Fourth Edition

Measurement and Evaluation in Human Performance

James R. Morrow, Jr.
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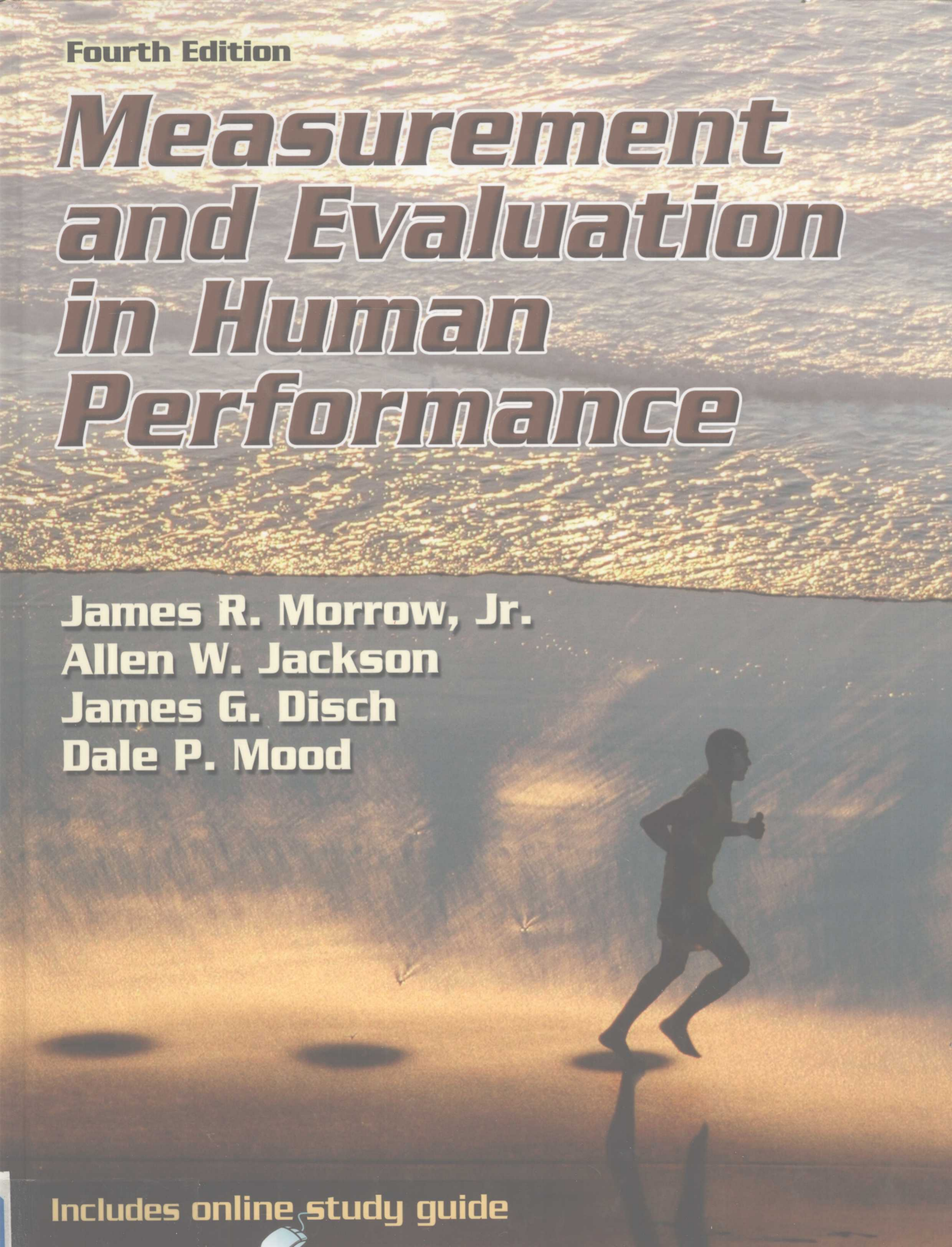

Includes online study guide

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PREFACE

In *Measurement and Evaluation in Human Performance, Fourth Edition,* our objective remains that which we originally developed over a decade ago. We want an effective, interactive textbook that is understandable to the undergraduate student in human performance, kinesiology, exercise science, or physical education.

Students, you are about to study concepts in human performance, kinesiology, exercise science, and physical education that your textbook authors believe are the most important you will learn about as an undergraduate. We understand that your motor behavior, exercise physiology, and biomechanics professors, and even your English, mathematics, and history professors, feel the same about their courses. We are not suggesting that those courses are unimportant or even a great deal less important. However, the concepts of reliability, objectivity, and validity that serve as the focus of this textbook and the course you are completing transcend all courses and all phases of life. We are confident that you want to make good decisions in all aspects of your professional and personal life. In the truest sense, this means you want to make evidence-based decisions that are accurate, trustworthy, truthful, and specific to making a good judgment. That is exactly what this textbook and the course in which you are enrolled are all about.

Whether your desired career path is physical therapy, another allied health profession, teaching, athletic training, general kinesiology or exercise science, health and fitness, or sport studies or sport management, in this textbook you will find concepts important to your daily work once you become employed. It is common knowledge that physical activity is related to quality of life and a wide variety of morbidities and mortality. The ability to measure physical activity, physical fitness, and physical skills is important to you in your career, regardless of the specific career path you enter. It is important that you understand and use sound measurement properties whether testing in the psychomotor, cognitive, or affective domains.

When you obtain data as a result of some type of testing or survey process, you want to be confident that the data you have for decision making are trustworthy. That is, can you count on these data? Are they truthful? Consider whether you are testing the fitness level of a student or client, or receiving test results from your personal physician. You want the results to be valid because you will be making important life decisions based on the results. In this text we will help you learn how to gather data, analyze them, interpret the results, and feel confident that what you have learned is valuable enough to make good decisions.

Your textbook authors have been university professors for nearly 150 years of combined instruction. We have taught literally hundreds of sections and thousands of students in the content area of your textbook. We have received much feedback and commentary from these students. We have attempted to incorporate all of this valuable information into the textbook so that you will find the course and materials interesting, entertaining, informative, and useful. We understand that some (or many) students are intimidated by the content presented in a measurement and evaluation course. We believe that we can uncover the mysteries of such a course and help you appreciate and learn this important material. Know early on that the level of mathematics involved in this textbook is no more than that in an introductory algebra course. We use these introductory concepts and combine them with reliability and validity theory in a way that we hope will affect your personal and professional life so when you have a decision facing you, you will

immediately think about how you might gather data, analyze them, and make a good decision. That does not mean that the course is necessarily easy. It is certainly not as hard as some students think. It does, however, require study, review, and logical thinking to help you put all of the concepts together. We believe we do this well in the textbook.

UPDATES TO THE FOURTH EDITION

As we present the fourth edition of our text, we have maintained elements that have worked well, added some new points, and moved information around a bit to permit instructors and students to have a better understanding of the textbook and apply the information into their specific courses and career goals. The key changes that we have made from the previous edition are intended to enhance the flow of content and organize the materials so that some chapters (or even sections) could be omitted, depending on the students' career goals. For example the last two chapters pertain largely to those who are seeking to become teachers in public schools. These chapters might be omitted from a course where students are not seeking this career objective. The key changes in the fourth edition are the following:

- Chapters have been realigned into four cohesive sections.
- Chapters have been reordered into a format that makes it easier for those teaching students not going into teaching careers to easily omit the final chapters of the text.
- While we continue with major utilization of Predictive Analytics Software (PASW), previously known as Statistical Package for the Social Sciences (SPSS), we also include greater utilization of Microsoft (MS) Excel with examples in an appendix that includes directions, screen captures, and templates for calculating some statistics. Excel templates are located in the Online Study Guide in chapters 5 and 7. A PowerPoint presentation illustrating Excel use is available in the OSG in chapter 2.
- The amount of information on physical activity assessment has been increased across all chapters.
- Large datasets are included in each chapter that result in your reviewing previously learned concepts and methods to illustrate how valuable computer skills are in measurement and evaluation. Note that these large datasets are for illustrative purposes and may not be actual data from any specific research study.
- The textbook's Web site includes a wider range of student study and practice activities, including many of the third edition's Mastery Items and additional homework problems (and their answers).
- For instructors, the ancillary items have all been updated including the Presentation Package; a new Image Bank that includes most of the figures, content photos, and tables from the book; new and expanded quizzes in the Instructor Guide; and new and revised questions in the Test Package.

TEXTBOOK ORGANIZATION

The textbook is presented in four parts. Part I, Introduction to Tests and Measurements in Human Performance, consists of two chapters. Chapter 1 introduces you to concepts in measurement and evaluation in human performance and the domains of interest in which you will use measurement and evaluation concepts and tools. Chapter 2, Using Technology in Measurement and Evaluation, is very important. We ourselves use the information in your textbook every day of our lives. However, to do all of this work by hand would be tedious and susceptible to errors. The use of statistical packages does not eliminate all errors (you might still enter the wrong data, analyze the data the wrong

way, or interpret the results incorrectly), but it does save you a great deal of time. We use Predictive Analytics Software (PASW) and MS Excel to help you complete analyses. You are introduced to these tools in chapter 2, and examples are then used throughout the remainder of the textbook. Is it important to learn about tests and measurements? How can you learn about these areas, and can you become skilled at using them? We think so, and we hope you will agree after completing part I.

Part II, Basic Statistical Concepts, consists of three chapters and provides the statistical background for many of the decisions and interpretations that you will encounter in the remainder of the textbook. You will expand your PASW or MS Excel experiences (or both) in chapters 3, 4, and 5 and continue them throughout the remainder of the textbook. The concepts that you learn in part II are the reason some students refer to this course content as "statistics." While the basic statistics presented are important, we prefer to refer to these as foundational elements for reliability and validity decisions. Again, the level of mathematics knowledge required in these areas is high school or college algebra. Importantly, we are not mathematicians and do not expect you to be. We are, however, practical users of the information in your textbook and we actually use this material *every* day of our lives. We try to keep the mathematics to a minimum and focus on concepts. Although having a stronger mathematics background can be an advantage to a student, we present material in such a way that minimal mathematical expertise is expected or required. Moreover, the use of PASW and MS Excel helps you complete time-consuming and difficult tasks with large numbers of observations very quickly and accurately. Chapter 3, Descriptive Statistics and the Normal Distribution, illustrates how one describes test results and interprets them with graphs and charts. Chapter 4, Correlation and Prediction, helps you understand relations between variables and how knowledge about one variable tells you something about other variables. Chapter 5, Inferential Statistics, is used daily by human performance researchers to help make decisions from research study results and determine how these results can be generalized. It is common knowledge that physical activity, physical fitness, and energy expenditure are important to quality of life, health, and disease and death risk. Much of what we know about the relations between these variables and quality of life has been generated as a result of the types of analyses you will learn in part II. Would you like to have your test results presented in interesting and meaningful ways? Would you like to be able to read, interpret, understand, and use the scientific research literature related to your profession? You will be able to do so after completing part II.

Part III, Reliability and Validity Theory, presents the most important concepts of the textbook. Everything that is done in all of the textbook chapters can be directed toward or emanate from the concepts of reliability and validity. Chapter 6 presents reliability and validity from a norm-referenced perspective, while chapter 7 does so from a criterion-referenced perspective. Chapters 6 and 7 have a great deal in common. The key difference is the level of measurement involved. In chapter 6, test results are continuous in nature (like body fat or oxygen consumption), and in chapter 7 they are categorical (like pass/fail or alive/dead). Beyond that, the concepts of reliability and validity cross both chapters. Consider the most recent test you completed. It could have been in school, in a physician's office, at work, or anywhere else. How do you know the test results were reliable and accurately reflected your true results? You will be better able to interpret these results once you have completed part III.

Part IV, Human Performance Applications, consists of seven application chapters. The intent of part IV is to illustrate practical settings where you will use the kinds of knowledge you have gained to this point in the textbook. Chapter 8, Developing Written Tests and Surveys, shows you how to create tests that discriminate among individuals with different levels of knowledge. While it is important to be able to discriminate

among different levels of knowledge, this is difficult to do. Another important ability in this area is the development of survey and questionnaire materials that accurately reflect an individual's knowledge or attitude or a group's general knowledge or attitude. Chapters 9 and 10 focus on the psychomotor domain and illustrate assessment of physical fitness and physical activity in adults (chapter 9) and children and youth (chapter 10). Chapter 11 illustrates reliability and validity issues when assessing sport skills and motor abilities. Many textbooks use this type of chapter to list many different tests that can or should be used to assess a particular skill (e.g., tennis or golf) or ability (e.g., jumping or throwing). Rather than present which tests you should use, we prefer to identify the important concepts to be considered when choosing a test and then let you decide if a particular test appropriately meets your needs. Much has been said about the fitness and physical activity levels of adults and youth in the United States and around the world. What measures might be taken to assess physical fitness, physical activity levels, or both? Assume that you want to measure the physical skills, abilities, or status of students, clients, or athletes with whom you work. How might you best assess their abilities and skills, and how might you interpret and use these results? For example, the National Football League does this with their "combine" camps each year when attempts are made to determine which player should be drafted by a team. You will be able to use measurement techniques to answer many of these questions after completing chapters 9, 10, and 11.

Chapter 12, Psychological Measurements in Sports and Exercise, presents scales that can be used in the affective domain. Scales here assess attitudes, beliefs, and concepts that are largely unobservable, yet existent. For example, it is easy to think about individuals who have an "attitude toward physical activity," but how would you measure this attitude? You will be better able to interpret results obtained from the affective domain after completing chapter 12.

The final two chápters, Classroom Grading: A Summative Evaluation (chapter 13) and Performance-Based Assessment: Alternative Assessments for Measurement and Evaluation (chapter 14), are most appropriate for those with career goals in public or private school instruction. Concepts are presented that are important to those evaluating performance in the cognitive and psychomotor domains, with a focus on the important points of fairness, freedom from bias, and truthfulness of measurement. Even students whose career options are not directed toward evaluating student achievement will learn much from these chapters that they can apply to the classes they are currently enrolled in or will enroll in during their undergraduate career. Are you well informed about the grading procedures used in the classes in which you are enrolled? What might you encourage the professor to do to make grading more fair? Chapters 13 and 14 will help you better answer these questions.

Appendix A: Microsoft Excel Applications provides MS Excel support for those without access to PASW. Directions for calculating measurement and evaluation statistics with Excel are presented. The results are similar to those obtained with PASW. Templates are provided in some cases (chi square and epidemiological statistics) that can be used rather than the many involved steps necessary in these cases with Excel. Some of these resources are available on the textbook's Internet site.

STUDENT RESOURCES

Key to this latest version of our textbook is the wide variety of student resources that help you learn the material and see how it applies to your career and everyday decision making in human performance. Within each chapter, you'll find many items that will help you understand and retain information:

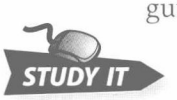
- Chapter objectives tell you the main points you should take away after having finished studying a chapter.
- Key terms are highlighted in the text, and their definitions are provided for you in the glossary.
- Mastery Items test whether or not you have mastered a particular concept. These items include student activities, problems, and other activities that will help you confirm that you have mastered the information at certain points throughout a chapter. Some Mastery Items require you to complete the task on a computer; a computer icon points out which Mastery Items need to be completed using computer software. Here is an example of the computer icon:

- Measurement and Evaluation Challenge sidebars both introduce and close the chapters. The opening sidebar presents a scenario in which an individual is faced with a situation; the closing sidebar shows how the concepts covered in the chapter can help that individual deal with the issues presented in the opening scenario.
- Dataset Applications give you an opportunity to practice many of the techniques presented in chapters 2 through 14. Large datasets are available in each chapter's section of the Online Study Guide (OSG). (See the next section for more information on the OSG.) You will gain valuable experience in using statistical software by following the instructions in your textbook and using the datasets in the OSG. Dataset Applications are identified with this icon:

You are highly encouraged to complete all of the homework problems, Mastery Items, and assignments provided for you with each textbook chapter. Completion of these items will help you better understand the concepts and apply them to your career. Equally important, they will help prepare you for examinations.

Online Study Guide

The OSG is a great resource for you. There are outlines, quiz questions, homework problems, and student learning activities that will enhance understanding and application of the concepts presented in the text. There are callouts throughout the chapters that guide you to the OSG:



Chapter outlines are called out at the beginning of each chapter, and you can print out these outlines to help you move through the chapter content and take notes during class.

These activities ask you to think about a certain issue or complete a task that will help you better understand chapter content.

Each chapter ends by directing you to the OSG, where you will find homework problems and quizzes to ensure you've fully grasped a chapter's content.

When you see one of these callouts, go to the appropriate location in the OSG and download the information or complete the activity. Students who ignore the many opportunities provided in the OSG miss great opportunities to better understand the course content. Frankly, better understanding and application is what you will be tested on. Students, BEWARE! Ignore the OSG at your own peril! If you want to do well in the course, apply yourself and use the many resources available to you. You can access the OSG by going to www.HumanKinetics.com/MeasurementAndEvaluationInHumanPerformance. If your instructor has a personal or class Internet site, he or she might even have a link to the OSG from there.

Helpful Study Hints

Here are a few hints that should help you learn and use the contents of your measurement and evaluation textbook. Frankly, most of these suggestions would apply to any course in which you are enrolled and are common knowledge to most students. The hard part is actually doing what you know you need to do. These are our suggestions:

1. Download the chapter outlines from the OSG.
2. Read the "Measurement and Evaluation Challenge" at the start of the chapter. Think about it.
3. Keeping the "Measurement and Evaluation Challenge" in mind, scan the chapter before you read it. Highlight key things that pique your interest.
4. Read the chapter. Highlight key points in more detail.
5. Try to do the homework problems.
6. Attend class every day. Do not sit near your friends. Take notes in class. Ask questions.
7. Study together in groups.
8. Rework the homework problems.
9. Reread the chapter.
10. Return to the "Measurement and Evaluation Challenge" that started the chapter and see if you can determine how the chapter information has helped you address the challenge.
11. Work with the large dataset available for each chapter beginning with chapter 2. Conduct the analyses as directed, but also conduct analyses of your own that are related to the dataset.
12. If you have questions, consider how you might learn the answer. Look through the chapter, review your notes, look at the homework, and go to the OSG. Some instructors suggest, "Ask three and then me." The idea is for you to ask three of your classmates (or other sources) about your questions. The interaction will help all of you learn the material better. If after asking three people you still have questions, go ask the instructor.

We believe that we have prepared a textbook that is understandable, interesting, informative, and easy to read. Yet it provides important information and concepts that will help you in your decision making. You are encouraged to use the textbook and the various resources to their fullest extent. We have learned that students who apply themselves, spend the time necessary for learning, attend class, are prepared, and follow the preceding suggestions have a greater appreciation for reliability and validity theory, understand the concepts better, and apply the concepts more often in their careers than students who do not use these techniques, methods, and strategies. We hope you will do what we want you do to: read, study, learn, understand, and most importantly *use* measurement and evaluation concepts throughout your academic, personal, and professional lives.

INSTRUCTOR RESOURCES

Several ancillaries are available to help instructors teach the material presented in this textbook:

- ***Instructor Guide.*** The Instructor Guide provides sample course syllabi, extra quiz questions (and their answers), supplemental activities, and answers to all of the homework problems, Mastery Items, and student activities. While we hope instructors will use these materials, we also encourage instructors to create their own additions and extensions of these materials so that the course reflects the instructor personally and addresses current important topics.
- ***Test Package.*** The Test Package contains hundreds of test questions. Here again, we encourage instructors to use and modify these items so that they reflect current information from the scientific literature. The literature of measurement and evaluation in human performance is being added to daily. Take advantage of the advances in our field and develop test items around these scientific advances.
- ***Presentation Package.*** The Presentation Package contains slides, as well as real-life examples, that match key figures, tables, and concepts from the book. Existing slides can be modified, and the presentation can be easily adapted to accommodate additional slides.
- ***Image Bank.*** The Image Bank includes all of the figures, content photos, and tables from the text. You can use these items to add to the Presentation Package or to create your own PowerPoint presentation covering the textbook material. These items can also be used in handouts for students.
- ***Online Study Guide.*** The Online Study Guide is a valuable resource for your students. Here, they can find specific information for each chapter including an outline of the chapter, an online quiz, homework problems plus answers to the odd-numbered homework problems, student activities plus answers to the odd-numbered activities, answers to the odd-numbered Mastery Items, and large datasets that are needed to complete the Dataset Application activities in the chapters.

All of the ancillaries can be accessed by going to www.HumanKinetics.com/MeasurementAndEvaluationInHumanPerformance.

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CONTENTS

Part I

Introduction to Tests and Measurements in Human Performance

We all want to make good decisions. In part I, we introduce you to concepts of measurement and evaluation and their importance in decision making. These concepts are the foundation for your study throughout the remainder of the book. Chapter 1 presents a rationale for and an overview of the scope and use of measurement in human performance. Chapter 2 describes computer applications in human performance, with specific attention to applications of measurement, testing, and evaluation; this chapter introduces advanced technology for conducting many of the exercises in the remainder of the book. Specifically, you will use the World Wide Web and statistical software (Predictive Analytics Software [PASW] and MS Excel) to help solve measurement and evaluation problems.

Part I will provide you with much of the background and computer skills necessary for making valid measurement decisions. For example, you'll learn to create data tables in PASW, read Microsoft Excel files into PASW, and analyze a dataset using the appropriate procedures. These procedures will be used throughout the remainder of the text in Mastery Items and in other activities available to you through your textbook and through the Online Study Guide (OSG). You should go to the text's Web site, where you will find many helpful resources as you learn more about measurement and evaluation.