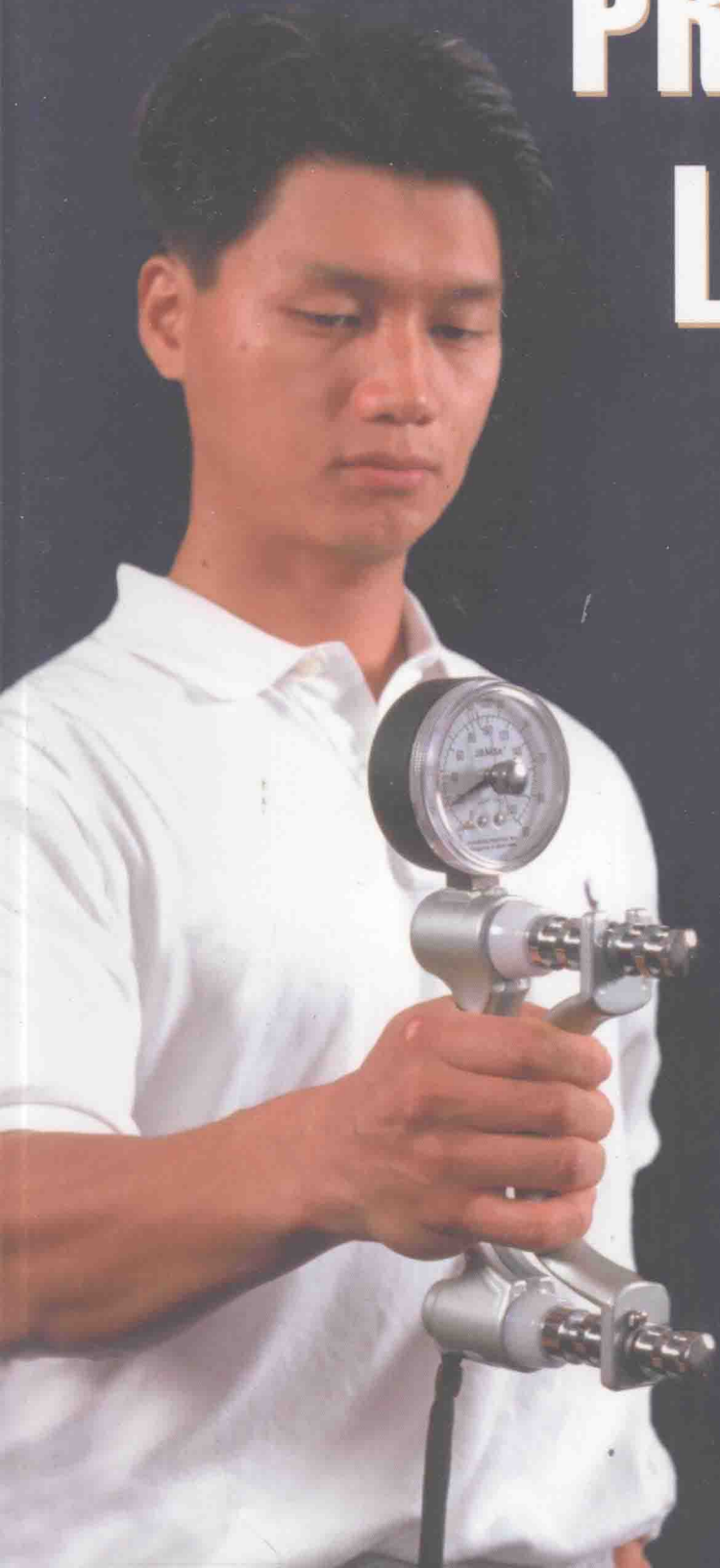
EXERCISE TESTING AND PRESCRIPTION LAB MANUAL

Second Edition



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Exercise Testing and Prescription Lab Manual

Second Edition

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To my wonderful wife and best friend, Tracy
and my children, Eddie and Elena

—EOA

Preface

The health benefits of regular physical activity are unquestionable. Furthermore, researchers have defined exercise guidelines that clarify the safest, most effective, and most efficient manner of physical activity participation. The American College of Sports Medicine (ACSM) has established the gold standard for professional practice and certification in exercise testing and prescription. ACSM was the first organization to certify health and fitness professionals and, since 1975, has certified more than 45,000 professionals in 44 countries. The Health Fitness Specialist (HFS) certification has had the greatest number of participants. This laboratory manual addresses the necessary skills and techniques for successful completion of the HFS certification.

A HFS certified professional is qualified to assess, design, and implement fitness programs for apparently healthy individuals and for individuals with controlled disease. Certification guidelines are presented in *ACSM's Guidelines for Exercise Testing and Prescription, Eighth Edition*. A component of the requirements for each certification, including HFS, is a practical application of the knowledge and skills associated with exercise testing and prescription. This *Exercise Testing and Prescription Lab Manual* is an excellent supplement to undergraduate courses that prepare students to take the ACSM HFS certification examination. The experiential learning labs are easy to follow and correspond with the practical skills required for successful completion of the HFS certification exam.

How This Lab Manual Is Organized

Similar to the first edition, this lab manual contains three sections: part I, Pretest Responsibilities; part II, Techniques in Exercise Testing; and part III, Exercise Prescription. The first section includes three labs that focus on the HFS's responsibilities before performing an exercise test. These labs address safety procedures, requirements for exercise testing equipment, calibration of equipment, medical history evaluation, risk factor evaluation and stratification, and informed consent. This edition includes instructions for calibration of laboratory instruments and 10 new case studies that highlight a breadth of examples that represent a hypokinetic population. Case studies direct significant attention toward risk factor evaluation and stratification.

The second section includes seven labs that focus on the techniques used in assessing the components of health-related fitness (cardiorespiratory, body composition, muscular strength and endurance, and flexibility). To allow for more concentrated attention on skill development in assessing HR and BP, this edition has separate labs for assessing HR and BP and for assessing skinfold thickness and circumferences. The application procedures in these labs include step-by-step instructions, data collection worksheets, diagrams depicting appropriate techniques, and charts that present norms for comparisons within an individual's age and sex category.

The final section of this manual focuses on exercise prescription. In this edition the metabolic calculations in the first lab (lab 11) include an answer key. The next

two labs (labs 12 and 13) address the three phases of exercise prescription (initial, improvement, and maintenance) and the assessment of a participant's goals and commitment to the physical activity prescription. The final lab (lab 14) challenges students to apply the techniques and principles presented in the manual through the development of case studies.

The appendixes provide a summary of the effects of common pharmacological agents on cardiorespiratory responses at rest, common metric conversions used in exercise testing and prescription calculations, and a list of metabolic and anthropometric formulas.

Practical Learning Features

Each lab features an easy to follow format including the headings Purpose, Materials, Background Information, Procedures, Discussion Questions, and References or Bibliography. The Background Information section provides a framework for the lab but does not necessarily present all the knowledge required for an understanding of the rationale, theory, and physiological principles of the topics presented in that lab. We expect that more in-depth knowledge will be presented in a course lecture format or that students will research topics further to be able to answer discussion questions they do not understand. The Procedures section contains the steps required to complete the lab. Many labs require data collection. To facilitate this process, this manual contains all the forms and worksheets necessary to complete the lab assignments and collect the data in an organized manner. These forms and worksheets are located in appendixes A and B and owners of this manual may photocopy them. Each lab identifies how many copies of which forms are needed to complete it so that students can bring enough copies of the appropriate forms and worksheets to that lab. Once the students who have purchased the manual become practitioners, they may also copy forms from appendixes A and B for use with their clients. A glossary defines terms appearing in the text and appendixes.

New to This Edition

This second edition addresses the updates necessary to be consistent with the recent modifications that ACSM has published (*ACSM's Guidelines for Exercise Testing and Prescription, Eighth Edition*). This edition also includes added background and rationale in the introduction of a number of chapters, in particular, information that addresses the importance of the assessment and how the assessment relates to overall program development. Finally, this edition's enhanced discussion questions will appropriately challenge students by incorporating greater analysis of the information provided in the corresponding lab.

In response to student feedback about the first edition, the organization of this manual has been changed slightly to focus on taking the reader through each progressive phase of exercise testing and prescription. In addition, students will find enhanced instructions for skills and techniques that are critical for preparing for the HFS certification exam. The progression of labs through the testing and prescription process, the easy to follow instructions, and the practical worksheets make this lab manual the perfect experiential component for a course in exercise testing and prescription. It is a wonderful tool for individuals who have taken the challenge of preparing themselves for the HFS certification.

This manual takes the reader through each progressive phase of exercise testing and prescription. These practical experiences are intended to coincide with a lecture course that presents the required knowledge base for HFS certification.

This manual fills a void for the health fitness practitioner studying for the HFS certification exam with a focused presentation of the skills included in the exam. Each lab is presented in a way that can be easily followed independent of additional instruction. Furthermore, each lab has worksheets that facilitate the practical experience. The labs match directly with the practical skills evaluated on the HFS exam and thus provide an excellent tool for facilitating preparation.

Acknowledgments

This second edition lab manual has evolved in parallel with contemporary standards for the application of exercise testing techniques and physical activity prescription. A number of colleagues have provided critical feedback that has influenced the improvements made to this manual. We would like to acknowledge those individuals:

Drs. Michael Meyers and Robert Kraemer provided valuable input and critical review of the labs. The work of Terry Garner, Naomi Howard, and Jason VanGotten, who were also completing their graduate assistantship responsibilities, greatly enhanced the presentation of the labs. Finally, the first author would like to express his appreciation to his wife, Tracy Acevedo, for her heartfelt support and her editorial expertise.

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PART

I

Pretest Responsibilities

Part I comprises three labs that focus on the HFS's responsibilities before performing an exercise test. These labs present information pertaining to safety procedures, requirements for exercise testing equipment, calibration of equipment, medical history evaluation, risk factor evaluation and stratification, and informed consent. Case studies direct significant attention toward risk factor evaluation and stratification.

LAB 1

Orientation to Lab Instruments, Procedures, and Responsibilities

Purpose

This lab familiarizes students with the safety procedures, lab equipment, and instruments that they will use during labs throughout the course. It explains the procedures, requirements, and responsibilities for lab assignments.

Materials

- Cycle ergometer (e.g., Monark, Tunturi)
- 12-lead electrocardiograph (ECG) (electrodes and cables)
- 3-lead ECG telemetry system (electrodes and transmitters)
- Treadmill
- Rating of perceived exertion (RPE) scale
- Flexibility assessment devices (e.g., goniometer, sit-and-reach box, meter stick or yardstick)
- Mercurial and aneroid sphygmomanometer
- Stethoscope
- Hand dynamometer
- Barometer and thermometer
- Scale and stadiometer
- Body composition assessment devices

Procedures

1. The lab instructor describes preliminary preparation for exercise testing. The following elements are crucial to a safe, professional exercise testing environment and the fitness specialist should be familiar with them.
   a. Establishing emergency procedures
   b. Periodically practicing emergency drills
   c. Clearly posting emergency phone numbers
   d. Ensuring current CPR certification
   e. Maintaining an appropriately professional (clean, quiet, visually appealing) environment for testing
   f. Establishing policies to ensure adequate client privacy
   g. Checking and calibrating equipment frequently
2. The lab instructor discusses the procedures and grading system.
3. The lab instructor briefly introduces and describes the items listed under Materials. Students will practice using this equipment as they participate in the labs that follow in this course.
4. Review the units of the metric system (appendix D).
5. Discuss the general lab instructions below that should be followed for each lab.

General Laboratory Instructions

1. Before each scheduled lab, read the instructions to become familiar with the materials you will use and the procedure you will follow.
2. The lab instructor will give additional verbal clarification and demonstrations when necessary. Listen and take notes as applicable.
3. You will usually work in groups of three or four. Organize your group quickly, selecting a recorder, a subject, and a technician. Become familiar with the responsibilities that each position entails. If data are to be collected from more than one subject, rotate assignments during each lab. (Note: Obtain data from all group members when possible.)
4. One member of the group should be responsible for obtaining the equipment needed for the day, maintaining it accordingly during the work period, and returning it after the lab period. Be extremely careful with all equipment; it is very expensive and difficult to replace. Return all equipment to the exact place from which it was taken, make sure it is clean, and keep the storage facility well organized.
5. The recorder should record the observations immediately as they are taken. Record only raw data; perform any calculations and conversions after the data are collected.
6. Work seriously and quietly. Noise may disrupt the subject or interfere with accurate reporting of the results. If basal rates are to be established or if blood pressures are to be recorded, eliminate all noise.
7. Listen to final instructions. Do not leave the lab before checking with the lab instructor.

8. Appropriate clothing (shorts, T-shirt, sweats, athletic shoes, and socks) is required. In addition, you will need a calculator for computing data.
9. Complete lab assignments, including discussion questions, after each lab meeting. Type the labs and hand them in before the next scheduled lab begins.

LAB 2

Calibrating Lab Instruments

Purpose

This lab demonstrates how to calibrate equipment for exercise testing and prescription and why such calibration is important.

Materials

- Cycle ergometer
- Sphygmomanometer
- Weight scale
- Hanging scale
- One copy of the Cycle Ergometer Calibration Worksheet (appendix B, page 118)
- One copy of the Sphygmomanometer Calibration Worksheet (appendix B, page 119)
- One copy of the Weight Scale Calibration Worksheet (appendix B, page 120)
- One copy of the Hanging Scale Calibration Worksheet (appendix B, page 121)

Background Information

When inaccurate instruments are used in a procedure, they introduce error. The process of adjusting or correcting an instrument to coincide with a known standard is called *calibration*. Calibration is essential to obtaining reliable and valid data. In the simplest case, two scales of measurement might be compared with each other. For example, if we lay a meter stick alongside some reference measure, we can then compare the lengths and subdivisions of the two. In this case, to correct any error we might have to sand off the existing markings on the meter stick and etch new ones along the entire scale.

A reference quantity previously determined to be within an acceptably small degree of error can be used as a calibration standard (reference measure). For example, a set of brass weight standards might be used to calibrate a balance scale for accurate weighing. In the case of a sophisticated electronic balance, adjustments can be made to reconcile small deviations of measurement from known weights. Some instruments, however, have no simple means of adjustment.