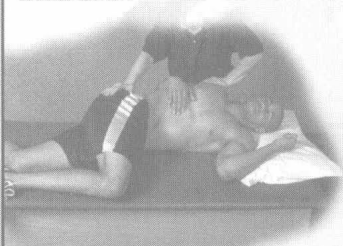
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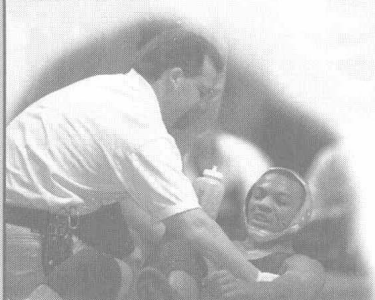
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# Preface

DAVE PERRIN AND PETE KOEHNEKE

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 Koehneke 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, there had been textbooks written or edited on the subject. 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 had told me that they used more than one text because there was no single textbook that addressed all of their course's content. And over the past 15 years, a number of advances and revolutionary changes have occurred in how musculoskeletal injuries are rehabilitated. The advancement of surgical techniques has been accompanied by a concomitant advancement of rehabilitation techniques. The rehabilitation process is constantly evolving and becomes more sophisticated with changes in surgical techniques, equipment development, and newly acquired knowledge of human physiology.

Overall, the problem was that other textbooks available were for technicians. They addressed how to perform rehabilitation techniques, but they did not tell what occurs physiologically, why applications are important, and how treatments are effective. Rehabilitation clinicians and those who rehabilitate musculoskeletal injuries are allied health medical professionals who are obligated to understand the therapeutic exercise and rehabilitation techniques used by the individuals they treat. 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 and thus develop the essential building blocks to provide the clinician with the skills to safely and successfully rehabilitate injured individuals.

## STRUCTURE AND ORGANIZATION OF THERAPEUTIC EXERCISE FOR MUSCULOSKELETAL INJURIES

This text is divided into four parts. Each successive 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 it, 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, physics principles, assessment techniques, and record keeping.

Part II presents specific techniques—including manual therapy, 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 tendinitis treatment strategies. These techniques are all used throughout a treatment program and can be applied to many different body segments. This material is used as 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 allied health professionals, we should be familiar with terms commonly used to identify, treat, and manage musculoskeletal injuries. Though our patients may often 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*. The job title of the allied health professional who provides rehabilitative care could be *certified athletic trainer*, *occupational therapist*, *physical therapist*, or *recreational therapist*, but since this textbook deals with rehabilitation generally and therapeutic exercises specifically, the individual 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, an industrial clinic; as long as the individual offering therapeutic exercise rehabilitation is an allied health professional and the individual receiving that service is a patient, the facility is a clinic.

## NEW TO THIS EDITION

The second edition of *Therapeutic Exercise for Musculoskeletal Injuries* has a few updates, additions, and clarifications from the first edition. Some of the additions are minor, and others are more substantial. The minor additions include some updated perspectives and additional information on rehabilitation programs and techniques for injuries and body segments in chapters 16 through 22. One of the more substantial additions is a clarification of PNF methods in chapter 7 (see “Muscle Structure and Function”). The theory of PNF and its techniques can be confusing, so I’ve attempted to convert some of the language to a more simple and easy to understand version. Chapter 7 also contains a more extensive chart of manual muscle testing grading. In the first edition, I mentioned the plus and minus system of muscle grading, but didn’t elaborate on their descriptions. The new table provides definitions and indications of the grade levels of where the plus and minus system is most appropriate.

I’ve also added an introductory section in chapter 11 (see “Posture and Body Mechanics”). Since Pilates is becoming more popular both in the sports medicine and orthopedic world and with the public, I have introduced the concepts of Pilates and provided an example as was done with the Feldenkrais Method and the Alexander Technique in the same chapter of the first edition. I have also listed sources through which the reader may obtain additional information on Pilates.

A small but important modification has been made to chapter 16, where I’ve explained how to instruct a patient in finding and achieving a pelvic neutral position. Probably the largest addition of this edition is also in chapter 16, in the section on the sacroiliac joint and muscle energy. Part of this expanded section includes information on how to examine an SI joint and how to interpret the findings to determine the most appropriate treatment. The new accompanying photos and tables should assist the reader in understanding this text information. With a better understanding of the SI joint and its dysfunctions, the muscle energy treatments presented in the first edition and kept intact for the second edition will carry more meaning for the reader. A more extensive inclusion of pelvic stability exercises is also included in chapter 16.

At the end of each chapter there are lab activities that utilize the information from the chapter for either practice of the techniques presented as well as problem solving activities that simulate clinical activities relative to the chapter’s topic. They may be used as laboratory course exercises or as a practical review. The practical scenarios at the beginning of each chapter and the critical thinking questions at the end of each chapter remain as a learning tool for the student. The goal of these activity inserts is to assist the student in putting the chapter’s information into clinical and applicable relevance. Sometimes it is difficult for an individual without prior experience to understand the applicability of a topic; these situations and questions are designed to encourage the discovery of how and why the information presented is significant.

## PURPOSE OF THERAPEUTIC EXERCISE FOR MUSCULOSKELETAL INJURIES

This text is a compilation of over 30 years of experience in athletic training facilities, orthopedic and physical therapy clinics, hospitals, and sports medicine clinics, 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 allied health professions.

This text does *not* provide a cookbook approach to therapeutic exercise. However, it does provide the knowledge and tools you will need to develop the skills to determine what to use for each patient you encounter. It provides

the instruments you will need for deciding the best course of action, the knowledge of why you are using it, what to expect when you use a technique, the dangers and advantages of applications, proper progressions, and how to apply the knowledge and techniques to specific injuries. Whereas 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 the patient or to you as the person delivering care for that patient. 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 provides you with the tools for developing 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

Since the first edition's release, several instructors and students, most of whom I did not know, have spontaneously offered their enthusiasm for the text. Others have additionally provided me constructive feedback. I am truly grateful to each of them. I am particularly appreciative of all the students who have communicated with me since they are the ones for whom the book is designed. I am especially thankful to Christopher Schneider, an undergraduate student at the time of his correspondence, whose letter was simultaneously unique and gratifying.

My gratitude also extends to Tracy Beltran. She willingly volunteered to serve as model for the new photographs in this edition. Not knowing what she was getting into and the individuals with whom she had to work, she remained a professional in attitude and response and was wonderful to work with throughout the photo shoot.

Two people to whom I am indebted gave their time willingly and without hesitation when I needed their expertise: Kris Boyle-Walker, MPT, ATC; and Ingrid Provident, EdD, OTR. I am fortunate to call them friends and just as fortunate to have their expertise so willingly provided to me. Kris may laugh at my panicked calls of distress, but I remember when I used to know more than she did. The contributions of both Kris and Ingrid have made this text better than it would have otherwise been.

The Human Kinetics staff once again demonstrated expertise and friendliness that exceeded expectations. Kelly Huff is a true professional photographer, and I was fortunate to have him working with me on this second edition. Renee Thomas Pyrtel, my developmental editor, redefined patience; her guidance, and yes, patience, with me were to a degree that authors dream of. Have no doubt, she kept me on task, but the finesse with which she operated was remarkable. Loarn Robertson, acquisitions editor, reinvigorated the vision of this text and the others in the series and provided me with support, enthusiasm, and honesty throughout the project. HK should be proud of them; I know I am.

Finally, I must acknowledge my family, friends, and Duquesne University colleagues, each of whom, without their knowing it, continually serve as my pillar and inspiration. It is their generous sharing and giving of themselves that makes me a better person.



# Introduction to the Athletic Training Education Series

The five textbooks of the Athletic Training Education Series—*Introduction to Athletic Training*, *Examination of Musculoskeletal Injuries* (formerly *Assessment of Athletic Injuries*), *Therapeutic Exercise for Musculoskeletal Injuries* (formerly *Therapeutic Exercise for Athletic Injuries*), *Therapeutic Modalities for Musculoskeletal Injuries* (formerly *Therapeutic Modalities for Athletic Injuries*), and *Management Strategies in Athletic Training*—were written for athletic training students and as a reference 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 an invaluable resource 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 five new editions in the series have made key improvements and have added important information. *Introduction to Athletic Training* includes a revised and simplified chapter on pharmacology. A new part I in *Examination of Musculoskeletal Injuries* makes this text one of the most comprehensive presentations of the foundational techniques for each assessment tool used in injury examination. Updated information on proprioceptive neuromuscular facilitation and sacroiliac joint evaluation and treatment is included in *Therapeutic Exercise for Musculoskeletal Injuries*, and a section on Pilates has been added. In *Therapeutic Modalities for Musculoskeletal Injuries*, a new chapter on evidence-based practice has been added, and the FDA’s approval of laser treatment for selected injuries has led to a new chapter on this topic. Finally, the impact of the Health Insurance Portability and Accountability Act and the appropriate medical coverage model of the National Athletic Trainers’ Association (NATA) are now addressed in *Management Strategies in Athletic Training*.

The Athletic Training Education Series offers a coordinated approach to the process of preparing students for the NATA 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 publication *Competencies in Athletic Training*. The Athletic Training Education Series addresses these competencies comprehensively and 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. These content areas and the texts that address each content area are as follows:

- Risk management and injury prevention (*Introduction* and *Management Strategies*)
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- Assessment and evaluation (*Examination* and *Therapeutic Exercise*)
- Acute care of injury and illness (*Introduction*, *Examination*, and *Management Strategies*)
- Pharmacology (*Introduction* and *Therapeutic Modalities*)
- Therapeutic exercise (*Therapeutic Exercise*)
- General medical conditions and disabilities (*Introduction* and *Examination*)
- Nutritional aspects of injury and illness (*Introduction*)
- Psychosocial intervention and referral (*Introduction*, *Therapeutic Modalities*, and *Therapeutic Exercise*)
- Health care administration (*Management Strategies*)
- Professional development and responsibilities (*Introduction* and *Management Strategies*)

The authors for this series—Craig Denegar, Susan Hillman, Peggy Houglum, Richard Ray, Ethan Saliba, Susan Saliba, Sandra Shultz, and I—are eight certified athletic trainers and physical therapists with well over a century 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, including the high school, sports medicine clinic, college, professional sport, hospital, 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 important committees, including

the Professional Education Committee, the 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 related instructional materials currently available to athletic training students and educators. Several elements are present in all 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 importance and relevance of the chapter content.
- Cross-referencing among texts offers a complete education on the subject.
- Thorough reference lists allow for further reading and research.

To enhance instruction, each text includes an instructor guide and test bank. *Therapeutic Exercise for Musculoskeletal Injuries*, *Therapeutic Modalities for Musculoskeletal Injuries*, and *Examination of Musculoskeletal Injuries* each includes a presentation package. Presentation packages (formerly known as graphics packages) are usually in Microsoft PowerPoint format and delivered via CD-ROM. They contain selected illustrations, photos, and tables from the text. Instructors can use them 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.

Beyond the introductory text by Hillman, 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 to use one or more parts of the series.

When I entered the profession of athletic training over 25 years ago, one text—*Prevention and Care of Athletic Injuries* by Klafs and Arnheim—covered nearly all the subject matter required for passing the NATA Board of Certification examination and practice as an entry-level athletic trainer. Since that time we have witnessed an amazing expansion of the information and skills one must master 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

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May your lives be as rich in the joy, love, and fulfillment with which  
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# Contents

Preface	xi
Acknowledgments	xiv
Introduction to the Athletic Training Education Series	xv
Credits	xvii

<b>Part I</b>	<b>BASIC CONCEPTS</b>	<b>1</b>
<b>Chapter 1</b>	<b>Concepts of Rehabilitation</b>	<b>3</b>
	The Rehabilitation Team	4
	Interacting With Team Members	7
	Qualities of Professionalism	9
	Components of a Rehabilitation Program	13
	Basic Components of Therapeutic Exercise	21
	Return-to-Competition Criteria	23
	Psychological Considerations	23
	Learning Aids	26
<b>Chapter 2</b>	<b>Concepts of Healing</b>	<b>29</b>
	Primary and Secondary Healing	37
	Healing Phases	37
	Growth Factors	44
	Healing of Specific Tissues	46
	Tensile Strength During Healing	51
	Factors That Affect Healing	52
	The Role of Therapeutic Exercise in Healing	58
	Learning Aids	60
<b>Chapter 3</b>	<b>Concepts in Physics</b>	<b>65</b>
	Force	66
	Newton's Laws of Motion	67
	Center of Gravity	68
	Stability and Fixation	70
	Body Levers	72
	Levers and Force	75
	Physiological Muscle Advantages	76
	Other Concepts in Physics	78
	Learning Aids	82

Chapter <b>4</b>	<b>Examination and Assessment</b>	<b>87</b>
	Examination: Making a Profile	89
	Assessment: Planning for Action	99
	Keeping Rehabilitation Records	102
	Learning Aids	116
Part <b>II</b>	<b>THERAPEUTIC EXERCISE PARAMETERS AND TECHNIQUES</b>	<b>121</b>
Chapter <b>5</b>	<b>Range of Motion and Flexibility</b>	<b>123</b>
	Defining Flexibility and Range of Motion	124
	Connective-Tissue Composition	124
	Effects of Immobilization on Connective Tissue	125
	Effects of Remobilization on Connective Tissue	128
	Mechanical Properties and Tissue Behavior in Range of Motion	128
	Neuromuscular Influences on Range of Motion	132
	Determining Normal Range of Motion	134
	Measuring Range of Motion	134
	Terminology in Goniometry	140
	Stretching Techniques	141
	Exercise Progression	147
	Special Considerations	148
	Learning Aids	149
Chapter <b>6</b>	<b>Manual Therapy Techniques</b>	<b>153</b>
	Critical Analysis	155
	Massage	155
	Myofascial Release	158
	Myofascial Trigger Points	165
	Muscle Energy	170
	Joint Mobilization	173
	Neural Mobilization	183
	Learning Aids	193
Chapter <b>7</b>	<b>Muscle Strength and Endurance</b>	<b>197</b>
	Muscle Structure and Function	199
	Neuromuscular Physiology	205
	Fast- and Slow-Twitch Fibers	210
	Muscle Strength, Power, and Endurance	211

Force Production	214
Types of Muscle Activity	217
Open and Closed Kinetic Chain Activity	219
Evaluating Muscle Strength	221
Gradations of Muscle Activity	230
Strength Equipment	231
Proprioceptive Neuromuscular Facilitation	242
Strengthening Principles	248
Exercise Progression	252
Learning Aids	254

## Chapter **8** The ABCs of Proprioception **259**

Neurophysiology of Proprioception	261
Central Nervous System Proprioceptor Sites	263
Balance	264
Coordination	266
Agility	268
Therapeutic Exercise for Proprioception	269
Learning Aids	273

## Chapter **9** Plyometrics **275**

Neuromuscular Principles	277
Plyometric Force Production	278
Plyometric Exercise Phases	279
Preplyometric Considerations	280
Plyometric Program Design	281
Plyometric Program Considerations	283
Precautions and Contraindications	285
Equipment	285
Lower-Extremity Plyometrics	288
Upper-Extremity and Trunk Plyometrics	296
Learning Aids	298

## Chapter **10** Functional Exercise **301**

Definitions, Foundations, and Goals	303
Contributions to Therapeutic Exercise	303
Basic Functional Activities	305
Advanced Functional Activities	306
Advanced Functional Exercise Progression	306
Precautions	308

Functional Evaluation	309	
A Lower-Extremity Functional Progression	310	
An Upper-Extremity Functional Progression	315	
Returning the Patient to Full Participation	319	
Learning Aids	320	
<b>Part III GENERAL THERAPEUTIC EXERCISE APPLICATIONS</b>		<b>323</b>
<b>Chapter 11 Posture and Body Mechanics</b>		<b>325</b>
Posture	326	
Muscle Imbalances	337	
Body Mechanics	340	
Body-Awareness Programs	345	
Learning Aids	351	
<b>Chapter 12 Ambulation and Ambulation Aids</b>		<b>355</b>
Normal Gait	356	
Pathological Gait	375	
Normal Running Gait	377	
Mechanics of Ambulation with Assistive Devices	381	
Learning Aids	387	
<b>Chapter 13 Aquatic Therapeutic Exercise</b>		<b>391</b>
Physical Properties and Principles of Water	393	
Equipment	396	
Indications, Advantages, Precautions, and Contraindications	400	
Aquatic Therapeutic Exercise Principles and Guidelines	402	
Deep-Water Exercise	404	
Aquatic Therapeutic Exercises	405	
Learning Aids	421	
<b>Chapter 14 Swiss Balls and Foam Rollers</b>		<b>425</b>
Swiss Balls	426	
Swiss-Ball Exercises	430	
Foam Rollers	444	
Foam-Roller Exercises	445	
Learning Aids	453	