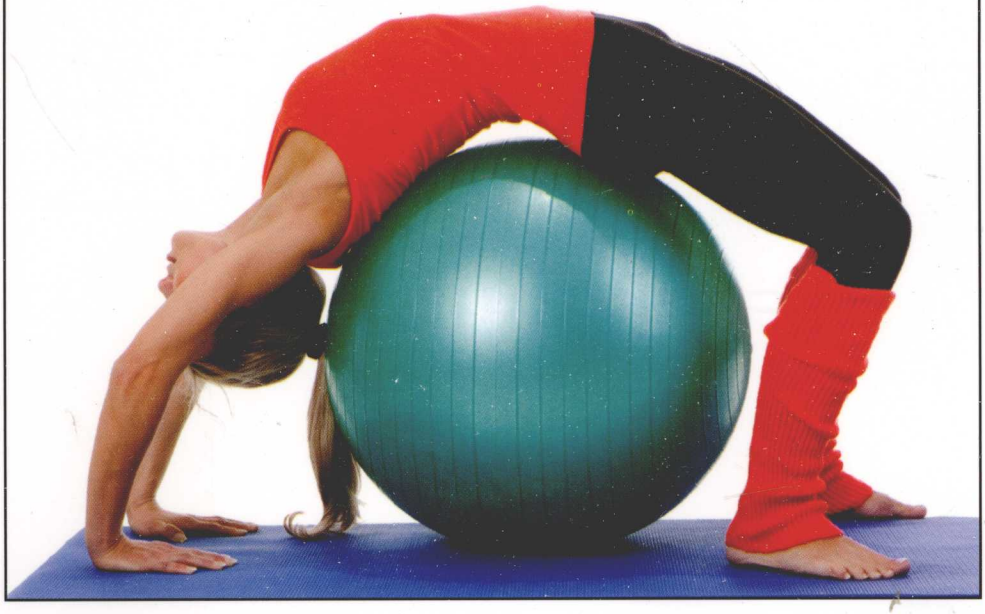
FIFTH EDITION

REHABILITATION TECHNIQUES

for Sports Medicine and Athletic Training

William E. Prentice



McGRAW-HILL INTERNATIONAL EDITION

Fifth Edition

Rehabilitation Techniques for Sports Medicine and Athletic Training

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REHABILITATION TECHNIQUES FOR SPORTS AND ATHLETIC TRAINING
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Preface

This fifth edition of *Rehabilitation Techniques for Sports Medicine and Athletic Training* is for the student of athletic training who is interested in gaining more in-depth exposure to the theory and practical application of rehabilitation techniques used in a sports medicine environment.

The purpose of this text is to provide the athletic trainer with a comprehensive guide to the design, implementation, and supervision of rehabilitation programs for sport-related injuries. It is intended for use in advanced courses in athletic training that deal with practical application of theory in a clinical setting. The contributing authors have collectively attempted to combine their expertise and knowledge to produce a single text that encompasses all aspects of sports medicine rehabilitation.

ORGANIZATION

This fifth edition is divided into four parts. Part One discusses the basics of the rehabilitation process. It begins by discussing the important considerations in designing a rehabilitation program for the injured patient and providing a basic overview of the rehabilitation process (Chapter 1). It is essential for the athletic trainer to understand the importance of the healing process and how it should dictate the course of rehabilitation (Chapter 2). The evaluation process is critical in first determining the exact nature of an existing injury and then designing a rehabilitation program based on the findings of that evaluation (Chapter 3). It is also essential to be aware of the psychological aspects of rehabilitation with which the injured patient must deal (Chapter 4).

Part Two deals with achieving the goals of rehabilitation. The chapters address primary goals of any sports medicine rehabilitation program: establishing core stability (Chapter 5), reestablishing neuromuscular control (Chapter 6), regaining postural stability and balance (Chapter 7), restoring range of motion and improving flexibility (Chapter 8), regaining muscular strength, endurance, and power (Chapter 9), and maintaining cardiorespiratory fitness during rehabilitation (Chapter 10).

Athletic trainers have many rehabilitation "tools" with which they can choose to treat an injured athlete. How they choose to use these tools is often a matter of personal preference. Part Three discusses in detail how these tools can be best incorporated into a rehabilitation program to achieve the goals identified in the first section. The chapters in Part Three focus on primary tools of rehabilitation: plyometric exercise (Chapter 11), open- versus closed-kinetic-chain exercise (Chapter 12), joint mobilization and traction techniques (Chapter 13), proprioceptive neuromuscular facilitation techniques (Chapter 14), aquatic therapy (Chapter 15), and functional progressions and functional testing (Chapter 16).

Part Four of this text goes into great detail on specific rehabilitation techniques that are used in treating a variety of injuries. Specific rehabilitation techniques are included for the shoulder (Chapter 17), the elbow (Chapter 18), the wrist, hand, and fingers (Chapter 19), the groin, hip, and thigh (Chapter 20), the knee (Chapter 21), the lower leg (Chapter 22), the ankle and foot (Chapter 23), and the spine (Chapter 24). Each chapter begins with a discussion of the pertinent functional anatomy and biomechanics of that region. An extensive series of photographs illustrating a wide variety of rehabilitative exercises is presented in each chapter. The last portion of each chapter involves in-depth discussion of the pathomechanics, injury mechanism, rehabilitation concerns, rehabilitation progressions, and finally, criteria for return to activity for specific injuries.

As will become readily apparent, the updated fifth edition of *Rehabilitation Techniques for Sports Medicine and Athletic Training* offers a comprehensive reference and guide emphasizing the most current techniques of sport injury rehabilitation for the athletic trainer overseeing programs of rehabilitation.

COMPREHENSIVE COVERAGE OF RESEARCH-BASED MATERIAL

Compared to some of the other health care specializations, athletic training is still in its infancy. Growth dictates the necessity for expanding our research efforts to identify new and more effective methods and techniques for dealing with sport-related injury. Any athletic trainer charged with the responsibility of supervising a rehabilitation program knows that the most currently accepted and up-to-date rehabilitation protocols tend to change rapidly. A sincere effort has been made by the contributing authors to present the most recent information on the various aspects of injury rehabilitation currently available for the literature.

Additionally, this manuscript has been critically reviewed by selected athletic trainers who are well-respected clinicians, educators, and researchers in this field to further ensure that the material presented is accurate and current.

PERTINENT TO THE ATHLETIC TRAINER

Many texts are currently available on the subject of rehabilitation of injury in various patient populations. However, the fifth edition of this text concentrates exclusively on the application of rehabilitation techniques in a sport-related setting for a unique sports medicine emphasis.

PEDAGOGICAL AIDS

The teaching aids provided in this text to assist the student include the following:

Objectives. These goals are listed at the beginning of each chapter to introduce students to the points that will be emphasized.

Figures and Tables. The number of new photos and tables included throughout the text has been significantly increased in an effort to provide as much visual and graphic demonstration of specific rehabilitation techniques and exercises as possible.

Clinical Decision-Making Exercises. Approximately 150 clinical decision-making exercises are found throughout the text to challenge the student to integrate and apply the information presented in this text to clinical cases that typically occur in an athletic training setting. Solutions for each exercise are presented at the end of each chapter.

Rehabilitation Plans. Rehabilitation Plans can be found in each chapter in Part Four as examples of case studies that help apply the thought process an athletic trainer should use in developing and implementing a rehabilitation program.

Summary. Each chapter has a summary list that reinforces the major points presented.

References. A comprehensive list of up-to-date references is presented at the end of each chapter to guide the reader to additional information about the chapter content.

Glossary. A glossary of terms is provided for quick reference.

ANCILLARIES

Laboratory Manual. A new Laboratory Manual accompanies the fifth edition of *Rehabilitation Techniques for Sports Medicine and Athletic Training.* It has been prepared by Dr. Tom Kaminski of the University of Delaware to provide hands-on directed learning experiences for students using the text. It includes practical laboratory exercises designed to enhance student understanding. The Laboratory Manual is available for download at www.mhhe.com/prenticerehab5e

Connect Principles of Athletic Training is a new online learning system composed of interactive exercises and assessments, like those that appear on the NATA's new Board of Certification exam. Videos, animations, and other multimedia features will enable students to visualize complicated concepts ad practice skills. All of the activities are automatically graded and can be submitted to the instructor's grade book. For more information, visit www.mcgrawhillconnect.com

TO THE STUDENT

Connect Principles of Athletic Training is an interactive digital product which can help you study for the NATA's Board of Certification exam. Ask your instructor if this product is available through your bookstore.

ACKNOWLEDGMENTS

The preparation of the manuscript for a textbook is a long-term and extremely demanding effort that requires input and cooperation on the part of many individuals. I would like to personally thank each of the contributing authors. They were asked to contribute to this text because I have tremendous respect for them both personally and professionally. These individuals have distinguished themselves as educators and clinicians dedicated to the field of athletic training. I am exceedingly grateful for their input.

Gary O'Brien, my developmental editor, as always, has been persistent and diligent in the completion of this text. He has patiently encouraged me along, and I certainly have appreciated his support. I have come to rely heavily on Jill Eccher, my project manager. She makes certain that all of the details on a project such as this are taken care of and I greatly appreciate her input and opinions.

The following individuals have invested a significant amount of time and energy as reviewers for this manuscript, and I appreciate their efforts.

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Finally, and most importantly, this is for my family—Tena, Brian, and Zach—who make an effort such as this worthwhile.

Bill Prentice

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Brief Contents

PART ONE The Basis of Injury Rehabilitation

1 Essential Considerations in Designing a Rehabilitation Program for the Injured Patient 1
2 Understanding and Managing the Healing Process through Rehabilitation 18
3 The Evaluation Process in Rehabilitation 46
4 Psychological Considerations for Rehabilitation of the Injured Patient 71

PART TWO Achieving the Goals of Rehabilitation

5 Establishing Core Stability in Rehabilitation 97
6 Reestablishing Neuromuscular Control 122
7 Regaining Postural Stability and Balance 144
8 Restoring Range of Motion and Improving Flexibility 175
9 Regaining Muscular Strength and Endurance 197
10 Maintaining Aerobic Capacity and Endurance during Rehabilitation 214

PART THREE The Tools of Rehabilitation

11 Plyometrics in Rehabilitation 227
12 Open- versus Closed-Kinetic-Chain Exercise in Rehabilitation 248
13 Joint Mobilization and Traction Techniques in Rehabilitation 267
14 Proprioceptive Neuromuscular Facilitation Techniques in Rehabilitation 296
15 Aquatic Therapy in Rehabilitation 318
16 Functional Progressions and Functional Testing in Rehabilitation 340

PART FOUR Rehabilitation Techniques for Specific Injuries

17 Rehabilitation of Shoulder Injuries 364
18 Rehabilitation of Elbow Injuries 418
19 Rehabilitation of Wrist, Hand, and Finger Injuries 451
20 Rehabilitation of Groin, Hip, and Thigh Injuries 484
21 Rehabilitation of Knee Injuries 526
22 Rehabilitation of Lower-Leg Injuries 579
23 Rehabilitation of Ankle and Foot Injuries 608
24 Rehabilitation of Injuries to the Spine 646

Glossary 692

Index 697

Contents

PART ONE The Basis of Injury Rehabilitation

1 Essential Considerations in Designing a Rehabilitation Program for the Injured Athlete
William E. Prentice

The Rehabilitation Team – 2
The Philosophy of Sports Medicine Rehabilitation – 4
Establishing Short- and Long-Term Goals in a Rehabilitation Program – 7
Documentation in Rehabilitation – 15
Legal Considerations in Supervising a Rehabilitation Program – 16
Summary –16

2 Understanding and Managing the Healing Process through Rehabilitation
William E. Prentice

Understanding the Healing Process – 18
Injuries to Articular Structures – 24
Injuries to Bone – 28
Injuries to Musculotendinous Structures – 30
Injuries to Nerve Tissue – 34
Additional Musculoskeletal Injuries – 36
Incorporating Therapeutic Exercise to Affect the Healing Process – 38
Using Medications to Affect the Healing Process – 39
Rehabilitation Philosophy – 41
Summary – 42

3 The Evaluation Process in Rehabilitation
Darin A. Padua

The Systematic Differential Evaluation Process – 47
Injury Prevention Screening – 63
Documenting Findings – 64
Summary – 69

4 Psychological Considerations for Rehabilitation of the Injured Athlete
Elizabeth G. Hedgpeth
Joe Gieck

Acculturation – 71
Predictors of Injury – 73
Progressive Reactions Depend on Length of Rehabilitation – 76
Dealing with Short-Term Injury – 77
Dealing with Long-Term Injury – 78
Dealing with Chronic Injury – 82
Dealing with a Career-Ending Injury – 84
Compliance and Adherence to Rehabilitation – 85
Pain as a Deterrent to Compliance – 88
Return to Competition – 89
Interpersonal Relationship between Athlete and Athletic Trainer – 90
Summary – 92

PART TWO Achieving the Goals of Rehabilitation

5 Establishing Core Stability in Rehabilitation
Mike Clark
Barbara J. Hoogenboom
Jolene L. Bennett

What Is the Core? – 98
Core Stabilization Training Concepts – 99
Review of Functional Anatomy – 99
Transversus Abdominus and Multifidus Role in Core Stabilization – 103
Postural Considerations – 104
Muscular Imbalances – 104
Neuromuscular Considerations – 105
Scientific Rationale for Core Stabilization Training – 105
Assessment of the Core – 106
Core Stabilization Training Program – 108
Guidelines for Core Stabilization Training – 116
Summary – 117

6 Reestablishing Neuromuscular Control
Scott Lephart
C. Buz Swanik
Freddie Fu
Kellie Huxel
Why Is Neuromuscular Control Critical to the Rehabilitation Process? – 122
What Is Neuromuscular Control? – 123
The Physiology of Mechanoreceptors – 124
Neural Pathways of Peripheral Afferents – 125
Feed-Forward and Feedback Neuromuscular Control – 125
Reestablishing Neuromuscular Control – 126
Functional Activities – 136
Summary – 138

7 Regaining Postural Stability and Balance
Kevin M. Guskiewicz
Postural Control System – 145
Control of Balance – 145
Somatosensation as It Relates to Balance – 147
Balance as It Relates to the Closed Kinetic Chain – 148
Balance Disruption – 148
Assessment of Balance – 149
Injury and Balance – 154
Balance Training – 156
Dual-Task Balance Training and Assessment – 168
Clinical Value of High-Tech Training and Assessment – 170
Summary – 170

8 Restoring Range of Motion and Improving Flexibility
William E. Prentice
Importance of Flexibility to the Patient – 176
Anatomic Factors That Limit Flexibility – 176
Active and Passive Range of Motion – 177
Stretching to Improve Mobility – 178
Neurophysiologic Basis of Stretching – 179
Effects of Stretching on the Physical and Mechanical Properties of Muscle – 179
Effects of Stretching on the Kinetic Chain – 180
Importance of Increasing Muscle Temperature Prior to Stretching – 180
Stretching Techniques – 180
Specific Stretching Exercises – 183
Alternative Stretching Techniques – 184
Manual Therapy Techniques for Increasing Mobility – 186
Summary – 193

9 Regaining Muscular Strength and Endurance
William E. Prentice
Types of Skeletal Muscle Contraction – 198
Factors That Determine Levels of Muscular Strength, Endurance, and Power – 198
The Physiology of Strength Development – 200
Techniques of Resistance Training – 201
Core Stabilization Strengthening – 209
Training for Muscular Strength versus Muscular Endurance – 209
Resistance Training Differences between Males and Females – 210
Resistance Training in the Adolescent – 210
Specific Resistive Exercises Used in Rehabilitation – 210
Summary – 211

10 Maintaining Aerobic Capacity and Endurance during Rehabilitation
William E. Prentice
Training Effects on the Cardiorespiratory System – 215
Maximal Aerobic Capacity – 217
Producing Energy for Exercise – 219
Techniques for Maintaining Cardiorespiratory Endurance – 220
Combining Continuous and Interval Training – 222
Caloric Thresholds and Targets – 223
Detraining – 223
Summary – 223

PART THREE The Tools of Rehabilitation

11 Plyometrics in Rehabilitation
Steve Tippett
Michael Voight
What Is Plyometric Exercise? – 228
Biomechanical and Physiological Principles of Plyometric Training – 229
Program Development – 232
Plyometric Program Design – 234
Guidelines for Plyometric Programs – 236
Integrating Plyometrics into the Rehabilitation Program: Clinical Concerns – 237
Specific Plyometric Exercises – 238
Summary – 245

12 Open- versus Closed-Kinetic-Chain Exercise in Rehabilitation
William E. Prentice

Concept of the Kinetic Chain – 249
Advantages and Disadvantages of Open- versus Closed-Kinetic-Chain Exercises – 249
Using Closed-Kinetic-Chain Exercises to Regain Neuromuscular Control – 250
Biomechanics of Open- versus Closed-Kinetic-Chain Activities in the Lower Extremity – 251
Closed-Kinetic-Chain Exercises for Rehabilitation of Lower-Extremity Injuries – 253
Biomechanics of Open- versus Closed-Kinetic-Chain Activities in the Upper Extremity – 257
Open- and Closed-Kinetic-Chain Exercises for Rehabilitation of Upper-Extremity Injuries – 258
Summary – 262

13 Joint Mobilization and Traction Techniques in Rehabilitation
William E. Prentice

Relationship between Physiological and Accessory Motions – 267
Joint Arthrokinematics – 268
Joint Positions – 270
Joint Mobilization Techniques – 270
Joint Traction Techniques – 274
Mobilization and Traction Techniques – 275
Mulligan Joint Mobilization Technique – 291
Summary – 292

14 Proprioceptive Neuromuscular Facilitation Techniques in Rehabilitation
William E. Prentice

PNF as a Technique for Improving Strength and Enhancing Neuromuscular Control – 296
Basic Principles of PNF – 297
Basic Strengthening Techniques – 298
PNF Patterns – 300
PNF as a Technique of Stretching for Improving Range of Motion – 310
Muscle Energy Techniques – 313
Summary – 314

15 Aquatic Therapy in Rehabilitation
Barbara Hoogenboom
Nancy Lomax

Physical Properties and Resistive Forces – 319
Advantages and Benefits of Aquatic Rehabilitation – 323
Disadvantages of Aquatic Rehabilitation – 325
Facilities and Equipment – 326
Water Safety – 328
Aquatic Techniques – 328
Special Techniques – 335
Conclusions – 336
Summary – 336

16 Functional Progressions and Functional Testing in Rehabilitation
Michael McGee

The Role of Functional Progressions in Rehabilitation – 340
Benefits of Using Functional Progressions – 341
Psychological and Social Considerations – 342
Components of a Functional Progression – 343
Designing a Functional Progression – 344
Functional Testing – 345
Examples of Functional Progressions and Testing – 346
Carolina Functional Performance Index (CFPI) – 358
Applying Functional Progressions to a Specific Sport Case – 358
Conclusion – 359
Summary – 359

PART FOUR Rehabilitation Techniques for Specific Injuries

17 Rehabilitation of Shoulder Injuries
Rob Schneider
Joseph B. Myers
Terri Jo Rucinski

Functional Anatomy and Biomechanics – 364
Rehabilitation Techniques for the Shoulder – 376
Rehabilitation Techniques for Specific Injuries – 389
Summary – 411

18 Rehabilitation of Elbow Injuries
Pete Zulia
William E. Prentice

Functional Anatomy and Biomechanics – 418
Rehabilitation Techniques for the Elbow Complex – 422
Rehabilitation Techniques for Specific Injuries – 433
Aquatic Therapy Techniques to Assist in the Rehabilitation of the Elbow – 444
Throwing Program for Return to Sport – 446
Summary – 447

19 Rehabilitation of Wrist, Hand, and Finger Injuries
Anne Marie Schneider

Functional Anatomy and Biomechanics – 451
The Hand – 452
Rehabilitation Techniques for Specific Injuries – 453
Summary – 481

20 Rehabilitation of Groin, Hip, and Thigh Injuries
Bernie DePalma
Doug Halverson
Functional Anatomy and Biomechanics – 484
Rehabilitation Techniques for the Groin, Hip, and Thigh – 487
Rehabilitation Techniques for Acute Groin, Hip, and Thigh Injuries – 500
Chronic Groin, Hip and Thigh Injuries – 517
Summary – 523

21 Rehabilitation of Knee Injuries
Darin A. Padua
Michelle C. Boling
William E. Prentice
Functional Anatomy and Biomechanics – 526
Rehabilitation Techniques – 529
Rehabilitation Techniques for Ligamentous and Meniscal Injuries – 541
Rehabilitation Techniques for Patellofemoral and Extensor Mechanism Injuries – 555
Summary – 572

22 Rehabilitation of Lower-Leg Injuries
Christopher J. Hirth
Functional Anatomy and Biomechanics – 579
Rehabilitation Techniques for the Lower Leg – 580
Rehabilitation Techniques for Specific Injuries – 590
Summary – 603

23 Rehabilitation of Ankle and Foot Injuries
Skip Hunter
Steven M. Zinder
William E. Prentice
Functional Anatomy and Biomechanics – 608
Rehabilitation Techniques – 611
Rehabilitation Techniques for Specific Injuries – 621
Summary – 641

24 Rehabilitation of Injuries to the Spine
Daniel N. Hooker
William E. Prentice
Functional Anatomy and Biomechanics – 646
The Importance of Evaluation in Treating Back Pain – 648
Rehabilitation Techniques for the Low Back – 651
Spinal Segment Control Exercise – 651
Rehabilitation Techniques for Low Back Pain – 665
Rehabilitation Techniques for Thoracic Spine Conditions – 681
Rehabilitation Techniques for the Cervical Spine – 683
Summary 687

Glossary – 692

Index – 697

PART ONE

The Basis of Injury Rehabilitation

1 Essential Considerations in Designing a Rehabilitation Program for the Injured Patient

2 Understanding and Managing the Healing Process through Rehabilitation

3 The Evaluation Process in Rehabilitation

4 Psychological Considerations for Rehabilitation of the Injured Patient

CHAPTER 1

Essential Considerations in Designing a Rehabilitation Program for the Injured Patient

William E. Prentice

After completing this chapter, the athletic training student should be able to do the following:

- Describe the relationships among the members of the rehabilitation team: the athletic trainers, team physicians, coaches, strength and conditioning specialists, athlete, and athlete's family.
- Express the philosophy of the rehabilitative process in a sports medicine environment.
- Realize the importance of understanding the healing process, the biomechanics, and the psychological aspects of a rehabilitation program.
- Arrange the individual short-term and long-term goals of a rehabilitation program.
- Discuss the components that should be included in a well-designed rehabilitation program.
- Propose the criteria and the decision-making process for determining when the injured patient may return to full activity.

One of the primary goals of every sports medicine professional is to create a playing environment that is as safe as it can possibly be. Regardless of that effort, the nature of participation in sport and physical activity dictates that injuries will eventually occur. Fortunately, few of the injuries that occur in an athletic setting are life-threatening. The majority of the injuries are not serious and lend themselves to rapid rehabilitation. When injuries do occur, the focus of the athletic trainer shifts from injury prevention to injury treatment and rehabilitation. In a sports medicine setting, the athletic trainer generally assumes primary responsibility for the design, implementation, and supervision of the rehabilitation program for the injured athlete.

The athletic trainer responsible for overseeing an exercise rehabilitation program must have as complete an understanding of the injury as possible, including knowledge of how the injury was sustained, the major anatomical structures affected, the degree or grade of trauma, and the stage or phase of the injury's healing.[2,12]

THE REHABILITATION TEAM

Providing a comprehensive rehabilitation program for an injured patient in an athletic environment requires a group effort to be most effective. The rehabilitation process requires communication among a number of individuals, each of whom must perform specific functions relative to caring for the injured athlete. Under ideal conditions, the athletic trainer (and the athletic training students), the athlete, the physician, the coaches, the strength and conditioning specialist, and the injured athlete's family will communicate freely and function as a team. This group is intimately involved with the rehabilitative process, beginning with patient assessment, treatment selection, and implementation, and ending

with functional exercises and return to activity. The athletic trainer directs the post-acute phase of the rehabilitation, and it is essential that the patient understand that this part of the recovery is just as crucial as surgical technique to the return of normal joint function and the subsequent return to full activity. All decisions made by the physician, the athletic trainer, and the coaches which dictate the course of rehabilitation ultimately affect the injured patient.

CLINICAL DECISION MAKING Exercise 1–1

A team physician has diagnosed a swimmer with thoracic outlet syndrome. The athletic trainer is developing a rehabilitation plan for this patient. What considerations must be taken into account?

Of all the members of the rehabilitation team charged with providing health care, perhaps none is more intimately involved than the athletic trainer. The athletic trainer is the one individual who deals directly with the patient throughout the entire period of rehabilitation, from the time of the initial injury until the complete, unrestricted return to activity. The athletic trainer is most directly responsible for all phases of health care in an athletic environment, including preventing injuries from occurring, providing initial first aid and injury management, evaluating and diagnosing injuries, and designing and supervising a timely and effective program of rehabilitation that can facilitate the safe and expeditious return to activity.

In 2004 the Board of Certification (BOC) completed the latest role delineation study, which defines the profession of athletic training. This study was designed to examine the primary tasks performed by the entry-level athletic trainer and the knowledge and skills required to perform each task. The panel determined that the roles of the practicing athletic trainer could be divided into six major areas or performance domains: prevention; clinical evaluation and diagnosis; immediate care; organization and administration; professional responsibilities; and treatment, rehabilitation, and reconditioning.

An athletic trainer must work closely with and under the supervision of the team physician with respect to designing rehabilitation and reconditioning protocols that make use of appropriate therapeutic exercise, rehabilitative equipment, manual therapy techniques, or therapeutic modalities. The athletic trainer should then assume the responsibility of overseeing the rehabilitative process, ultimately returning the patient to full activity.

Certainly, the athletic trainer has an obligation to the patient to understand the nature of the injury, the function of the structures damaged, and the different tools available to safely rehabilitate that patient. Additionally, the athletic trainer must understand the treatment philosophy of the patient's physician and be careful in applying different treatment regimens because what may be a safe but outdated technique in the opinion of one physician may be the treatment of choice to another. The successful athletic trainer must demonstrate flexibility in his or her approach to rehabilitation by incorporating techniques that are evidence-based and effective, but somewhat variable from one patient to another, as well as from one physician to another.

Communication is crucial to prevent misunderstandings and a subsequent loss of rapport with either the patient or the physician. The patient must always be informed and made aware of the why, how, and when factors that collectively dictate the course of an injury rehabilitation program.

Any personal relationship takes some time to grow and develop. The relationship between the coach and the athletic trainer is no different. The athletic trainer must demonstrate to the coach his or her capability to correctly manage an injury and guide the course of a rehabilitation program. It will take some time for the coach to develop trust and confidence in the athletic trainer. The coach must understand that what the athletic trainer wants is exactly the same as what the coach wants—to get an injured patient healthy and back to practice as quickly and safely as possible.

This is not to say, however, that the coaches should not be involved with the decision-making process. For example, when a patient is rehabilitating an injury, there may be drills or technical instruction sessions that the individual can participate in without exacerbating the injury. Thus the coaches, athletic trainer, and team physician should be able to negotiate what that individual can and cannot do safely in the course of a practice.

Athletes are frequently caught in the middle between coaches who tell them to do one thing and medical staff who tell them something else. The athletic trainer must respect the job that the coach has to do and should do whatever can be done to support the coach. Close communication between the coach and the athletic trainer is essential so that everyone is on the same page.

CLINICAL DECISION MAKING Exercise 1–2

A gymnast has just had an anterior cruciate ligament (ACL) reconstruction. The orthopedist has prescribed some active range of motion (AROM) exercises to start the rehabilitation process. The patient is progressing very quickly and wants to increase the intensity of her activity. What should the athletic trainer do to address the patient's request?

When rehabilitating an injured patient, particularly in a high school or junior high school setting, the athletic trainer, the coach, and the physician must take the time to explain and inform the patient's parents about the course of the injury rehabilitation process. With a patient of secondary school age, the parents' decisions regarding health care must be of primary consideration. In certain situations, particularly at the high school and middle school levels, many parents will insist that their child be seen by their family physician rather than by the individual who may be designated as the team physician. This creates a situation in which the athletic trainer must work and communicate with many different "team physicians." The opinion of the family physician must be respected even if that individual has little or no experience with injuries related to sports.

It should be clear that the physician working in cooperation with the athletic trainer assumes the responsibility of making the final decisions relative to the course of rehabilitation for the patient from the time of injury until full return to activity. The coaches must defer to and should support the decisions of the medical staff in any matter regarding the course of the rehabilitative process.

THE PHILOSOPHY OF SPORTS MEDICINE REHABILITATION

The approach to rehabilitation is considerably different in a sports medicine environment than in most other rehabilitation settings.[1] The competitive nature of athletics necessitates an aggressive approach to rehabilitation. Because the competitive season in most sports is relatively short, the patient does not have the luxury of being able to sit around and do nothing until the injury heals. The goal is to return to activity as soon as is safely possible. Consequently, the athletic trainer tends to play games with the healing process, never really allowing enough time for an injury to completely heal. The athletic trainer who is supervising the rehabilitation program usually performs a "balancing act"—walking along a thin line between not pushing the patient hard enough or fast enough and being overly aggressive. In either case, a mistake in judgment on the part of the athletic trainer can hinder return to activity.

Understanding the Healing Process

Decisions as to when and how to alter or progress a rehabilitation program should be based primarily on the process of injury healing. The athletic trainer must possess a sound understanding of both the sequence and the time frames for the various phases of healing, realizing that certain physiological events must occur during each of the phases. Anything that is done during a rehabilitation program that interferes with this healing process will likely increase the length of time required for rehabilitation and slow return to full activity. The healing process must have an opportunity to accomplish what it is supposed to. At best the athletic trainer can only try to create an environment that is conducive to the healing process. Little can be done to speed up the process physiologically, but many things can impede healing (see Chapter 2).

Exercise Intensity. The **SAID Principle** (an acronym for Specific Adaptation to Imposed Demand) states that when an injured structure is subjected to stresses and overloads of varying intensities, it will gradually adapt over time to whatever demands are placed upon it.[14] During the rehabilitation process, the stresses of reconditioning exercises must not be so great as to exacerbate the injury before the injured structure has had a chance to adapt specifically to the increased demands. Engaging in exercise that is too intense or too prolonged can be detrimental to the progress of rehabilitation. Indications that the intensity of the exercises being incorporated into the rehabilitation program exceed the limits of the healing process include an increase in the amount of swelling, an increase in pain, a loss or a plateau in strength, a loss or a plateau in range of motion, or an increase in the laxity of a healing ligament.[23] If an exercise or activity causes any of these signs, the athletic trainer must back off and become less aggressive in the rehabilitation program.

CLINICAL DECISION MAKING **Exercise 1–3**

A baseball player recently underwent surgery to repair a superior labrum anterior and posterior (SLAP) lesion and torn rotator cuff. He wants to know why he can't start throwing right away. What is your reason for why he must progress slowly?

In most injury situations, early exercise rehabilitation involves submaximal exercise performed in short bouts that are repeated several times daily. Exercise intensity must be commensurate with healing. As recovery increases, the intensity of exercise also increases, with the exercise performed less often. Finally, the patient returns to a conditioning mode of exercise, which often includes high-intensity exercise three to four times per week.