



About the Health Fitness Assessment

The Health Fitness Assessment is a combination of four common assessments measuring body fat, VO₂max, and muscular strength and endurance.

Percent Body Fat

Basic body composition is expressed as the relative percentage of body mass that is fat and fat-free tissue using a two-compartment model. Body composition can be estimated with both laboratory and field techniques that vary in complexity, cost, and accuracy. The following assessment uses skinfold measurements taken with skinfold calipers.

The principle behind this technique is that the amount of subcutaneous fat is proportional to the total amount of body fat. It is assumed that close to one-third of total body fat is located subcutaneously.

Before collecting data using this technique, the technician must be trained, practiced, and have demonstrated reliability in measurements.

The accuracy of predicting percent body fat from skinfolds is about +/- 3.5%.

Adapted from *ACSM's Guidelines for Exercise Testing and Prescription, Eighth Edition*. 2010, pages 62 – 66.

Equipment:

1. Lange Skinfold Calipers or Harpenden Skinfold Calipers (recommended skinfold calipers. Others may be used but the Lange and Harpenden are best known in evidence based research to be accurate)
2. Fabric Measuring Tape



Test Steps:

1. All measurements should be made on the right side of the body.
2. Caliper should be placed 1 cm away from the thumb and finger, perpendicular to the skinfold and halfway between the crest and the base of the fold.
3. The pinch should be maintained while reading the caliper.
4. Wait 1 to 2 seconds but not longer before reading the caliper.
5. Take duplicate measurements at each site and retest if measurements are not within 1 to 2 mm.
 - i. If within 1 or 2 mm take average
 - ii. If not within 1 or 2 mm take 3rd measurement.
 - iii. If still no match, then take average of 2 closest measurements.
6. Rotate through measurement sites allowing skin to regain texture before completing a second measurement.
7. You may improve the re-test validity when completing re-assessments by using a fabric measuring tape to measure the exact location of each skinfold site, by measuring with the tape the exact distances for each skinfold from their origination sites, such as:

When doing a thigh skinfold, use the measuring tape to exactly determine the midway point between the top of the patella and the iliac crest, mark this point with a washable marker on the body and then record the exact location of the skinfold in millimeters in the IHP. Complete your skinfold measurement and then when you do a re-assessment at a later date be sure to do the follow-up measurement at the exact same location by using the measuring tape to mark the measurement location exactly and perform the skinfold at this exact location.

Skinfold Sites:

Jackson Pollock – Men

Chest – Diagonal Fold, midway between upper armpit and nipple

Abdominal – Vertical Fold, 1 inch to the right of the navel

Thigh – Vertical Fold, midway between the iliac crest and the top of the patella

Jackson Pollock – Women

Triceps – Vertical Fold, midway between the shoulder and elbow

Suprailiac – Diagonal Fold, directly above the top of the iliac crest

Thigh – Vertical Fold, midway between the iliac crest and the top of the patella

Durnin – Womersley – Men & Women

Bicep – Vertical Fold, halfway between the shoulder and elbow, directly on bicep

Triceps – Vertical Fold, midway between the shoulder and elbow

Subscapular – Diagonal Fold, directly below the shoulder blade

Suprailiac – Diagonal Fold, directly above the iliac crest

Sources:

3-Site: Jackson and Pollock (1985) "Practical assessment of body composition." *Physical Sport Medicine*.

4-Site: Durnin and Womersley (1974) "Body fat assessment from total body density and its estimation from skinfold thickness:

measurements on 481 men and women aged 16-72 years." *British Journal of Nutrition*.

VO2 – Cardiovascular Fitness Assessment

Maximal oxygen uptake or max VO₂, is the measured rate at which oxygen can be taken by the lungs, pumped and distributed by the heart and blood vessels and used by the muscles to do work. VO₂ is measured in milliliters of oxygen per kilogram of body weight per minute. VO₂ values range between 20 ml for poorly conditioned individuals up to 90 ml for elite athletes. A high VO₂ indicates good functional heart health as well as a high endurance capacity. The minimal standard for optimal fitness is around 38 – 45 ml/kg of body weight/minute for men 20 – 60 years of age. Values for women are approximately 10 – 20% lower.



Equipment:

Treadmill

Watch for manually counting heart rate or a heart rate monitor that automatically displays heart rates.

The Single Stage Treadmill Walking Test (Ebbeling et al. 1991).

The single stage treadmill walking test is a submaximal aerobic fitness test that estimates VO₂ max. It is suitable for low risk, apparently healthy, non-athletic adults 20-59 years of age. The walking pace required throughout the test also makes it appropriate for participants who experience problems such as knee pain when exercising at a jogging pace. The test can be administered to moderate sized groups of participants with low to moderate fitness levels and requires only a treadmill and a HR monitor.

Test Steps:

The walking speed for the test is individually determined based on the participant's gender, age, and fitness level

1. Estimate the participant's age-predicted HR_{max} (220-age) bpm then calculate; 50% bpm and 70% bpm of his/her HR_{max}.
2. Have the participant warm-up for 4 minutes at a 0% grade and a walking speed that brings the HR to between 50% and 70% of his/her HR_{max}. (The recommended walking speed is from 3.4 to 4 mph). If the HR is not in this range after the first minute, adjust the speed accordingly.
3. Following the warm-up, keep the participant at the same speed for an additional 4 minutes at a grade of 5%, then record the steady-state HR (SS HR) from the average of the final 30 sec of the last two minutes at the 5% grade. (Note; to achieve steady-state, the HR from the last two minutes must not differ by more than 5 bpm. If the HR differs by more than 5 bpm, extend the test by an additional minute and record the SS HR from the new final two minutes.) SS HR = bpm.
4. Enter the final speed achieved and SS HR into the data entry fields in the IHP Fitness Assessment data entry form. Click "calculate" at the bottom of the page and the IHP will automatically calculate the VO₂ in ml · kg-min.
5. Allow the participant to cool down at a comfortable slow walk and 0% grade for 2-5 min.
6. Complete recovery blood pressures and heart rates ensuring the participant has returned to a healthy, safe recovery level
7. Blood pressure and RPE levels may also be measured during the test and recorded to ensure test safety. Follow ACSM protocols for cardiovascular fitness testing at all times and most importantly to determine when a test should be stopped.

Source:

Ebbeling, C.B., et al. (1991) "Development of a single-stage submaximal treadmill walking test." *Medicine & Science in Sports & Exercise*.



Push-up

The purpose of the push-up test is to measure muscular endurance of the upper body specifically the flexors and adductors of the shoulder and the extensors of the elbow. Muscular endurance represents how well a muscle exerts sub-maximum force repeatedly within a given period of time. In this test the subject performs as many push-ups as possible until fatigue.

Equipment:

1. Mat area on the floor
2. Stopwatch

Test Steps:

For male subjects the push-up test is administered with male subjects in the standard “up” position (hands shoulder width apart, back straight, head up, using the toes as the pivotal point)

For female subjects the push-up test is administered in the modified “knee push –up” position (legs together, lower leg in contact with mat with ankles plantar-flexed, back straight, hands shoulder width apart, head up).

1. The subject must lower the body until the chin touches the mat. The stomach should not touch the mat.
2. For both men and women, the subject’s back must be straight at all times and the subject must push up to a straight arm position.
3. The maximal number of push-ups performed consecutively without rest is counted as the score.

Source:

ACSM's Guidelines for Exercise Testing and Prescription, Eighth Edition. 2010.

Hand Grip Strength

Muscle strength is defined as the ability of a muscle to exert maximal force against a given resistance. Hand grip strength correlates fairly well in determining isometric upper body strength. It is important to maintain good strength levels since with each decade of life the body loses a certain amount of strength and muscle tissue. Those who work out with weights throughout their lives have a much greater level of strength and better muscle tone, despite the aging process. Many factors influence the strength of the grip, including muscle strength, hand dominance, fatigue, time of day, age, nutritional status, restricted motion, and pain.



Equipment:

1. Hand Grip Dynamometer – recommend the Jamar or Lafayette Dynamometer

Test Steps:

1. Begin by showing the individual how to do the test and complete one or two demonstration reps for the individual.
2. Let the individual choose the hand they would like to have tested. Be sure to rotate the “peak-hold” needle on the dynamometer to the “0” position before beginning.
3. Have the individual sit with their shoulders adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position, and wrist between 0° and 30° dorsiflexion and between 0° and 15° ulnar deviation.
4. After the individual is positioned properly, say, “Squeeze as hard as you can...harder!...harder!...relax.” Be sure to tell the individual to only squeeze one rep, do not do multiple reps in the same trial.
5. Record the reading and reset the peak-hold needle to zero. Record the scores of three successive trials.

Mathiowetz V. et al. (1985) "Grip and Pinch Strength: Normative Data for Adults." *Archive of Physical Medicine Rehabilitation*.