

FOUNDATIONS OF Athletic Training

Prevention, Assessment, and Management

sixth edition

Marcia K. Anderson

Foundations of Athletic Training

Prevention, Assessment, and Management

SIXTH EDITION

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Foundations of Athletic Training

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SIXTH EDITION

Preface

Four major goals were established for the sixth edition of *Foundations of Athletic Training*. The primary goal was to continue to provide the most current and comprehensive evidence-based content related to the prevention, assessment, and management of injuries and illnesses sustained by physically active individuals. A second goal was to acknowledge the importance and significance of the *Role Delineation Study* (RDS) published by the Board of Certification. The RDS identifies the essential knowledge and skills for the athletic trainer and serves as a blueprint for the development of the certification examination and entry into the profession. As in past editions, each chapter continues to provide critical information that meets or exceeds the specific RDS competencies covered within the chapter. A third goal was to enhance learning potential through the actual presentation of information. In particular, the extensive color art program provides realistic and accurate visualizations of musculoskeletal anatomy, injuries and medical conditions, assessment, and management techniques. The fourth goal also pertained to content presentation. In an effort to continue our tradition of providing special pedagogical features in a visually pleasing format, multicolor borders and formatting have been used to identify critical boxes, application strategies, and tables as a way to highlight key information.

Foundations of Athletic Training has undergone extensive review from leaders in the athletic training field. The review process has been instrumental in enabling us to achieve our goal of developing the most comprehensive text available for athletic training educators and students. The text has been reorganized into seven parts.

Section I, Foundations for the Prevention of Sports Injuries, features new information in Chapter 1 Injury Care and the Athletic Trainer on various new job settings and the integration of emergency medical technicians and paramedics as part of the health care team. Updated information is provided in Chapter 2, Preparticipation Examination and Chapter 3, Protective Equipment. Chapter 4, Protective Taping and Wrapping has added information on the makeup of tape, different types of tape, and the new PowerFlex Taping System.

Section II, Clinical Examination and Diagnosis, includes four new chapters. Chapter 5, Evidence-Based Health Care, discusses evidence-based research as it relates to athletic training clinical practice and is described through a systematic approach to answer clinical questions through the review and application of existing research to improve patient outcomes. Injury assessment has been separated into two distinct new chapters. Chapter 6, Clinical Assessment and Diagnosis, discusses the assessment process for the purposes of developing a complex therapeutic intervention program, detailing the subjective evaluation, objective evaluation, assessment, and plan (SOAP) sequence for an off the field assessment. The new Chapter 7, Acute Injuries: Assessment and Disposition, provides strategies for preventing and preparing for emergency situations and minimizing the extent of injury. Assessment methods for evaluating patients with acute injury are then discussed followed by strategies to remove patients from the injury site following the most current best practices as recommended by the National Athletic Trainers' Association. Finally, the chapter provides a review of the leading causes of sudden death in sports along with the recognition and acute management of these conditions. The new Chapter 8, Assessment of Body Alignment Posture and Gait, describes somatotyping, an overview of posture, information on how to conduct a postural assessment, and how to identify normal and faulty posture and interpret the findings. The second half of this chapter focuses on the principles of gait and gait assessment. Chapter 9, Psychosocial Intervention and Patient Care, has been updated with the most current evidence-based practice in patient care in the psycho-social-emotional domain.

Section III, Therapeutic Interventions, provides updated information on Tissue Healing and Wound Care (Chapter 10), Therapeutic Medications (Chapter 11), Therapeutic Modalities (Chapter 12), and Therapeutic Exercise Program (Chapter 13). As recommended by many reviewers, the joint chapters were rearranged to open with Section IV, Conditions of the Lower Extremity, followed by Section V, Conditions of the Upper Extremity, and finally Section VI, Conditions to the Axial Region. The most current information is provided on concussions, baseline concussion testing protocol, including the SCAT3, VOMS/VORS, and cranial nerve assessments, followed by the graduated return-to-play protocols for patients recovering from a concussion. Within each joint area chapter, assessment has been moved earlier in the chapter to immediately follow the section on prevention of injury. The assessment process continues to follow standard protocol including history, observation, palpation, and physical examination tests (e.g., functional tests, stress tests, special tests, neurological tests, and activity-specific functional tests). Care has been taken to provide sensitivity and specificity scores based on current evidence-based research on many of the stress and special tests. Conditions of the senior athlete and female athlete have been integrated into the regular joint chapters.

Section VII, Systemic Conditions and Special Considerations has been updated with current information on Cardiovascular Disorders (Chapter 24), Neurological Conditions (Chapter 25), Respiratory Tract Conditions (Chapter 26), including the use of a peak-flow meter and asthma management, Gastrointestinal Conditions (Chapter 27), Endocrine Conditions (Chapter 28), and Environmental Conditions (Chapter 29). A new Chapter 30 has been devoted to conditions seen in Athletes with Physical Disabilities. Finally, Common Infectious Diseases (Chapter 31) and Dermatology (Chapter 32) are presented.

PEDAGOGICAL FEATURES

Several pedagogical features continue to enhance the text's usefulness as a teaching tool. These in-text features include:

- **Art and Photography Program.** A color art and photography program supplements the material presented in the text. Using an innovative approach that involves drawings within a human model, the illustrations of musculoskeletal anatomy provide a detailed and realistic depiction of structures.
- **Learning Objectives.** Each chapter opens with a series of learning objectives that identify the key concepts in the chapter.
- **Critical Thinking Scenarios.** Critical thinking scenarios are found at the beginning of most of the major sections in each chapter. These scenarios are intended to encourage the student to critically analyze information and apply decision-making knowledge and skills.
- **Key Terminology.** Important terms are bolded within the text. In addition to the explanation of the term in the chapter, these terms are also defined in the glossary.
- **Critical Information Boxes.** These boxes are interspersed throughout each chapter. They are intended to highlight and summarize important information.
- **Tables.** Several chapters have tables that expand on pertinent information discussed in the text. This format allows a large amount of didactic knowledge to be organized in an easy-to-read summary of information.
- **Application Strategies and Management Algorithms.** In several chapters, field strategies and management algorithms are used to present the clinical application of cognitive knowledge.
- **Application Questions.** At the end of each chapter, a series of injury scenarios and discussion questions are provided to enhance class discussions. There is no right answer because multiple variations of the questions can be discussed by the students. This format allows for a freer expression of knowledge and practical application depending on the work setting, activity, age of the participant, and so forth.

- **Summary.** Each chapter has a summary of key concepts discussed in the text.
- **References.** Updated references are provided. The majority of the references have been published within the last 5 years. The primary exceptions are references to original ground-breaking research.
- **Glossary and Index.** An extensive glossary of terms gathered from the highlighted words in the individual chapters is provided at the end of the book. In addition, a comprehensive index contains cross-references to locate specific information within the text.

ANCILLARY MATERIALS

Online resource centers are available to both athletic training educators and athletic training students on the book's companion Web site at <http://thePoint.lww.com/AndersonFound6e>.

Instructor's Resource Center

The online resource center is organized by chapters and includes the following:

- **PowerPoint Presentations.** The PowerPoint presentations were developed with an understanding that instructors and students adopt a variety of strategies when using PowerPoint. The slides provide detailed rather than general information, recognizing that it is simpler for an educator to delete rather than add information. In addition, given the tendency of many students to take notes verbatim from a slide, an effort was made to condense the actual wording of statements to streamline the note-taking process. The presentations can be downloaded and customized to meet specific needs.
- **Supporting Lecture Notes.** The lecture notes correspond to the individual slides comprising the PowerPoint presentations. The notes are not intended to serve as an actual lecture. Rather, they are designed to provide the instructor with information that supports the material presented on the slides. As such, the notes include an additional explanation and background information, as well as examples of concepts.
- **Teaching Strategies.** The teaching strategies provide additional experiences and instructional methods to complement the learning process. In particular, the teaching strategies provide an active, problem-solving, and critical thinking approach to learning. For example, Chapters 10 through 19 contain differential diagnosis problems intended to engage the learner in the analysis of clinical signs and symptoms.
- **Reference Materials.** Each chapter contains a variety of materials intended to supplement the information presented in the text. For example, Chapter 1 provides sample forms pertaining to legal considerations. Chapters 14 through 23 include handouts that pertain to the injury assessment process (i.e., history, observation/inspection, palpation, testing). The handouts provide an extensive amount of information in an organized and easy-to-read format.
- **Worksheets.** Using a variety of formats, the exercises in the worksheets require students to demonstrate knowledge and comprehension, as well as to apply, analyze, synthesize, and evaluate information. In addition, some exercises incorporate the use of psychomotor skills. Answer sheets are provided for the worksheets.
- **Image Bank.** A bank of the various illustrations contained in the text is provided.
- **Articles and Web Links.** A list of articles and Web sites that are pertinent to information in various chapters is provided as a supplement for obtaining additional information.
- **Test Bank.** The bank includes more than 1,500 sample test questions composed of multiple choice, matching, true/false, and short answer questions. The program will allow faculty to add/customize their own test questions.
- **WebCT and Blackboard-Ready Cartridges**

Student Resource Center

The online resource center for students will contain two of the same features available through the instructor's resource center—namely, the reference materials and the Web Links. In addition, the student resource center will include the following:

- **Stedman's Audio Glossary.** The glossary available in the text will also be readily accessible online.
- **Articles and Web Links.** A list of articles and Web sites that are pertinent to information in various chapters is provided as a supplement for obtaining additional information.
- **Electronic Flash Cards.** Interactive flash cards can be an effective way to study important terms and concepts. Students will have the option to view cards by term/concept or by definition.
- **Reference Materials.** Each chapter contains a variety of materials intended to supplement the information presented in the text. For example, Chapter 1 provides sample forms pertaining to legal considerations. Chapters 14 through 23 include handouts that pertain to the injury assessment process (i.e., history, observation/inspection, palpation, testing). The handouts provide an extensive amount of information in an organized and easy-to-read format.
- **Quizzes.** Quizzes use a variety of testing formats, including multiple choice and N-wise multiple choice. These formats are similar to those used on the Board of Certification (BOC) examination.
- **Drag-and-Drop Figure Labeling.** The images can be labeled by dragging the correct descriptor to the corresponding element of the figure.

In addition, purchasers of the text can access the searchable Full Text Online by going to the *Foundations of Athletic Training* Web site at <http://thePoint.lww.com/AndersonFound6e>. See the inside front cover of this text for more details, including the passcode you will need to gain access to the Web site.

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Acknowledgments

The author would like to thank the hardworking and talented staff of Wolters Kluwer. Michael Nobel, John Larkin, and Shauna Kelley who provided enthusiastic support, guidance, and innovative ideas for enhancing this edition of the book. As with any new edition, changes come to the individuals who update and write new chapters. I want to specifically thank Dr. Gail Parr, Professor at Towson University in Baltimore, Maryland for her work over the past decade on this project as a co-author and the individual who developed the online resources for this text and the *Fundamentals in Athletic Training* text. Her contributions were certainly instrumental in the success of this book as a leading athletic training educational text.

I wish to also thank the following individuals who developed new chapters:

Chapter 5, Evidence-Based Health Care, written by Dr. Lisa Juttee, Associate Professor at Xavier University in Cincinnati, Ohio.

Chapter 8, Assessment of Body Alignment Posture and Gait, written by Dr. M. Susan Guyer, Professor of Exercise Science and Sport Studies and ESSS Department Chair & Clinical Education Coordinator of Athletic Training at Springfield College, Springfield, Massachusetts.

Several chapters were also updated by colleagues and friends including:

Chapter 9, Psychosocial Intervention and Patient Care, written by Dr. Victoria Bacon, Clinical Psychologist and Professor of Counselor Education, at Bridgewater State University, Bridgewater, Massachusetts.

Chapter 10, Tissue Healing and Wound Care; Chapter 11, Therapeutic Medications; Chapter 12, Therapeutic Modalities; and Chapter 13, Therapeutic Exercise Program by Pat Cordeiro MS, ATC, CSCS, Assistant Athletic Trainer, Tufts University, Medford, Massachusetts.

Chapter 24, Cardiovascular Disorders; Chapter 25, Neurological Conditions; Chapter 26, Respiratory Tract Conditions; Chapter 27, Gastrointestinal Conditions; Chapter 28, Endocrine Conditions; Chapter 29, Environmental Conditions; Chapter 31, Common Infectious Diseases; and Chapter 32, Dermatology by Dr. Jackie Williams, Program Coordinator, Athletic Training Education, Slippery Rock University, Slippery Rock, Pennsylvania.

In addition to the colleagues working on the chapters, I want to also thank Dr. Dominique Ross, Assistant Professor of Athletic Training & Clinical Education Coordinator at Lasell College, Newton, Massachusetts. Dominique is responsible for updating the Ancillary Materials on thePoint for this project. Her background in clinical education has been instrumental in providing a comprehensive resource center for both instructors and students.

Most especially, I want to thank Dr. Mary Barnum, Professor of Exercise Science and Sport Studies and Program Director of the Athletic Training Program at Springfield College, Springfield, Massachusetts. She has assumed the key leadership role in updating all of the remaining chapters in the text as well as organizing the photography session with Susan Symonds of Infinity Portrait Design from Boston, Massachusetts. Dr. Barnum's knowledge of evidence-based research and clinical skills has surpassed my expectations for the production of this edition. She is a welcomed partner in the project.

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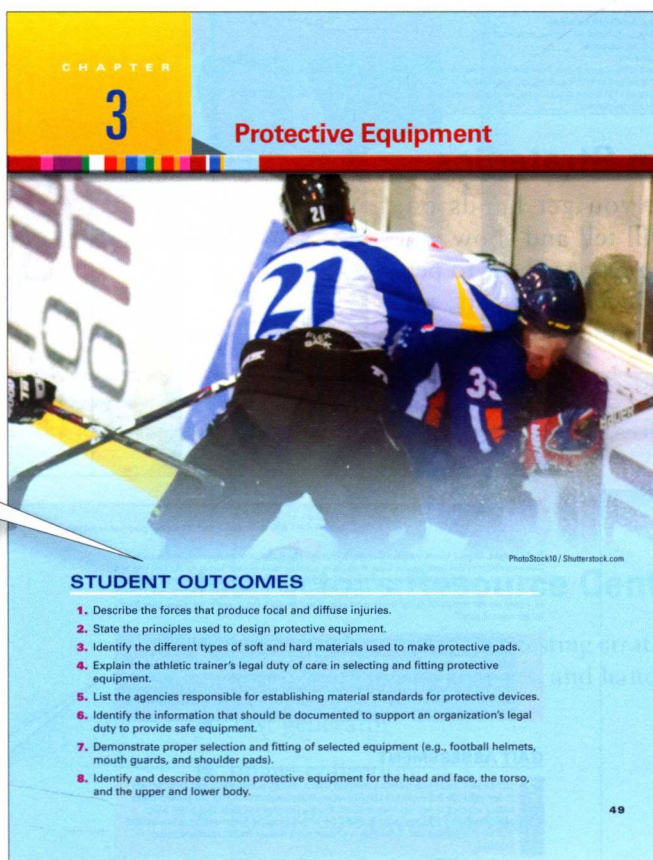
User's Guide

CHAPTER OPENING ELEMENTS

Each chapter begins with the following elements, which will help you get off to the right start.

Outcomes

These are the learning objectives that you need to meet after reading the chapter content. (Here's a tip: Read them again after finishing the chapter as a self-test.)



SPECIAL FEATURES

The new and unique aspects of this edition are shown and explained here so that you can make the most out of them.

Application Strategies

Here is where you get hands on. These boxes will tell and show you in a step-by-step manner how to perform skills, conduct assessments, and teach injury prevention exercises.

APPLICATION STRATEGY 20.1

Cranial Injury Evaluation

Determine the initial level of consciousness.

1. If unconscious or altered level of conscious and/or complaining of neck pain or findings consistent with cervical spine injury:
 - a. Stabilize head and neck.
 - b. Check ABCs.
 - c. Remove equipment.
 - d. Activate the emergency plan, including summoning EMS if necessary.
 - e. Take and monitor vital signs (i.e., pulse, respiration, and blood pressure).
 - f. Babinski reflex.
2. If conscious with no complaints of neck pain or findings consistent with cervical spine injury:
 - a. Take history and assess mental status:
 - Orientation (e.g., time, place, person, and situation-mechanism of injury)
 - Concentration (e.g., count digits backward or recite the months of the year in reverse order)
 - Memory (e.g., names of teams in previous contests, recall of three words and three objects, recent noteworthy events, or details of the contest)
 - Symptoms (e.g., headache, nausea, or tinnitus, pain)
 - b. Observation and inspection
 - Leakage of CSF
 - Signs of trauma (e.g., deformity, body posturing, or discoloration around the eyes and behind the ears)
 - Loss of emotional control (e.g., irritability, aggressiveness, or uncontrolled crying)
 - c. Palpate bony and soft-tissue structures for point tenderness, crepitus, depressions, elevations, swelling, blood, or changes in skin temperature.

Once history reveals the potential that the patient may have sustained a brain injury, vital signs should be assessed at once and the patient inspected for signs of skull and brain trauma. A cranial nerve assessment and assessment of mental status should be conducted followed by administering the SCAT3.

CHAPTER 8 • Assessment of Body Alignment Posture and Gait 203

Body weight, impact forces translated upward through the skeleton from the foot, and muscle tension contribute to this compressive load. Walking or running increases the forces on the hip. Use of a crutch or a cane on the side opposite an injured lower limb serves to more evenly distribute the load between the legs throughout the gait cycle. It is better to use no assistive device than to use a crutch or a cane on the same side as the lower extremity injury because this actually increases joint forces on the injured side.²⁰

The hip and lower extremity is part of a kinetic chain that transfers forces from the ground to body. Each joint within this chain is a link that must function smoothly and effectively to produce an efficient and pain-free gait. By performing a gait assessment, the clinician will be able to determine if the patient has normal muscle and joint function of each link in the kinetic chain that are responsible for walking and running. If dysfunction is found, the location and type of dysfunction will assist the clinician in determining if it is related to or even the cause of the patient's hip pain.

GAIT ASSESSMENT

The 26-year-old female patient presented with a history of recurrent and growing pain in her right hip but could not identify an acute mechanism of injury. The patient began adding running to her exercise program about a year ago and feels that might have something to do with her pain. How will the athletic trainer determine what is a normal gait for this patient and, if the gait is altered, what factors could contribute to her pathology?

The gait cycle (Fig. 8.9) begins with a period of single-leg support in which body weight is supported by one leg while the other leg swings forward. The swing phase can be divided into the initial swing, midswing, and terminal swing. The period of double support begins with the initial contact of the swing leg with the ground or floor. As body weight transfers from the support leg to the swing leg, the swing leg undergoes a loading response and becomes the new support leg. A new period of single support then begins as the swing leg loses ground contact. The time during which body weight is balanced over the support leg is referred to as midstance. As the body's center of gravity shifts forward, the terminal stance phase of the support leg coincides with the terminal swing phase of the opposite leg.

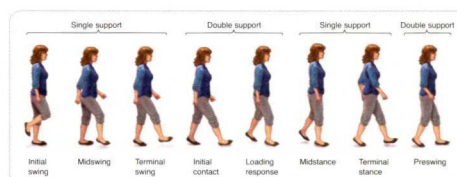


Figure 8.9. Gait. The gait cycle consists of alternating periods of single-leg support and double-leg support.

EMS Alerts

Sometimes injuries and medical conditions can become life threatening, so situations in which the athletic trainer should immediately call for an emergency medical services (EMS) response and transport are highlighted and explained.

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Nearly 60% of tibial fractures involve the middle third of the tibia. Whether open or closed, this fracture is associated with complications such as delayed union, nonunion, or malunion. The most common cause of an isolated tibia fracture is a torsional force, resulting in a spiral or oblique fracture of the lower third of the tibia.

Fracture dislocations usually are caused by a fall from a height with the foot in excessive eversion or inversion or by being kicked while the foot is firmly planted on the ground. Typically, the foot is displaced laterally and the tibia is displaced to the lower leg, and extreme pain is present. This position can compromise the tibia's blood supply and nerve.

Signs and Symptoms

In a simple tibial or fibular fracture, often a crack is heard, and the individual is unable to bear weight on the injured extremity because of intense pain. Gross deformity, gross bone motion at the suspected fracture site, crepitus, immediate swelling, extreme pain, or pain with motion should signal immediate action.

With a comminuted fracture, deformity may or may not be present. The individual presents with tenderness over the distal end of the tibia and the fracture site on the proximal tibia. Any proximal fibular tenderness after a twisting injury calls for radiographs of the ankle, the tibia, and the fibula. A high tibial fracture often requires open reduction and internal fixation between the distal fibula and tibia to maintain the normal relationship of the bones while ligament healing occurs. The screws generally are removed 8 to 12 weeks after surgery.

Management

Management of lower leg, ankle, and foot fractures involves removing the shoe and sock to expose the injured area. If a fracture is suspected, the clinician should perform percussion, compression, and distraction before any movement of the limb. Depending on the site, the techniques listed in Application Strategy 14.2 may be helpful. The clinician also should assess the neurovascular integrity of the limb before and after immobilization by taking a distal pulse at the posterior tibial artery and/or dorsalis pedis artery or by blanching the toenails to determine capillary refill. The clinician should note the skin color of the foot and toes and should feel the toes for warmth. Sensation can be assessed by using the pulp of the fingers to stroke the top of the distal metatarsal heads and by asking the individual if the stroke was felt. The action is then repeated using the fingernail.

Non-displaced multi-fragment fractures are treated conservatively, with cast immobilization for 4 to 6 weeks, followed by a functional brace until the fracture is completely healed. Displaced fractures involving joint stability require surgical intervention with open reduction and internal fixation. Healing after surgery usually takes 2 to 3 months or longer, followed by extensive rehabilitation. Internal fixation with plates and screws often is necessary to stabilize tibial fractures; however, some individuals may experience a high rate of infection as a complication of internal fixation.

In addition to severe disease, the following conditions could lead to heel pain in young athletes: plantar fasciitis, heel fat pad syndrome, Achilles tendinitis/strain, retrocalcaneal bursitis, calcaneal stress fracture, calcaneal exostosis, contusion infection, tarsal coalition, and tarsal tunnel syndrome.

REHABILITATION

The cross-country runner has plantar fasciitis. What exercises should now be included in the rehabilitation program?

Critical Thinking Questions and Answers

This tried-and-true feature gives you a realistic scenario and then poses a question, which is answered at the end of the section. Use these to practice your critical thinking, problem-solving, and decision-making skills—they'll serve you well in the future.

ADDITIONAL LEARNING AND TEACHING RESOURCES

This textbook features a power companion Web site:
<http://thePoint.lww.com/AndersonFound6e>

thePoint®



Student Resource Center

- Clinically oriented anatomy images
- Drag-and-drop image labeling
- Audio glossary
- Chapter quizzes
- Electronic flash cards
- Web Links for supplemental information
- Additional reference material, such as boxes, tables, field strategies, and sample forms to support chapters
- **PLUS:** Video clips from *Acland's DVD Atlas of Human Anatomy*

Instructor's Resource Center

- Instructor's manual with testing strategies, lecture notes, worksheets, answers, and handouts
- Test generator
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