

# 2007-08 Physical Fitness Test Reference Guide

---

The “2007-08 Physical Fitness Test Reference Guide” is designed to assist school district and school staff in preparing for and conducting the administration of the test. This guide includes a detailed description of the fitness areas tested, the related performance criteria, and suggestions for facilitating the administration of each test.

## Background

The California Physical Fitness Test (PFT) provides information that can be used by students to assess and plan personal fitness programs; by teachers to design the curriculum of physical education programs; and by parents and guardians to understand their students’ fitness levels. This program also produces results that are used to monitor changes in the physical fitness of California students. By statute, all school districts in California are required to administer the PFT annually to all students in grades five, seven, and nine.

The State Board of Education designated the *FITNESSGRAM*<sup>®</sup> as the PFT for students in California public schools. The *FITNESSGRAM*<sup>®</sup> is a comprehensive, health-related physical fitness battery developed by The Cooper Institute. The primary goal of the *FITNESSGRAM*<sup>®</sup> is to assist students in establishing lifetime habits of regular physical activity.

## *FITNESSGRAM*<sup>®</sup>

The *FITNESSGRAM*<sup>®</sup> is designed to assess six key fitness areas that represent three broad components of fitness: (1) aerobic capacity, (2) body composition, and (3) muscle strength, endurance, and flexibility. The third component is divided into four areas: abdominal strength and endurance, trunk extensor strength and flexibility, upper body strength and endurance, and flexibility.

## Healthy Fitness Zones

The *FITNESSGRAM*<sup>®</sup> uses objective criteria to evaluate fitness performance. These criteria represent a level of fitness that offers a degree of protection against diseases resulting from physical inactivity. Performance on each of the fitness-area tests is classified into two general areas:

- Healthy Fitness Zone
- Needs Improvement (i.e., not in the Healthy Fitness Zone)

The desired performance goal for each fitness-area test is the Healthy Fitness Zone (HFZ). Test results within the HFZ reflect reasonable levels of physical fitness that can be attained by most students. All students should strive to achieve a score within the HFZ for each fitness-area test. It is possible that some students score above the HFZ.

This guide describes the six key areas tested by the PFT. Following each description are tables that display the HFZ by age and gender. The numbers in these tables represent the lower and upper limits of the HFZ (see Tables 1 through 12). The HFZs for most fitness areas of the *FITNESSGRAM*<sup>®</sup> have been established for students beginning with age five. The HFZs for the aerobic capacity tests begin with age ten (see Tables 1 and 2) or thirteen (see Table 3). Aerobic capacity HFZs for students under the age of ten are not available.

## Fitness Components and Tests

### AEROBIC CAPACITY

The aerobic capacity fitness area refers to the maximum rate that oxygen can be taken into and used by the body during exercise. This component of fitness is considered important because of the research that associates good aerobic capacity in adults with a reduction in many health problems. Three test options are provided to estimate aerobic capacity.

**PACER (Progressive Aerobic Cardiovascular Endurance Run).** This test estimates aerobic capacity from the number of laps (15 or 20 meters in distance) that are completed. Unlike the other two options, this test starts out easy and becomes progressively more difficult. Students are instructed to run as long as possible across a distance and at a specified pace set to music played from a tape or CD-ROM. (The required pace is also available without the music.) For this test, a set of parallel lines is drawn 15 or 20 meters apart. Students start on one line, run the distance, and touch the opposite line with one foot. Once they hear the sound of a single beep, students turn around and run back to the starting line. Every minute, indicated by a triple beep, the pace gets faster. Students continue in this manner until they fail twice to touch the line before they hear the single beep.

**Table 1. HFZs for 20-Meter PACER**

Age	Females # laps	Males # laps
10	7 – 41	23 – 61
11	15 – 41	23 – 72
12	15 – 41	32 – 72
13	23 – 51	41 – 83
14	23 – 51	41 – 83
15	32 – 51	51 – 94
16	32 – 61	61 – 94
17	41 – 61	61 – 106
17+	41 – 72	72 – 106

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

There are no HFZs for the 15-meter PACER. If the 15-meter PACER is administered, these scores must be converted to 20-meter scores, as shown in the following examples:

- Example 1: A female student, age 12, completes 16 laps on the 15-meter PACER. This is the equivalent of 12 laps on the 20-meter PACER, which is the score that is recorded for this student. (A score of 12 on the 20-meter PACER **does not** fall within the HFZ.)
- Example 2: A male student, age 15, completes 70 laps on the 15-meter PACER. This is the equivalent of 54 laps on the 20-meter PACER, which is the score that is recorded for this student. (A score of 54 on the 20-meter PACER **does** fall within the HFZ.)

The conversion table can be viewed and downloaded from <http://www.fitnessgram.net> (Outside Source).

**One-Mile Run.** This test estimates aerobic capacity from running performance. Students are instructed to run a mile as fast as possible; however, walking is permitted for students who cannot run the total distance. The time taken to complete the run is recorded in minutes and seconds.

**Table 2. HFZs for One-Mile Run** <sup>(1)</sup>

Age	Females minutes:seconds	Males minutes:seconds
10	12:30 – 9:30	11:30 – 9:00
11	12:00 – 9:00	11:00 – 8:30
12	12:00 – 9:00	10:30 – 8:00
13	11:30 – 9:00	10:00 – 7:30
14	11:00 – 8:30	9:30 – 7:00
15	10:30 – 8:00	9:00 – 7:00
16	10:00 – 8:00	8:30 – 7:00
17	10:00 – 8:00	8:30 – 7:00
17+	10:00 – 8:00	8:30 – 7:00

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

<sup>(1)</sup>The number on the left is the lower end of the HFZ; the number on the right is the upper end of the HFZ. For time, smaller numbers are better than larger numbers.

**Walk Test.** This test is for use with students who are ages 13 or older. The test estimates aerobic capacity from heart rate response to a one-mile walk. Students are instructed to walk one mile as fast as possible. Immediately after the walk, the heart rate is determined. This heart rate (heart beats per a 15-second time period) is used along with the total walk time (in minutes and seconds) and the weight of the student to estimate aerobic capacity. An aerobic capacity score (VO<sub>2</sub> max) is estimated by inserting age, gender, weight, mile walk time, and heart rate at the end of the walk into the Rockport Fitness Walking Test Equation (see Figure 1). This score reflects the maximum rate that oxygen can be taken into and used by the body during exercise.

**Figure 1. Rockport Fitness Walking Test Equation**

$\text{VO}_2 \text{ max} = - .3877 (\text{Age}) + 6.315 (\text{Gender}) - .0769 (\text{Weight}) - 3.2649 (\text{Time}) - .1565 (\text{Heart Rate}) + 132.853$
Age is in years Gender is 1 for Males and 0 for Females Weight is in pounds Time is in minutes Heart Rate is in beats/minute

**Table 3. HFZs for Walk Test**

Age	Females VO <sub>2</sub> max	Males VO <sub>2</sub> max
13	36 – 44	42 – 52
14	35 – 43	42 – 52
15	35 – 43	42 – 52
16	35 – 43	42 – 52
17	35 – 43	42 – 52
17+	35 – 43	42 – 52

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

### **Administration Tips for the Aerobic Capacity Test**

- Preparing for any of the tests should include instructions and practice in pacing and in techniques for heart rate monitoring.
- Adequate time should be allowed for students to warm up before taking a test and to cool down after completing the test.
- To avoid potential invalid estimates, do not administer a test in unusually high temperatures and/or humidity or when the wind is strong.

### **BODY COMPOSITION**

The body composition fitness area targets the various factors that contribute to an individual's total weight (i.e., percent of muscle, bone, organ, and fat content). Body composition tests estimate the level of body fat. This component of fitness is considered important because of the research that associates excessive fat content with health problems, such as coronary heart disease, stroke, and diabetes. *FITNESSGRAM*<sup>®</sup> provides three test options to estimate body composition.

**Skinfold Measurements.** This test estimates body fat by taking multiple measurements of the thickness of skinfolds on the triceps and calf. A device called a skinfold caliper is used to take these measurements. Using the Body Composition Conversion Chart (found in the *FITNESSGRAM*<sup>®</sup> Test Administration Manual), the measurements are converted to percentages of body fat.

**Table 4. HFZs for Percentage of Body Fat <sup>(2)</sup>  
(Skinfold Measurements and Bioelectric Impedance Analyzers)**

Age	Females %	Males %
5	32 – 17	25 – 10
6	32 – 17	25 – 10
7	32 – 17	25 – 10
8	32 – 17	25 – 10
9	32 – 13	25 – 7

10	32 – 13	25 – 7
11	32 – 13	25 – 7
12	32 – 13	25 – 7
13	32 – 13	25 – 7
14	32 – 13	25 – 7
15	32 – 13	25 – 7
16	32 – 13	25 – 7
17	32 – 13	25 – 7
17+	32 – 13	25 – 7

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

<sup>2)</sup>The number on the left is the lower end of the HFZ; the number on the right is the upper end of the HFZ. For percent fat, smaller numbers are better than larger numbers.

**Body Mass Index (BMI).** This test is not an estimate of body fat. Instead, it provides information on the appropriateness of a student’s weight relative to his or her height. The BMI is not the recommended body composition test; however, it is available because there may be school district policies limiting skinfold measurements. The use of the BMI does yield some useful information for body composition estimation.

A body fat percentage or a BMI that falls below the range included in the HFZ is identified as “Very Low.” Students falling into the Very Low category should be informed of this designation and told that being too lean may not be best for optimal health.

**Table 5. HFZs for Body Mass Index <sup>(3)</sup>**

Age	Females BMI	Males BMI
5	21.0 – 16.2	20.0 – 14.7
6	21.0 – 16.2	20.0 – 14.7
7	22.0 – 16.2	20.0 – 14.9
8	22.0 – 16.2	20.0 – 15.1
9	23.0 – 13.5	20.0 – 13.7
10	23.5 – 13.7	21.0 – 14.0
11	24.0 – 14.0	21.0 – 14.3
12	24.5 – 14.5	22.0 – 14.6
13	24.5 – 14.9	23.0 – 15.1
14	25.0 – 15.4	24.5 – 15.6
15	25.0 – 16.0	25.0 – 16.2
16	25.0 – 16.4	26.5 – 16.6
17	26.0 – 16.8	27.0 – 17.3

17+	27.3 – 17.2	27.8 – 17.8
-----	-------------	-------------

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

<sup>9</sup>The number on the left is the lower end of the HFZ; the number on the right is the upper end of the HFZ. For BMI, smaller numbers are better than larger numbers.

The California Department of Education (CDE) also accepts measurements of body fat obtained from two devices, the bioelectric impedance analyzer and automated skinfold calipers.

**Bioelectric Impedance Analyzer (BIA).** The BIA measures resistance to the flow of an electrical signal in the body. The device sends a safe, low energy electrical signal through the body and generates an index of resistance. The resistance value (along with other values, such as height, weight, age, and gender) is then used to estimate the percentage of body fat. There are various BIA devices available that are affordable, easy to use, and accurate enough for use on the *FITNESSGRAM*<sup>®</sup>.

**Automated Skinfold Calipers.** This is a computerized version of the skinfold measurements described on the previous page. The computerized device is used to acquire, calculate, and display the percentage of body fat together with computer-entered data, such as age and gender.

### Administration Tips for the Body Composition Tests

- Privacy should be provided to the student when measuring a student's height or weight.
- Be sure the tester has practiced taking skinfold measurements.
- Whenever possible, the same tester should administer the skinfold measurements to the same students at subsequent tests.

## MUSCLE STRENGTH, ENDURANCE, AND FLEXIBILITY

The muscle strength, endurance, and flexibility fitness area determines the health status of the musculoskeletal system (i.e., muscles and bones throughout the body). Balanced, healthy functioning of this system requires that muscles work forcefully (i.e., strength), over a period of time (i.e., endurance), and be flexible enough to have a full range of motion at the joints (i.e., flexibility). This component of fitness is important, because it can reduce potential restrictions in independent living as adults (e.g., chronic lower back pain).

To determine the health level of the musculoskeletal system, four major areas are tested: (1) abdominal strength and endurance, (2) trunk extensor strength and flexibility, (3) upper body strength and endurance, and (4) flexibility.

### ABDOMINAL STRENGTH AND ENDURANCE

Abdominal strength and endurance are important in promoting good posture and correct pelvic alignment. The latter is important in the maintenance of lower back health. The curl-up is the only test that is used to determine this area of fitness.

**Curl-Up.** Students are to complete as many curl-ups as possible (to a maximum of 75), at a specified pace of about one curl-up every three seconds. The pace should be called or played on a prerecorded tape or CD-ROM. On a mat, students lie on their backs with their knees bent at a 140° angle and their hands at their sides, palms face down. Moving slowly, students curl up, sliding fingers across a measuring strip on the mat, and then curl back down until the head touches the mat. Students are stopped after reaching 75 curl-ups or when the second form correction is made.

### Administration Tips for the Curl-Up

- Allow students to practice and learn the correct curl-up form.
- Curl-up movements should be rhythmical (i.e., with the cadence) and continuous. Pauses and rest periods are not allowed.
- Students should reposition themselves if the body moves and the head does not contact the mat at the appropriate spot or the measuring strip moves out of position.
- Students should be stopped after four minutes.

**Table 6. HFZs for Curl-Up**

Age	Females # completed	Males # completed
5	2 – 10	2 – 10
6	2 – 10	2 – 10
7	4 – 14	4 – 14
8	6 – 20	6 – 20
9	9 – 22	9 – 24
10	12 – 26	12 – 24
11	15 – 29	15 – 28
12	18 – 32	18 – 36
13	18 – 32	21 – 40
14	18 – 32	24 – 45
15	18 – 35	24 – 47
16	18 – 35	24 – 47
17	18 – 35	24 – 47
17+	18 – 35	24 – 47

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

## **TRUNK EXTENSOR STRENGTH AND FLEXIBILITY**

Trunk extensor strength and flexibility is an important component of fitness, because it predicts first time and recurrent lower back pain – a major source of disability and discomfort in the United States. Although risks of developing back pain are greater with age, awareness and attention to trunk musculature at an early age is important to reduce future risks. The trunk lift is the only test used to determine this area of fitness.

**Trunk Lift.** While lying face down on a mat, students are asked to slowly lift the upper body off the floor, using the muscles of the back, to a maximum of 12 inches. Students need to hold the position for measurement (i.e., distance from the floor to the student’s chin). During the test, students should be instructed to keep their eyes focused on a spot on the floor. Once the measurement is made, the student returns to the starting position. A second trial is conducted and the highest score is recorded.

### **Administration Tips for the Trunk Lift**

- Students should not bounce during the test.
- Maintaining focus on the spot on the floor should assist in maintaining the head in the proper position.
- As a safety precaution, students should **not** be encouraged to lift higher than 12 inches as excessive arching of the back may harm the student by compressing the disks.

**Table 7. HFZs for Trunk Lift**

<b>Age</b>	<b>Females inches</b>	<b>Males inches</b>
5	6 – 12	6 – 12
6	6 – 12	6 – 12
7	6 – 12	6 – 12
8	6 – 12	6 – 12
9	6 – 12	6 – 12
10	9 – 12	9 – 12
11	9 – 12	9 – 12
12	9 – 12	9 – 12
13	9 – 12	9 – 12
14	9 – 12	9 – 12
15	9 – 12	9 – 12
16	9 – 12	9 – 12
17	9 – 12	9 – 12
17+	9 – 12	9 – 12

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

## **UPPER BODY STRENGTH AND ENDURANCE**

Upper body strength and endurance is an important fitness area because of reported benefits in maintaining functional health and good posture. Three options are available to determine upper body strength.

**Push-Up.** Students are instructed to complete as many push-ups as possible at a specified pace (of about one push-up every three seconds). The pace should be called or played on a prerecorded tape or CD-ROM. Students are stopped when the second form correction is made or when they experience extreme discomfort or pain. The number of push-ups is recorded.

### **Administration Tips for the Push-Up**

- Allow students to practice and learn the correct push-up form.
- The test should be terminated if the student appears to be in extreme discomfort or pain.
- Males and females follow the same protocol.

**Table 8. HFZs for Push-Up**

Age	Females # completed	Males # completed
5	3 – 8	3 – 8
6	3 – 8	3 – 8
7	4 – 10	4 – 10
8	5 – 13	5 – 13
9	6 – 15	6 – 15
10	7 – 15	7 – 20
11	7 – 15	8 – 20
12	7 – 15	10 – 20
13	7 – 15	12 – 25
14	7 – 15	14 – 30
15	7 – 15	16 – 35
16	7 – 15	18 – 35
17	7 – 15	18 – 35
17+	7 – 15	18 – 35

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

**Modified Pull-Up.** In this test, students are instructed to successfully complete as many modified pull-ups as possible. Students perform the modified pull-up by lying on their backs directly under a bar. Students grasp the bar and pull up their upper bodies until the chin reaches a specified level, marked by an elastic band. Students are stopped when the second form correction is made. The number of modified pull-ups is recorded.

#### **Administration Tips for the Modified Pull-Up**

- Only arm movement is allowed. The body should be kept straight.
- Movement should be rhythmical and continuous. Students may not stop to rest.

**Table 9. HFZs for Modified Pull-Up**

Age	Females # completed	Males # completed
5	2 – 7	2 – 7
6	2 – 7	2 – 7
7	3 – 9	3 – 9
8	4 – 11	4 – 11
9	4 – 11	5 – 11

10	4 – 13	5 – 15
11	4 – 13	6 – 17
12	4 – 13	7 – 20
13	4 – 13	8 – 22
14	4 – 13	9 – 25
15	4 – 13	10 – 27
16	4 – 13	12 – 30
17	4 – 13	14 – 30
17+	4 – 13	14 – 30

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

**Flexed-Arm Hang.** Students are instructed to hang by the arms and with their chin above a bar as long as possible. Students are stopped when their chin drops below the bar or when the second form correction is made. The length of time hanging is recorded in seconds.

#### Administration Tips for the Flexed-Arm Hang

- The body should not swing during the test.
- Only one trial is permitted unless the tester believes that the student has not had a fair opportunity to perform one trial.

**Table 10. HFZs for Flexed-Arm Hang**

Age	Females seconds	Males seconds
5	2 – 8	2 – 8
6	2 – 8	2 – 8
7	3 – 8	3 – 8
8	3 – 10	3 – 10
9	4 – 10	4 – 10
10	4 – 10	4 – 10
11	6 – 12	6 – 13
12	7 – 12	10 – 15
13	8 – 12	12 – 17
14	8 – 12	15 – 20
15	8 – 12	15 – 20
16	8 – 12	15 – 20
17	8 – 12	15 – 20
17+	8 – 12	15 – 20

© 2007 by The Cooper Institute, Dallas, Texas. All rights reserved.

## FLEXIBILITY

Flexibility of the joints, both in the upper and lower body, is an important component of health-related fitness. People benefit from increased flexibility on a daily basis, both in routine tasks and those associated with more rigorous physical activity. Two options are available to determine a student's flexibility.

**Back-Saver Sit and Reach.** This test predominantly measures the flexibility of the hamstring muscles. Students are instructed to reach the specified distance on the right and left sides of the body. Starting in a sitting position, with one leg extended (touching the box needed for this test) and the other leg bent, the student reaches forward with both hands along the scale of the box. The student reaches four times and holds the position on the fourth reach for at least one second. The distance the student reaches is recorded, and the same procedure is conducted on the opposite leg. To be in the HFZ, the student should meet the reach criteria using both the right and left sides of the body.

### Administration Tips for the Back-Saver Sit and Reach

- The knee of the extended leg should remain straight. The tester may place one hand on the student's knee as a reminder to keep the knee straight. As a safety precaution, care should be taken not to push or use force to hold down the student's knee.
- Hips must remain square to the box. Do not allow the student to turn the hip away from the box as he or she reaches.
- As a safety precaution, reach performance should be limited to 12 inches.

**Table 11. HFZs for Back-Saver Sit and Reach**

Age	Females inches	Males inches
5	9	8
6	9	8
7	9	8
8	9	8
9	9	8
10	9	8
11	10	8
12	10	8
13	10	8
14	10	8
15	12	8
16	12	8
17	12	8
17+	12	8

**Shoulder Stretch.** This test measures upper body flexibility. Students are instructed to touch the fingertips together behind the back with one hand reaching over the shoulder and the other under the elbow. **Both** shoulders are tested, and each is recorded separately.

**Table 12. HFZs for Shoulder Stretch**

Age	Females & Males
All ages	Touching the fingertips together behind the back on <b>both</b> sides.

### **General Suggestions for PFT Administration**

Most of the *FITNESSGRAM*<sup>®</sup> tests can be administered in a space equivalent to the size of most classrooms. While the test options for aerobic capacity require the greatest amount of space, one of the options, the PACER, requires a space that can accommodate the 15-meter or 20-meter distance needed to carry out the test. Therefore, schools with limited space should consider using one of the following options:

- Classrooms, lunchrooms, auditoriums, or other similar spaces
- Physical education facilities on other school campuses
- Local park and recreation facilities

### **Testing Students with Disabilities**

Certain variations or accommodations may be provided for students with disabilities who need special assistance on the PFT. Variations and accommodations should be specified in the student's individualized education program (IEP) or Section 504 Plan. *Matrix 1. Matrix of Test Variations, Accommodations, and Modifications for Administration of California Statewide Assessments* provides a list of the types of variations and accommodations that are available for the PFT. This chart is posted on the Student Testing Web page at <http://www.cde.ca.gov/ta/tg/sa/>.

*FITNESSGRAM*<sup>®</sup> is intended for use with students with disabilities who do not require modifications. You will, in some situations, be working with students with disabilities who do require modifications. If certain physical fitness components are deemed important as a dimension in physical education, they are equally important for all students. Therefore, teachers needing assistance with modifications should contact the California Department of Education Standards and Assessment Division at 916-319-0341 (phone) or [PFT@cde.ca.gov](mailto:PFT@cde.ca.gov) (e-mail).

### **Administration Resources**

The *FITNESSGRAM*<sup>®</sup> Test Administration Manual, 8.0 Test Kit CD-ROM (software), and materials needed (i.e., skinfold calipers, PACER tape, or CD-ROM) to administer the tests can be purchased from Human Kinetics by calling 800-747-4457, extension 2361. The manual includes a DVD of all the test protocols, a CD-ROM for the 15-meter and 20-meter PACER, and cadences for the curl-up and the push-up tests. Cadences help students with pacing their movements for curl-up and push-up tests. In addition, due to the addition of the 15-meter PACER, there is a conversion table for converting the 15 meter laps to 20 meter laps for recording purposes. This table can also be viewed and downloaded from <http://www.fitnessgram.net> (Outside Source).

Human Kinetics has recently released an update to the *FITNESSGRAM*<sup>®</sup> software. The 8.3 update enhances and/or fixes the following six areas:

- Incorporates all existing versions of the program (i.e., 8.0, 8.0.1, and 8.2) to 8.3.
- Fixes the problem of services stopping intermittently on the District install.
- Allows for reports to be generated using Adobe Reader 8.
- Allows for the ability to have student data (e.g., names, IDs) to be de-identified or not, per needs of a research partner.
- Allows for additional ethnicity codes to meet California's PFT reporting requirements.
- Makes enhancements to the generation of the *FITNESSGRAM*<sup>®</sup> Statistical and Achievement of Standards reports.

The *FITNESSGRAM*<sup>®</sup> 8.3 update is only available for downloading via the Internet at <http://www.HumanKinetics.com/service/support/techsupport.cfm> (Outside Source). Enter “*FITNESSGRAM*<sup>®</sup> 8.3 Updater” in the search field. Next, click on the *FITNESSGRAM*<sup>®</sup> 8.3 Updater link, and you will be taken to a page with an explanation of the update and the link for downloading the update.

If you have questions concerning the *FITNESSGRAM*<sup>®</sup> 8.3 update, contact Human Kinetics' Technical Support at 217-351-5076, Monday through Friday (excluding holidays) between 7:00 a.m. and 7:00 p.m. (Central Standard Time) or at [support@hkusa.com](mailto:support@hkusa.com) (e-mail).

All photos reprinted, by permission, from Human Kinetics, *FITNESSGRAM/ACTIVITY-GRAM*<sup>®</sup> Test Administration Manual, 3rd ed. (Champaign, IL: Human Kinetics). This manual includes a DVD with video of all test protocols.