

Performing Pre-Participation Health and Fitness Assessments

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February 2002

Exercise testing, according to ACSM standards, should be part of all members' initial assessments upon joining your facility.

With the release of the sixth edition of ACSM's Guidelines for Exercise Testing and Prescription, it is timely to review the steps to perform a complete health and fitness assessment. Yet even with so many procedural revisions, many in the health/fitness industry may be moving away from incorporating the assessment process when assimilating new members. However, to ensure members' safety and well-being, and to improve member retention and programming, assessments must be performed. Further, assessments provide both members and facility personnel with the means to document improvements attained through participation in an individualized, well-designed, regular exercise program. Following is a step-by-step review of the health assessment procedures according to ACSM standards, along with how to interpret test results, and strategies to more effectively incorporate the health assessment process in your facility.

Pre-test instructions and the test environment

Members should be instructed to arrive for their fitness assessments wearing the proper clothing and having avoided food and moderate-to-vigorous exercise for 12 hours prior, and alcohol, nicotine and caffeine for three hours prior to testing. They also should have been given some information regarding the assessment so that they have reasonable expectations and can plan the rest of their day accordingly.

When possible, testing should be conducted in a quiet, private area to reduce anxiety and improve concentration. Practically speaking, it may be feasible to only complete the questionnaires, and resting heart rate, blood pressure and body composition assessments in such a place. The remaining tests, including cardiorespiratory endurance, muscular fitness and flexibility assessments, will most likely occur on the facility floor.

The staff member conducting the tests should be relaxed, yet confident, to ease the member through the screening process. Testing procedures should be explained clearly, and ample time should be allowed to answer any questions. The process should be conducted in an organized fashion. Sometimes it may be necessary for members and staff to perform the entire screening process in the span of two days; the resting assessments on day one, followed by the active assessments on the second.

Components of the health screening

The general components of the health assessment process are broad in nature, and range from evaluating the many components of physical fitness to protecting your facility from liability. The tests and components should be performed in a specific order to include the following:

1. Physical Activity Readiness Questionnaire (PAR-Q), lifestyle and medical history inventories, and the informed consent form
2. Resting heart rate and blood pressure
3. Body composition
4. Cardiorespiratory endurance
5. Muscular fitness (includes both strength and endurance)

6. Flexibility

As noted, these tests may be divided into resting assessments (tests one, two and three) and active assessments (tests four, five and six). For certain individuals, however, the risks of exercise testing may outweigh the benefits associated with exercise. Exercise testing without a physician present may be contraindicated for a person with conditions such as acute infections or unstable chest pain (angina). A complete list can be found in ACSM's Guidelines for Exercise Testing and Prescription (p. 50). When in doubt, have your members obtain medical clearance from a doctor prior to testing.

The initial steps in the assessment process are aimed at obtaining a comprehensive understanding of your new members' health and lifestyle. Central to this information is completion of all necessary health/facility forms, and the determination of resting heart rate and blood pressure. Members should complete the forms (e.g., PAR-Q, questions regarding existing health conditions and risk factors for cardiovascular disease) that will provide information regarding whether it is safe to test them in your facility prior to scheduling a fitness assessment appointment. Examples of these forms can be found at the following:

- * PAR-Q (www.gov.on.ca/opp/recruit/english/par_q.pdf)
- * Informed consent ([www.exrx.net/Testing/Informed Consent.html](http://www.exrx.net/Testing/Informed%20Consent.html))
- * CAD risk factor analysis (ACSM's Guidelines, p.24)

Forms to evaluate lifestyle behaviors and readiness for change (based on the Transtheoretical Model) should also be considered, and can easily be developed (refer to the References: Nieman, pp. 575-577; or Howley pp. 35-36, for examples of the former, and see Marcus or Gorely for examples of the latter).

Resting heart rate and blood pressure

Determination of resting heart rate (RHR) and resting blood pressure (RBP) should, ideally, be conducted after the member has been allowed to sit quietly for five minutes. Practically speaking, members may complete health/fitness assessment forms during that time, if they haven't already. The most common method for determining RHR is the radial palpation technique. While the subject is seated, palpate the radial artery at the base of the thumb (lateral to the mass of wrist tendons) using your index and middle fingers. Count the pulse for 10 seconds and multiply by six. Record your results in beats per minute (bpm).

To determine RBP, wrap the cuff firmly around the upper arm at heart level, aligning the cuff with the brachial artery. The appropriate cuff size will be ensured when the cuff encircles at least two-thirds of the member's upper arm (most adults will use a large cuff size). The stethoscope bell is placed below the antecubital space over the brachial artery, with the bevel on the earpieces facing toward the front. While palpating the radial pulse, inflate the cuff until the pulse is no longer felt. Inflate the cuff 20 mmHg above this, and then slowly release pressure at a rate not exceeding 3 mmHg per second. The first sound heard represents systolic blood pressure (SBP). Continue to release pressure and note when the sound becomes muffled and then finally disappears. The latter is used for classification of diastolic blood pressure (DBP).

All readings of RBP are recorded in even numbers. The following classifications of RBP are adapted from a publication from the National Institute of Health.⁴ The average of two or more readings on two or more visits to your facility will, ideally, be used to classify your member's RBP. Values ≤ 129 mmHg for SBP, and ≤ 84 mmHg for DBP are considered normal. Values between 130 and 139 mmHg for SBP, and 85 and 89 mmHg for DBP are categorized as high normal. SBP values greater or equal to 140 mmHg, and DBP values greater or equal to 90 mmHg may place an individual into one of three stages of hypertension.

Body composition

Body composition describes the relative proportion of fat to fat-free mass. Excess body fat places an individual at increased risk for development of cardiovascular disease, type 2 diabetes and other diseases. A number of laboratory and field techniques have been developed to assess this important component of physical fitness.

A common and reliable field method, which correlates well to hydrostatic weighing, is to estimate body composition from skinfold measurements. The skinfold technique is based on the fact that subcutaneous fat is proportional to the total amount of body fat. It provides a reliable estimate of your member's body density, which is used to

determine percent body fat. This relationship, however, depends considerably on your member's age, gender and ethnicity. Population-specific equations to convert body density to percent fat reflect these variables (ACSM's Guidelines, p.62).

The general procedures for skinfold measurements are as follows:

- * Measurements should be taken on the member's right side
- * The caliper should be placed 1cm away from the thumb and finger, perpendicular to the fold
- * Maintain the pinch while reading the caliper
- * Obtain your reading in one to two seconds
- * Take two to three duplicate measurements at each site, but rotate through measurement sites to ensure the skin has time to return to normal

A standardized description of skinfold sites can be found in ACSM's Guidelines for Exercise Testing and Prescription (p.65) or at www.exrx.net/Testing/BodyCompSites.html. The skinfold sites used are dependent upon the generalized skinfold equation that converts skinfolds into body density. Such equations to convert skinfolds into body density can be found in ACSM's Guidelines (p.66). A common equation includes the chest, abdomen and thigh (men), and triceps, suprailiac and thigh (women) skinfolds. As noted, population-specific equations are then used to convert body density into percent body fat. Computer programs (www.exrx.net/Calculators/BodyComp.html) have made the task of converting skinfold measurements to percent body fat much easier, or you can consult ACSM's Guidelines for the manual process (p. 62). The average body fat for males and females varies depending on age (see pp.67 and 68 of ACSM's Guidelines, or consult www.exrx.net/Calculators/BodyComp.html).

Cardiorespiratory endurance

Cardiorespiratory endurance is your members' ability to sustain dynamic, vigorous-intensity exercise using large muscle groups. This type of exercise depends on the ability to consume (respiratory system), transport (cardiovascular system) and use (skeletal muscle) oxygen efficiently. The greater the efficiency of these systems, the higher the VO_2 max. Generally, a person with higher cardiorespiratory fitness has a reduced chance of death from all causes.

Most often, it is more practical to perform a submaximal exercise test to predict VO_2 max, rather than a maximal exercise test, which requires increased management and supervision. Stationary cycle ergometers and motor-driven treadmills are common modes to test aerobic capacity, as numerous protocols exist for each. If your member has not been classified as contraindicated to exercise (p. 50, ACSM's Guidelines), the general procedures for submaximal testing of cardiorespiratory endurance include the following:

- * Begin the test with a two- to three-minute warm-up at an intensity not higher than the first stage of the exercise test.
- * The exercise protocol should consist of approximately three-minute stages.
- * Members should be properly positioned on the cycle ergometer (slight bend in knee) or treadmill (straddling the belt) prior to starting the test.
- * Heart rate (HR) should be monitored at least twice during each stage, preferably at the second and third minutes.
- * If HR difference between the second and third minute of the stage is greater than 6bpm, extend the stage an additional minute.
- * Blood pressure (BP) should be monitored near the end of each stage.
- * Members' rate of perceived exertion (RPE) should be monitored at the conclusion of each stage (ACSM's Guidelines, p.79). As the member's stated RPE enters a range that would be appropriate for subsequent workouts,

members should be asked to pay close attention to this feeling (e.g., "somewhat hard"), and aim for the same feeling during regular workouts. It may also be useful at this time to describe the "rule of thumb," commonly called the "talk test."⁷

* Terminate the test when members achieve 85 percent of their maximal heart rate (MHR), or 70 percent of heart rate reserve. MHR should be estimated using a new formula ($208 - 0.7 \times \text{age}$).⁸

* Additional criteria have been established by ACSM to clarify significant abnormal responses to exercise that may warrant stopping the test. Such indications (signs/symptoms) may be found on page 80 of ACSM's Guidelines.

* After the test, have members cool down by performing exercise at an intensity not exceeding the first stage, or use a passive recovery if members experience signs or symptoms of discomfort.

* Monitor HR, BP, RPE, and signs and symptoms at least four minutes post-exercise, or longer if abnormal responses were noted.

As mentioned, numerous protocols exist to determine cardiorespiratory endurance. Refer to page 75 or page 98 in ACSM's Guidelines for a comprehensive review of cycle ergometer and treadmill tests. Also, the YMCA cycle ergometer protocol can be found online at www.exrx.net/Testing/YMCA CycleTest.html, and the Bruce treadmill protocol can be found at www.exrx.net/Testing/CardioTests.html.

Once the test is completed, it is appropriate to determine members' VO_2max using prediction equations. Consult Appendix D of ACSM's Guidelines for information on how to calculate VO_2max , or refer to www.exrx.net/Calculators/YMCACycle.html, or www.exrx.net/Calculators/Treadmill.html for computer-generated results. Your members may now be ranked into a percentile value of the appropriate population (age) based on their VO_2max value. Such information also provides a baseline to be noted upon retesting after cardiorespiratory endurance training. Percentile values for VO_2max can be found on page 77 of ACSM's Guidelines, or at the above Internet sites.

Muscular fitness

Muscular fitness is an important component of physical fitness because it positively influences body composition, bone mass, self-esteem, musculotendinous integrity (related to low-back pain) and glucose tolerance (related to type 2 diabetes), which is related to adult-onset diabetes. Muscular fitness describes both muscular strength (the maximal force a muscle can produce) and muscular endurance (the ability of a muscle to resist fatigue).

There are a few considerations to recognize before performing common tests to measure muscular fitness:

* Strength and endurance are specific to the muscle group, the speed of movement, the type of contraction and the joint angle being tested.

* Members should be familiarized with the equipment, and instructed on the proper movements of all exercises used in the test.

* Appropriate spotters should be used, and all safety measures should be reviewed with members prior to the assessments.

* Absolute measures of strength should be used to monitor improvements in strength-training programs.

* When comparing members' strength assessments to other individuals, results should be expressed as the weight lifted per unit of body weight.

Dynamic muscular strength is frequently assessed using the one-repetition maximum (1-RM), or the heaviest weight that can be lifted one time. However, performing a battery of 1-RM tests may prove to be impractical and/or increase associated risks. Tests of muscular fitness may be substituted by choosing a submaximal level of resistance, and counting the maximal number of repetitions before fatigue. The appropriate weight (and exercise) may be based on a percentage of 1-RM (estimated 6-RM or 10-RM) or body weight. After strength training, the same initial weight would be used to reassess muscular fitness of a particular muscle.

Additionally, push-ups and sit-ups are frequently used as tests of muscular endurance, as population norms exist for each. The push-up test of upper-body strength has the male in the standard position (hands shoulder width apart, back straight, head up, using the toes as a pivot). Females should assume a similar position, except the hands are placed slightly ahead of the shoulders, and the knees are in contact with the floor. The following procedures for the push-up test may be used for both male and female members:

1. Members should lower their body until their chin touches the floor (preferably a mat is used) while the stomach remains elevated above the floor.
2. With a straight back, all members should push up to a straight-arm position repetitiously without rest.
3. Record the maximal number of push-ups performed as that person's score.

For the curl-up (crunch) test of abdominal strength, all members assume a position lying down (supine) with a 90-degree bend in the knees. The arms are placed at the side with the fingertips in contact with tape placed on the floor. A second piece of tape is placed either 8 cm (for ages 45 years or older) or 12 cm (for those younger than 45 years) beyond the first. Members should do the following:

1. Perform controlled curl-ups by lifting the shoulder blades off the mat at a rate of 20 curl-ups per minute. Use a metronome set at 40 beats per minute to achieve this rate.
2. The lower back should remain flat during curl-ups, as the fingers touch both pieces of tape throughout the duration of testing.

Your members' scores reflect the total number of curl-ups performed, up to a maximum of 75.

Variations exist on how to perform the curl-up test, and may be found in ACSM's Guidelines. Norms for the push-up and curl-up tests may also be found in ACSM's Guidelines (pp.85 and 86). Also, refer to www.exrx.net/Calculators/PushUps.html or www.exrx.net/Calculators/SitUps.html for an easy method of determining members' population ratings for the push-up and curl-up tests.

Flexibility

Flexibility is the ability to move a joint through a full range of motion. It depends, in part, on the muscles, ligaments and tendons surrounding the joint, the degree of warm-up and the type of joint. Flexibility is an often-neglected component of physical fitness, but those who are inflexible may be at higher risk for injury during activity, and/or lower-back pain.

There are numerous methods to measure the flexibility at various joints throughout the body. Common tests incorporate the use of goniometers, inclinometers and tape measures. A simple and effective field test is the sit-and-reach test of low-back and hamstring flexibility. In lieu of a sit-and-reach box, the YMCA protocol, requiring only tape and a yardstick, may be used to assess trunk flexion:

1. Make sure members have completed a warm-up; the submaximal aerobic test plus some stretching (avoid bouncing at all times, as this increases the risk of injury) would accomplish this.
2. Place the yardstick on the floor with a 20-inch piece of tape placed perpendicularly at the 15-inch mark.
3. Have members sit with the yardstick between their legs, placing the heels of the feet (without shoes) on the edge of the tape, about 12 inches apart.
4. Members should slowly reach forward as far as possible, exhaling during the reach, with both hands holding the final position briefly. Ensure that members don't lead with one hand, that their knees remain extended without being forced to the floor, and that both hands remain in contact with the yardstick for the entire movement.
5. Record the most distant of three trials (in inches or centimeters) as the score.

Using the above protocol, your members' right and left sides may be tested separately to determine any differences. Percentiles for the standard test are based on age, and can be found on page 88 of ACSM's

Guidelines. Also, refer to www.exrx.net/Calculators/SitReach.html to determine your members' population rating for the YMCA Sit-and-Reach Test.

Conclusions

Exercise testing is not an end in itself, but rather should be integrated into the overall exercise program. Assessments can be performed in a manner that is time-efficient, safe and practical. There are numerous ways to use the testing experience to help educate your members, as in determining, for example, a member's 10 RM as part of an effort to design a circuit-training program. Through testing, you can maximize your ability to tailor a safe, effective program for each individual member. Further, through establishing a performance baseline, you gather tangible evidence that can be used later to document any fitness improvements attained through training. Such individual attention to your members' initial fitness level will not only aid in exercise programming, but may perhaps increase overall member retention and club profitability.FM

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