Muscle Strength Testing, Instrumented and Non-Instrumented Systems

By Louis R. Amundsen. Published 1990 by Churchill Livingstone, 650 Avenue of the Americas, New York, NY 10011. (186 pp.)

Reviewed by Joseph E. Szczesny, Jr., doctoral student in Sports Medicine, University of Virginia, Charlottesville

Muscle Strength Testing, Instrumented and Non-Instrumented Systems was produced as a result of the many diverse theoretical beliefs and practices associated with the quantification of muscular strength. The author emphasizes the practical aspects of systematic evaluation with the intention to provide the athletic trainer/physical therapist with a comprehensive overview of skeletal muscle strength testing.

The first chapter, Measurement of Skeletal Muscle Strength: An Overview of Instrumented and Non-Instrumented Systems, introduces the need for and clinical uses of various types of strength testing as well as suggestions for which battery of tests may be indicated for certain situations. The chapter concentrates heavily on the evaluation of activities of daily living. This is perhaps most appropriate for a patient such as a stroke victim, but the philosophy is easily applied to other populations. A brief explanation of the human body’s physiological processes associated with muscular contraction is also included. In addition, this chapter includes three appendices that provide useful examples of a low-level functional strength test, an intermediate-level muscle performance test, and an advanced-level muscle performance test.

Chapter 2, Manual Muscle Strength Testing of the Distal Muscles, covers the techniques used for testing the specific muscles that are distal to both the elbow and knee joints. This comprehensive evaluation includes testing of all the muscles associated with the movements found at the wrist, hand, phalanges, thumb, ankle, and toes. Detailed instructions and illustrations are provided to assist rehabilitation specialists in proper positioning of the patient, of themselves in relation to the patient, and of their hands. This ensures optimal applied resistance to the specific muscles being evaluated and proper stabilization of unwanted accessory movements.

Chapter 3, Muscle Strength Testing With Hand-Held Dynamometers, compares the two basic types of hand-held dynamometers, the spring versus the strain, by discussing the advantages and disadvantages of each. The author also covers in detail the validity (face and criterion) and reliability (intrarater and interrater) of the testing apparatus, referencing a complete review of background literature. In addition, this section presents explanations as well as illustrations depicting the proper positioning of the patient, joints being tested, and the dynamometer as it records the muscular strength values of associated joint movements.
Some special considerations addressed in this chapter include the following: appropriateness of the “make or break” test, the recommended number of test repetitions, duration of contraction, unit of measurement, and the basic interpretation of results.

The fourth chapter, entitled Isometric Muscle Strength Testing With Fixed-Load Cells, deals with the proper guidelines and procedures for performing maximal isometric strength tests. The author provides a detailed explanation of the components displayed on the force output curve such as reaction time, rise time, peak force, and fatigue rate. Advantages of isometric testing compared to isotonic testing as well as the precautions associated with this type of evaluation are carefully outlined. Chapter 4 concludes with five appendices that contain normative isometric strength value tables on different muscle groups for various populations.

Dynamic Muscle Strength Testing, covered in chapter 5, provides helpful guidelines and suggestions for dynamic testing from an experienced clinician. Specific considerations are given to the nine recommended guidelines for standardizing test protocols and suggested procedures for lower extremity testing. Related topics covered include the concept of repetition maximum (RM), terminology associated with isokinetics, interpretation of results, and background information on various isokinetic testing devices such as the Cybex, Biodex, Kin-Com, and Lido. This chapter’s appendix contains an example printout of data obtained from an isokinetic evaluation on concentric/eccentric knee flexion and extension.

In chapter 6, Trunk Strength Testing, in addition to covering muscular strength testing of the trunk, the author also identifies the controversy associated with whether low back pain is a result of trunk muscular weakness or vice versa. An overview of available isokinetic devices used for trunk testing and a description of their evaluation setups are also provided. The chapter concludes with an interesting discussion on the problematic measurement issues of trunk strength related to peak torque to body weight ratios and extension to flexion ratios.

Chapter 7, Grip and Pinch Strength Measurements, discusses the numerous factors that affect the validity and reliability of grip and pinch strength measurements. Recommendations for standardizing grip and pinch testing procedures are provided along with rationales for which type of equipment is ideal. Tables containing normative strength values are also presented for helpful referencing.

This textbook is an excellent resource for muscular strength assessment. It presents excellent supporting literature and strategies to allow the practitioner to make responsible decisions regarding muscle strength testing. I would strongly recommend this specialized textbook to any practitioner or researcher.
Rehabilitation Techniques in Sports Medicine: Proprioceptive Neuromuscular Facilitation

By Bill Prentice. Produced by The University of North Carolina, Chapel Hill, and Mosby Publishing, 11830 Westline Industrial Dr., St. Louis, MO 63146. (26 min, $49.95 U.S.)

Reviewed by Jeff Fields, Bell High School, Gainesville, FL, and Greg Zuest, Eastside High School, Gainesville, FL

Dr. Bill Prentice’s new Rehabilitation Techniques video series offers the sports therapist an excellent source of information provided by one of the field’s leading experts. His Proprioceptive Neuromuscular Facilitation (PNF) tape is a very thorough tool for both teaching and learning.

The viewer is initially provided with a brief yet thorough explanation of PNF’s physiological basis, its uses, and the goals of treatment. Additional topics discussed in the introductory segment include the principles of facilitation and inhibition, and the stretch reflex.

In segment 2, a discussion on basic principles of PNF, Prentice discusses techniques designed to achieve specific treatment goals. Examples include teaching the movement from start to finish, appropriate verbal cues, manual contact and appropriate resistance, rotational movement, timing, traction, and approximation.

Segment 3 is a discussion of PNF patterns with an emphasis on the diagonal patterns. Prentice explains D1 and D2 patterns for the upper and lower extremities, the upper and lower trunk, and the neck. The close-ups provided in this section are helpful in understanding the various hand placements presented.

Sections 4 and 5 deal with strengthening and stretching techniques. Examples include slow reversal, repeated contraction, contract–relax, and hold–relax techniques.

Prentice manages to pack a great deal of valuable information into one short video. He provides the hows, whys, and whens of PNF and its applications. This videotape is definitely recommended to students and instructors of sport rehabilitation.
Management Strategies in Athletic Training

By Richard Ray. Published 1994 by Human Kinetics Publishers, P.O. Box 5076, Champaign, IL 61825-5076. (257 pp., $32 U.S.)

Reviewed by Thomas W. Kaminski, doctoral student in Sports Medicine, University of Virginia

As the role of today's athletic trainer becomes more diverse, it is critical to have some administrative background to help make appropriate decisions that affect overall program management. This text is a welcome addition to the athletic training profession. It should prove to be useful for both the educator and the practicing clinician.

The author states that the primary purpose of this book is to "provide a standard for the kinds of knowledge and skills that every entry level athletic trainer should master." While this is a somewhat lofty purpose, especially for entry-level professionals, this book contains very useful and thought-provoking information that all athletic trainers should be aware of. In addition, this text offers the established athletic trainer and educator a tool with which administrative and management skills can be enhanced. In fact, the text is full of new and innovative ideas for application, interesting case studies, and an extensive annotated bibliography at the conclusion of each chapter. This should be helpful to the reader who wishes to explore some topics in greater detail.

This book is written in a concise and direct manner. It is very easy to understand and provides applications for the athletic training environment via stimulating case studies. The author lists the three primary audiences as undergraduate students preparing for the NATA certification examination, graduate students in athletic training/sports medicine working on advanced degrees, and practicing athletic trainers who wish to improve their administrative skills. This text could additionally be used by anyone involved in the administration of health care to the active population.

Historically, athletic trainers have relied on their own management expertise, gained through trial and error, anecdotal reports from colleagues, and job experience, to solve management problems in the workplace. Most have done so without any formal management education or training. This text provides the reader with a good foundation of management principles in athletic training. The author has done an excellent job in researching the latest concepts and theories of management. Each chapter begins with a case study that helps preface the major intent of the chapter. The chapter then concludes with two case studies that allow the reader to put concepts into practice. This feature should be quite advantageous for the educator hoping to stimulate discussion and critical thinking in the classroom setting. The author has also included the following special features that further enhance this textbook: clearly defined chapter objectives,
key words in boldface print, a glossary of important terms, chapter summaries, and an abundance of sample forms. The book also contains many helpful and easy-to-follow flow charts, tables, and graphs that further illustrate important points.

The text consists of eight chapters, each one appropriately and logically organized for easy reading. Chapter 1 introduces the reader to the foundations of management and the three management roles (interpersonal, informational, and decisional). Chapter 2 interfaces management theory with actual athletic training program management. This chapter stresses the importance of vision statements, mission statements, planning, and evaluation to the overall success of the program. Chapters 3 and 4 highlight the concepts of human and financial resource management. Topics range from staff selection, supervision, and performance evaluation to budgeting, purchasing, and inventory management.

The author provides a detailed approach to facility design and planning in chapter 5. Those fortunate enough to be involved in this exciting process should find this chapter enlightening. Chapter 6 is geared toward helping the athletic trainer become more proficient at information management. The presentation here is especially noteworthy because the author breaks down a complex and broad topic into useful and beneficial information, especially for the reader with minimal computer experience. The author points out the importance of proper medical documentation and provides easy steps for managing medical files. Chapter 7 reviews the athletic insurance forum, offering the reader an introduction into this difficult and ever-changing area. The author explains the various types of insurance programs, and the reimbursement and claims processes, just to mention a few. Tips to make this difficult responsibility less demanding are contained within this chapter.

The book concludes with chapter 8, discussing the relevant and pertinent legal considerations necessary in today’s litigious society. The author provides the necessary background information without losing the reader in a lot of legal jargon. Especially interesting are his strategies for avoiding legal liability.

This text will be useful for advanced courses in athletic training/sports medicine. In fact, it may even provide the impetus for development of a new course in athletic training/sports medicine education, or may supplement those already in existence. It should also become an invaluable resource for program directors, clinical instructors, and students wishing to expand their management horizons.
Athletic Training Action (ATA): Simulations in Athletic Training  
(Vol. I and II)  

Reviewed by Kevin W. VanWart, Physical Therapy Center, Ocala, FL

These volumes of written tutorials and computer simulations are designed to prepare the athletic training candidate for the NATA certification examination with emphasis on the written simulation section. The two volumes together are divided into nine sections, or modules. In Volume I, the first module covers foot and ankle injuries, discussing acute evaluation, treatment, long-term rehabilitation, and prevention. The remaining four modules discuss the same areas with knee injuries; shoulder injuries; elbow, forearm, wrist, and hand injuries; and overuse syndromes.

The four modules in Volume II cover the unconscious athlete, spinal and visceral injuries, therapeutic modalities, and education and counseling. At the end of each written module, as with Volume I, a suggested reading list is included.

The authors strongly suggest that the beginning student review the written tutorial before attempting the computer simulations. The more advanced student, however, may want to go directly to the computer simulation. In each section of the computer simulation the student is taken through a variety of situations that an athletic trainer may face during normal work day. After each question the student is given several answers to choose from. A completely inappropriate response will give the student a red screen to indicate that the plan of treatment was incorrect. A partially correct answer will give the student a yellow screen, still allowing the student to return to the correct scenario. After the student completes each section of the computer simulation, the program indicates areas needing further review (based on the missed answers), which can be found in the written tutorial.

Overall, this program when used appropriately can be an excellent aid for both the beginning athletic training student as well as students ready to sit for the written simulation part of the NATA Board Exam.

Prices: ATA Vol. I, $89.95; ATA Vol. II, $89.95; ATA Combo (both volumes), $169.90; ATA Plus (extra scenarios), $49.95; ATA Interactive Tutorial (for the student not quite ready for Vol. I & II), $59.95.
This book is a concise, as well as precise, volume that focuses on the psychological factors associated with rehabilitation. It is applicable to sport psychologists, athletic trainers, physicians, and health practitioners interested in the total psychological rehabilitation experience of athletes. Four sections contain 15 chapters and cover the following areas of rehabilitation: conceptual and practical approaches, psychological perspectives, counseling of athletes, and athletes with permanent disabilities. The chapter titles are delightfully descriptive and make the subject index almost redundant. The division of sections and chapters makes this book not only easy to read but quick to reference.

Chapter 1, An Overview of Psychological Perspectives, elaborates on psychological variables including personality traits, self-concept, and responses to psychosocial stress stimuli. Dr. Pargman suggests that professionals who work with athletes should acquire insight into the emotional, perceptual, personological, and social psychological factors related to sport injury. This theme is prevalent throughout the book. Chapter 2, The Athletic Trainer’s Role in Preventing Sport Injury and Rehabilitating Injured Athletes, is written by a sport psychologist and a lawyer, which brings an eclectic view to prevention and rehabilitation.

Chapter 3, The Biopsychology of Injury-Related Pain, is concerned with the “meaning” of pain to the athlete and includes a treatment approach with a psychological emphasis as well as a neurophysiological interpretation. Chapter 4, Ethical and Legal Issues for Sport Professionals Counseling Injured Athletes, addresses applied ethical issues and is directed toward the athletic trainer. It addresses the increasing responsibility athletic trainers have not only to the athlete but to the organization that employs them, the licensing body, the legal system, and society at large.

Psychological Perspectives on Athlete Injury is the title of Section 2. Chapter 5, Assessing and Monitoring Injuries and Psychological Characteristics in Inter-Collegiate Athletes, reviews various assessment and monitoring tools related to injury and psychological characteristics and incorporates a counseling and prediction model. Chapter 6, The Malingering Athlete, presents possible causes, persistent characteristics, and treatment strategies. The emphasis is first and foremost on scrupulous diagnosis, then moves to a compassionate understanding of causes. Caution is stressed, since this is a potentially destructive diagnosis for all concerned.
Chapter 7, Personality and Injury Rehabilitation Among Sport Performers, takes into account the history of stressors as well as personality and coping resources. The assessment tools discussed include explanatory style, dispositional optimism, and the hardiness components to assist the practitioner in anticipating and treating thoughts, emotions, and behaviors that could potentially impact rehabilitation.

Chapter 8, The Dimensions of Social Support When Dealing With Sport Injuries, discusses the constructs of social support suggesting that there are different types of support as well as different types of support givers. Strategies are presented to assist in creating and maintaining a system of support that includes both professional and personal relationships.

Section 3 and Section 4 discuss counseling athletes with injuries or permanent disabilities. Chapter 9, Counseling Strategies for Enhanced Recovery of Injured Athletes Within a Team Approach, encourages practitioners to be aware of the dimensions of social support and the necessity to mobilize and utilize support for the athlete. The text explains how to conduct an interview and discusses the emotional responses of athletes to an injury questionnaire as part of the interview. A team concept is presented, where there are 5–14 members on the rehabilitation team and the injured athlete is the captain of the team.

Chapter 10, Seeing Helps Believing, discusses an integration of sport psychology and sports medicine using Bandura's concept that shows modeling to be an effective way of communicating skills, behavior, and attitudes.

Chapter 11, The Use of Imagery in the Rehabilitation of Injured Athletes, discusses the mind–body paradigm for healing in the rehabilitation setting. The text covers imagery techniques, from preinjury preventive medicine to developing a mind set for recovery. Chapter 12, Mental Paths to Enhanced Recovery From a Sports Injury, is written in a survey format to compare fast or slow recovery based on performance-related criteria. Goal setting, positive self-talk, and mental imagery are positively related to recovery time.

Chapter 13, Counseling Athletes With Permanent Disabilities, relates the stages of progression through rehabilitation to the Kubler-Ross paradigm. The emphasis is on the team approach because one individual is unable to provide all the services needed. The two major issues are retirement for athletes and adjustment to permanent disability. Chapter 14, Providing Psychological Assistance to Injured and Disabled College Student Athletes, raises the problem of student athletes' reluctance to seek psychological help and the inaccessibility of counseling or psychological services.

Chapter 15, I Cried Because I Had No Shoes . . ., is a case study of a single athlete—the author—who had been a marathon runner. The author describes his saga via three motivational factors: attitude, metacognition and drive, and the use of goal setting.

Throughout this book is a theme of recovery and hope for athletes at all levels of injury rehabilitation.