

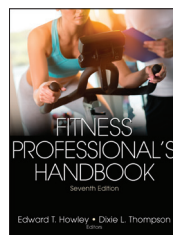
HUMAN KINETICS

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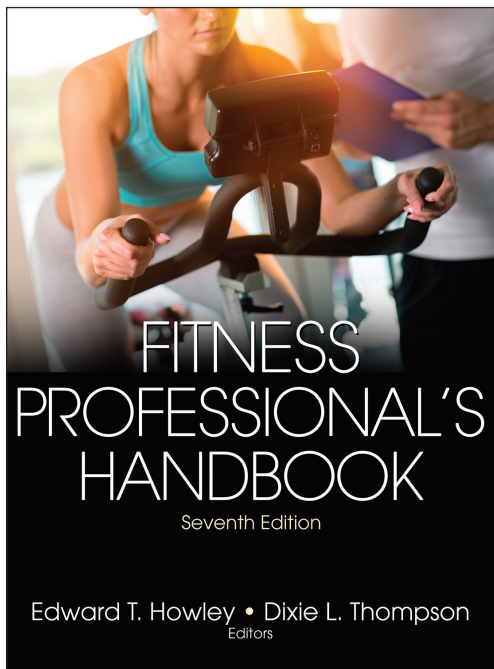
HUMAN KINETICS



New edition!

Look inside





NEW EDITION!

Available October 2016

The latest guidelines for testing and modifying exercise programs

Audiences: A text for undergraduate and beginning graduate courses in fitness testing, programming, and exercise prescription that assume a general background in anatomy and physiology. Also a reference for health and fitness professionals and those preparing for certification with the American College of Sports Medicine or other organizations.

Fitness Professional's Handbook, Seventh Edition With Web Resource, provides current and future fitness professionals with the knowledge to screen participants, conduct standardized fitness tests, evaluate the major components of fitness, and prescribe appropriate exercise. This full-color text incorporates information from the 10th edition of ACSM's *Guidelines for Exercise Testing and Prescription* and the *Physical Activity Guidelines for Americans* exercise and physical activity recommendations for adults, older adults, children, and those with special needs.

Every chapter has been updated, allowing readers to explore the newest theories and research findings and apply them to real-world situations. The following are among the most significant changes to the seventh edition:

- A new chapter, "Training for Performance," helps professionals expand their practice to work with recreational athletes who have performance-related goals
- New information, including the consequences of exercise-induced muscle damage (rhabdomyolysis), devices used to track physical activity and estimate energy expenditure (e.g., accelerometers), relative flexibility and the role of lumbopelvic rhythm in back function, the importance of progression in an exercise prescription, and the professional standard of care associated with HIIT programs reflects recent topics of interest and research
- Updated statistics on CVD and CHD from the American Heart Association, adult and childhood obesity, and the prevalence of COPD, asthma, bronchitis, and emphysema ensure accurate representation of data

Fitness Professional's Handbook, Seventh Edition With Web Resource

Edward T. Howley, PhD, and Dixie L. Thompson, PhD, Editors

©2017 • Hardback • 592 pp

Print: ISBN 978-1-4925-2337-6 • \$97.00 (\$135.95 CDN, £70.49 UK, €107.14 EURO)

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ANCILLARIES

All ancillaries are free to course adopters and available at www.HumanKinetics.com/FitnessProfessionalsHandbook

Instructor guide. Completely updated for this edition, the instructor guide includes a syllabus; course outlines that detail lecture topics and lab and classroom activities; initial and final practical exams, including checklists for easy grading; and a laboratory notebook that students can use to track their completion of 12 fitness assessment and programming activities.

Test package. Includes more than 650 questions, including true or false, multiple choice, and short answer and essay questions. The questions have been updated to reflect the new content added to the text.

NEW! Chapter quizzes. These new learning management system (LMS)-compatible, ready-made quizzes can be used to measure student learning of the most important concepts for each chapter. More than 350 unique multiple-choice, true or false, fill-in-the-blank, and short answer and essay questions are included.

Presentation package plus image bank. Contains more than 700 slides that present the textbook material in a lecture-friendly format, including art, photos, and tables pulled from the text. The image bank contains most of the art, tables, content photos, and reproducible forms from the text. Instructors may print the reproducible forms and use the art, tables, and photos to create class presentations.

NEW! Web resource. Includes a library of online video clips. The web resource also includes fillable and printable versions of many of the forms found in the text, as well as bi-annual industry updates and references from the authors.

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Twenty four video clips are included and correspond to key techniques covered in the book, particularly those which benefit from the presentation in video form.

Bassett

A pulse oximeter is used to assess the percent saturation of hemoglobin in the arterial blood (S_O₂) of pulmonary patients (figure 22.4). This noninvasive device shines a light beam through the fingertip, and the absorption characteristics of oxygenated and deoxygenated hemoglobin in the red or infrared region are used to assess the arterial oxygen saturation. Values for S_O₂ below 90% indicate that the client needs supplemental oxygen to increase the driving force for diffusion of oxygen into the lungs. Frequently, a dyspnea rating scale is used to evaluate symptoms during exercise testing (8, 21). Cardiovascular, pulmonary, met-

abolic, and power output measurements are obtained and used to evaluate the severity of disability (see table 22.1).



Watch **video 22.1**, which demonstrates the measurement of SaO₂ with a pulse oximeter during rest and exercise.

KEY POINT

One of the main pulmonary function tests for COPD is the FEV₁. COPD patients demonstrate a reduced ability to exhale quickly because of obstructed airways. In restrictive lung diseases, lung volumes are often reduced because the ability to expand the lungs is compromised. Exercise testing of patients with lung diseases, with appropriate monitoring of signs (hypoxemia) and symptoms (dyspnea) to assess the severity of the patient's condition, is beneficial.



FIGURE 22.4 Portable pulse oximeter used to assess a person's arterial O₂ saturation. The finger probe shines a light through the fingertip, and the absorption of light due to the pulsing arterial blood is measured. The number on the left side of the display shows the percent saturation of hemoglobin in arterial blood (S_O₂), and the number on the right side shows the HR.

Typical Exercise Prescription

Given the high prevalence of pulmonary diseases, especially among older adults, fitness professionals can expect

Grade	COPD description	Cause of dyspnea	FEV ₁ (% predicted)*	VO ₂ max (ml · kg ⁻¹ · min ⁻¹)	S _O ₂
GOLD 1	Mild COPD	Fast walking and stair-climbing	≥80	≥25	Normal
GOLD 2	Moderate	Walking at normal pace	≤80 to <79	>20 or >75% predicted	
GOLD 3	Severe	Slow walking	≤70 to <69	10-20 or >30%-75% predicted	
GOLD 4	Very severe	Walking less than one block	<50	>10 or >30% predicted	

*Spirometric classification using the fixed post bronchodilator ratio of FEV₁/FVC < 0.70. Data from the Global Initiative for Chronic Obstructive Lung Disease, collaboration between the National Institutes of Health and others. www.goldcopd.org, accessed November 4, 2015.

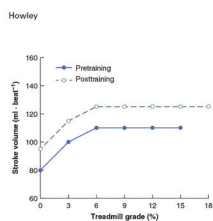


FIGURE 4.17 SV increases with training due to larger volume of the ventricle (18).

RESEARCH INSIGHT

Stroke Volume in Elite Athletes

For most people, SV levels off at about 40% VO₂max, making HR the sole factor increasing blood flow to the muscles at higher exercise intensities. However, there is clear evidence that this is not the case for highly trained endurance athletes. Interestingly, in these athletes, SV increases systematically with exercise intensity up to VO₂max. This appears to be due to both enhanced filling of the ventricle before contraction (EDV) and greater emptying of the ventricle during contraction (ejection fraction), in contrast to what is observed in people of average fitness (25, 69).

Cardiac Output

Cardiac output (Q) is the volume of blood pumped by the heart per minute and is calculated by multiplying the HR (beats · min⁻¹) by the SV (ml · beat⁻¹).

Cardiac output = HR · SV
= 60 beats · min⁻¹ · 80 ml · beat⁻¹

Cardiac output increases linearly with work rate. Generally, the cardiac output response to light and moderate work is not affected by endurance training. What changes is how the cardiac output is achieved: with a lower HR and higher SV.

Maximal cardiac output (highest value reached in a GXT) is the most important cardiovascular variable determining maximal aerobic power because the oxygen-enriched blood (carrying about 0.2 L of O₂ per liter of blood) must be delivered to the muscle for the mitochondria to use. If a person's maximal cardiac output is 10 L · min⁻¹, only 2 L of O₂ would leave the heart each minute (i.e., 0.2 L of O₂ per liter of blood times a cardiac output of 10 L · min⁻¹ = 2 L of O₂ · min⁻¹). A person with a maximal cardiac output of 30 L · min⁻¹ would deliver 6 L of O₂ · min⁻¹ to the tissues. Endurance training increases the maximal cardiac output and thus the delivery of oxygen to the muscles (see figure 4.18). This increase in maximal cardiac output is matched by greater capillary numbers in the muscle to allow the blood to move slowly enough through the muscle to maintain the time needed for oxygen to diffuse from the blood to the mitochondria (62). The increase in maximal cardiac output accounts for 50% of the increase in maximal oxygen uptake that occurs in previously sedentary people who engage in endurance training (59).

Oxygen Extraction

Two factors determine oxygen uptake at any time: the volume of blood delivered to the tissues per minute (cardiac output) and the volume of oxygen extracted from each liter of blood. Oxygen extraction is calculated by subtracting the oxygen content of mixed venous blood (as it returns to the heart) from the oxygen content of the arterial blood. This is the **arteriovenous oxygen difference**, or the (a - v) O₂ difference.

VO₂ = cardiac output · (a - v)O₂ difference.

At rest, cardiac output = 5 L · min⁻¹, arterial oxygen content = 200 ml of O₂ · L⁻¹, and mixed venous oxygen content = 150 ml of O₂ · L⁻¹.

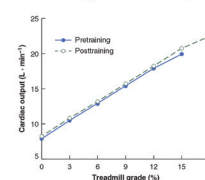


FIGURE 4.18 Maximal cardiac output increases following training (18).

Objectives, key points, glossary terms, and chapter review questions guide students to important concepts.

Thompson

- Increase the number of healthy snacks consumed. Choose bread, fruit, granola, and other nutritious foods.
- Consume complex carbohydrate (e.g., whole-wheat pasta, whole-grain bread, brown rice, potatoes) to get the majority of additional calories.
- Add resistance training to the daily routine. Weight training is an effective means for increasing fat-free mass.
- When training intensely, make sure each day to consume 1.5 g of protein for each kilogram of body weight.

KEY POINT

The additional calories needed to increase weight should come from increasing the number of healthy snacks or the size of meals. Adding resistance training to the exercise routine may help increase muscle mass.

12

REVIEW QUESTIONS

1. What is the current obesity prevalence for U.S. adults?
2. Define *positive caloric balance*. Does it lead to weight loss or weight gain?
3. What roles do genetic factors play in the development of obesity?
4. What three factors contribute to the daily caloric need?
5. What is the standard recommendation for daily caloric deficit when attempting weight loss?
6. Why is exercise important for those who are attempting weight loss or maintenance?
7. What are some behavioral strategies that can be useful for weight loss and maintenance?
8. List the signs of disordered eating.

CASE STUDIES

Ms. Kim is a 55-year-old female who comes to your facility for an initial evaluation. She complains that she has gained 20 lb (9 kg) in the last 5 yr, and she wants to lose that extra weight. She is 5 ft 5 in. (165 cm) and weighs 160 lb (72.6 kg). She currently does not exercise and has a sedentary job.

1. Calculate her estimated daily energy requirements.
2. In order for her to lose approximately 1 lb (0.5 kg) a week, what caloric intake would you recommend?
3. Assume Ms. Kim begins a weekly exercise program in which she will walk (3.5 mph or 5.6 kph) for 30 min on 5 days per wk. How many additional calories will this expend each day? (Hint: See chapter 6.) Describe the effect this will have on weight loss.

Answers to Case Studies

1. Ms. Kim's estimated daily energy requirements are as follows:
EER = 354 + 6.91(age) + PA(9.36(weight) + 726)(height)
= 354 + 6.91(55) + 1.129(36(72.7) + 726)(1.65)
= 2,078 kcal · day⁻¹.

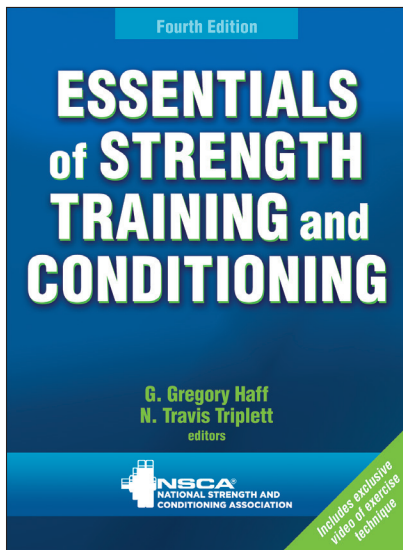
2. Approximately 4.5 kcal · day⁻¹.

If Ms. Kim engages in a 30-min walk, she will add an extra pound.

Case study questions and answers help readers apply the concepts to real-world scenarios.

References are numbered and organized by chapter at the end of the book to provide direction for more in-depth research.

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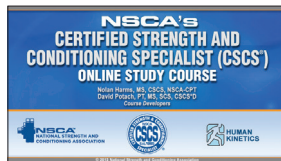
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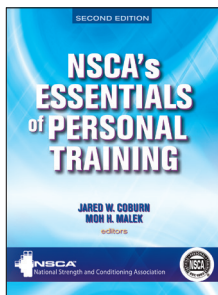
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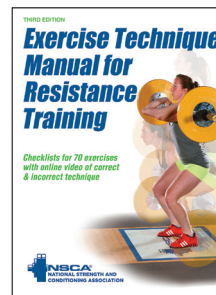
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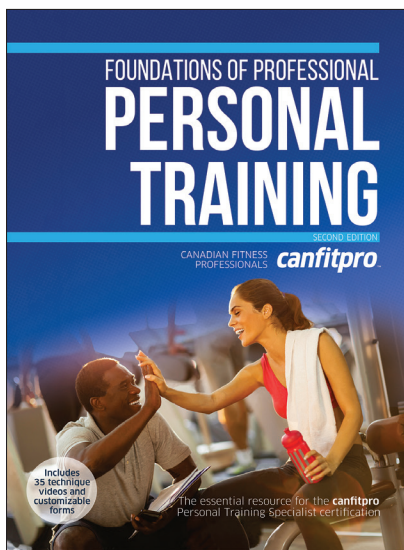
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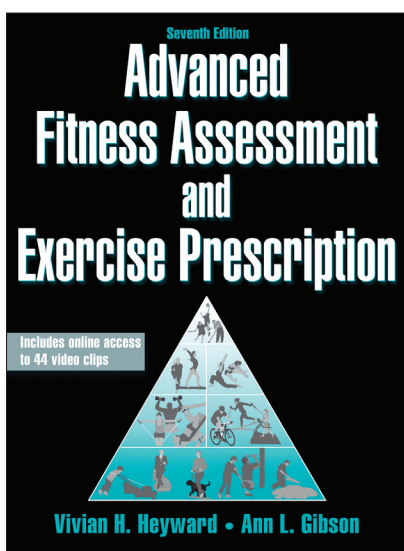
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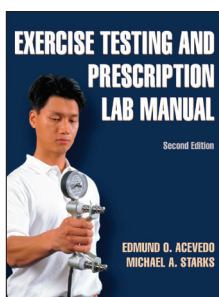
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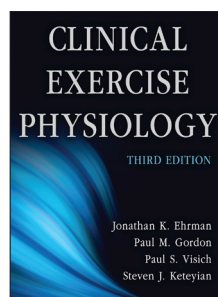
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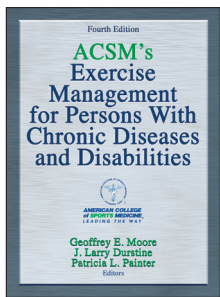
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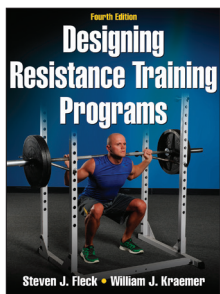
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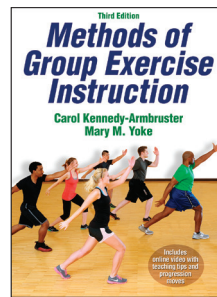
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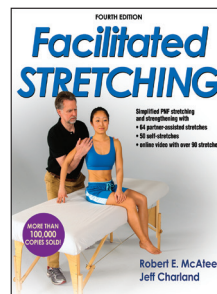
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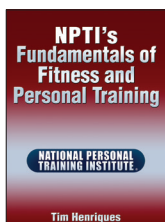
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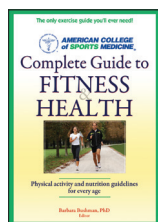
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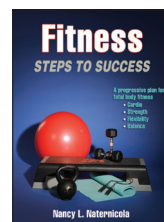
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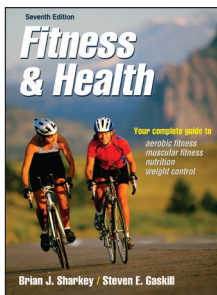
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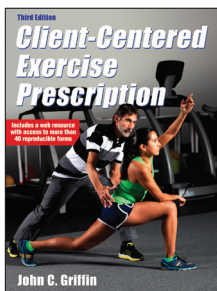
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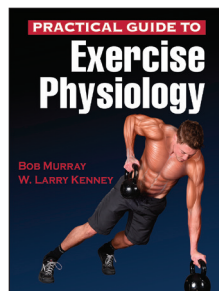
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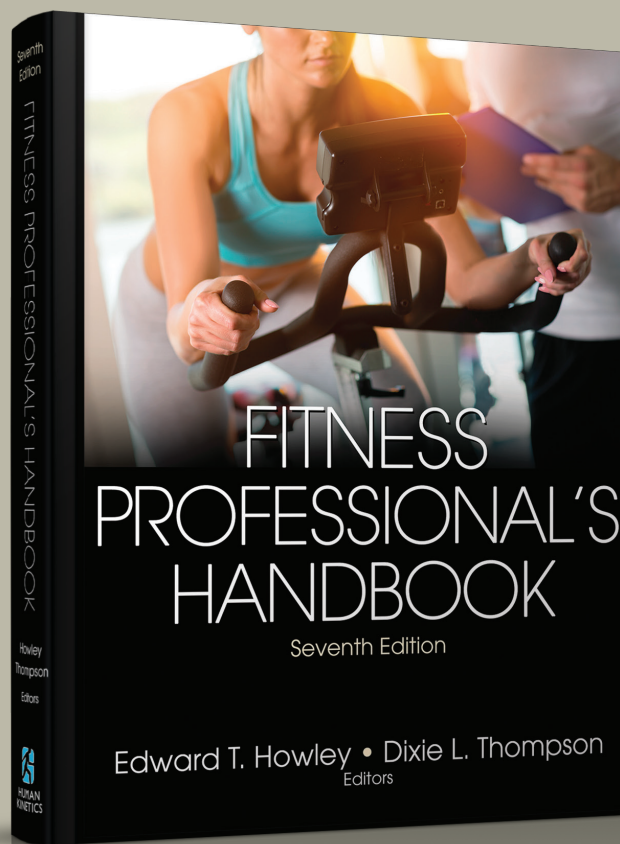
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