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GUIDELINE 2e

Assessment of Body Composition

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The NCAA Committee on Competitive Safeguards and Medical Aspects of Sports acknowledges the significant input of Dr. Dan Benardot, Georgia State University, who authored a revision of this guideline.

Athletic performance is, to a great degree, dependent on the ability of the student-athlete to overcome resistance and to sustain aerobic and/or anaerobic power. Both of these elements of performance have important training and nutritional components and are, to a large degree, influenced by the student-athlete's body composition. Coupled with the common perception of many student-athletes who compete in sports where appearance is a concern (swimming, diving, gymnastics, skating, etc.), attainment of an 'ideal' body composition often becomes a central theme of training.

Successful student-athletes achieve a body composition that is within a range associated with performance achievement in their specific sport. Each sport has different norms for the muscle and fat levels associated with a given height, and the student-athlete's natural genetic predisposition for a certain body composition may encourage them to participate in a particular sport or take a specific position within a sport. For instance, linemen on football teams have different responsibilities than receivers, and this difference is manifested in physiques that are also different.

Besides the aesthetic and performance reasons for wanting to achieve an optimal body composition, there may also be safety reasons. A student-athlete who is carrying excess weight may be more prone to injury when performing difficult skills than the student-athlete with a more optimal body composition. However, the means student-athletes often use in an attempt to achieve an optimal body composition may be counterproductive. Diets and excessive training often result in such a severe energy deficit that, while total weight may be reduced, the constituents of weight also change, commonly with a lower muscle mass and a relatively higher fat mass. The resulting higher body fat percentage and lower muscle mass inevitably results in a performance reduction that motivates the student-athlete to follow regimens that produce even greater energy deficits. This downward energy intake spiral may be the precursor to eating disorders that place the student-athlete at serious health risk. Therefore, while achieving an optimal body composition is useful for high-level athletic performance, the processes student-athletes often use to attain an optimal body composition may reduce athletic performance, may place them at a higher injury risk and may increase health risks.

Purpose of Body Composition Assessment

The purpose of body composition assessment is to determine the student-athlete's distribution of lean

(muscle) mass and fat mass. A high lean mass to fat mass ratio is often synonymous with a high strength to weight ratio, which is typically associated with athletic success. However, there is no single ideal body composition for all student-athletes in all sports. Each sport has a range of lean mass and fat mass associated with it, and each student-athlete in a sport has an individual range that is ideal for them. Student-athletes who try to achieve an arbitrary body composition that is not right for them are likely to place themselves at health risk and will not achieve the performance benefits they seek. Therefore, a key to body composition assessment is the establishment of an acceptable range of lean and fat mass for the individual student-athlete, and the monitoring of lean and fat mass over regular time intervals to assure a stability or growth of the lean mass and a proportional maintenance or reduction of the fat mass. Importantly, there should be just as much attention given to changes in lean mass (both in weight of lean mass and proportion of lean mass) as the attention traditionally given to body fat percent.

In the absence of published standards for a sport, one strategy for determining if a student-athlete is within the body composition standards for the sport is to obtain a body fat percent value for each student-athlete on a team (using the same method of assessment), and obtaining an average and standard deviation for body fat percent for the team. Student-athletes who are within 1 standard deviation (i.e., a Z-score of ± 1) of the team mean should be considered within the range for the sport. Those greater than or less than ± 1 standard deviation should be evaluated to determine the appropriateness of their training schedule and nutrient intake. In addition, it is important for coaches and student-athletes to use functional performance measures in determining the appropriateness of a student-athlete's body composition. Student-athletes outside the normal range of body fat percent for the sport may have achieved an optimal body composition for their genetic makeup, and may have objective performance measures (i.e., such as jump height) that are well within the range of others on the team.

Body composition can be measured indirectly by several methods, including hydrostatic weighing, skinfold and girth measurements (applied to a nomogram or prediction equation), bioelectrical impedance analysis (BIA), dual-energy x-ray absorptiometry (DEXA), ultrasound, computerized tomography, magnetic-resonance imagery, isotope dilution, neutron-activation analysis, potassium-40 counting, and infrared interactance. The most common of the methods now used to assess body composition in student-athletes are skinfold measurements, DEXA, hydrostatic weighing and BIA. While hydrostatic weighing and DEXA are considered by many to be the "gold standards" of the indirect measurement techniques, there are still questions regarding the validity of these techniques when applied to humans. Since skinfold-based prediction equations typically use hydrostatic weighing or DEXA as the criterion methods, results from skinfolds typically carry the prediction errors of the criterion methods plus the added measurement errors associated with obtaining skinfold values. BIA has become popular because of its non-invasiveness and speed of measurement, but results from this technique are influenced by hydration state. Since student-athletes have hydration states that are in constant flux, BIA results may be misleading unless strict hydration protocols are followed. In general, all of the commonly used techniques should be viewed as providing only estimates of body composition, and since these techniques use different theoretical assumptions in their prediction of body composition, values obtained from one technique should not be compared with values obtained from another technique.

Concerns with Body Composition Assessment

1. Using Weight as a Marker of Body Composition—While the collection of weight data is a necessary adjunct to body composition assessment, by itself weight may be a misleading value. For instance, young student-athletes have the expectation of growth and increasing weight, so gradual increases in weight should not be interpreted as a body composition problem. A student-athlete who has increased resistance training to improve strength may also have a higher weight, but since this increased weight is likely to result from more muscle, this should be viewed as a positive change. The important consideration for weight is that it can be (and often is) misused as a measure of body composition, and this misuse can detract from the purpose of body composition assessment.

2. Comparing Body Composition Values with Others Athletes—Student-athletes often compare body composition values with other student-athletes, but this comparison is not meaningful and it may drive a student-athlete to change body composition in a way that negatively impacts both performance and health. Health professionals involved in obtaining body composition data should be sensitive to the confidentiality of this information, and explain to each student-athlete that differences in height, age and gender are likely to result in differences in body composition, without necessarily any differences in performance. Strategies for achieving this include:

- Obtaining body composition values with only one student-athlete at a time, to limit the chance that the data will be shared.
- Giving student-athletes information on body composition using phrases such as "within the desirable range" rather than a raw value, such as saying "your body fat level is 18 percent."
- Providing athletes with information on how they have changed between assessments, rather than offering the current value.
- Increasing the focus on muscle mass, and decreasing the focus on body fat.
- Using body composition values as a means of helping to explain changes in objectively measured performance outcomes.

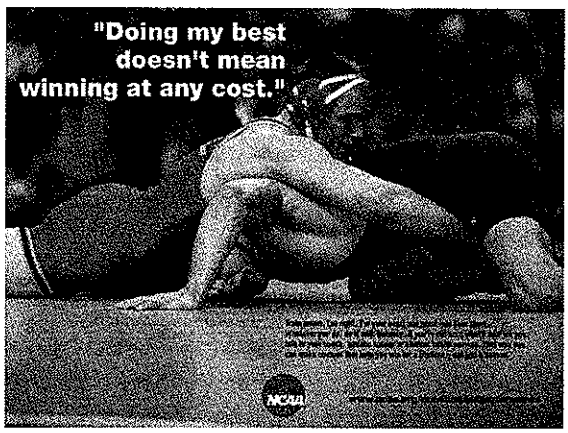
3. Seeking an Arbitrarily Low Level of Body Fat—Most student-athletes would like their body fat level to be as low as possible. However, student-athletes often try to seek a body fat level that is arbitrarily low and this can increase the frequency of illness, increase the risk of injury, lengthen the time the student-athlete can return to training after an injury, reduce performance and increase the risk of an eating disorder. Body composition values should be thought of as numbers on a continuum that are usual for a sport. If a student-athlete falls anywhere on that continuum, it is likely that factors other than body composition (training, skills acquisition, etc.) will be the major predictors of performance success.

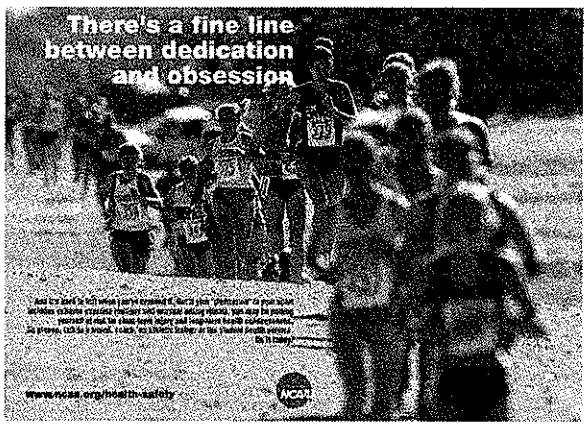
4. Frequency of Body Composition Assessment—Student-athletes who have frequent weight and/or skinfolds taken are fearful of the outcome, since the results are often (inappropriately) used punitively. Real changes in body composition occur slowly, so there is little need to assess student-athletes weekly, biweekly or even monthly. If body composition measurements are sufficient and agreed upon by all parties, measurement frequency of twice a year should be sufficient. In some isolated circumstances in which a student-athlete has been injured or is suffering from a disease state, it is reasonable for a physician to recommend a more frequent assessment rate to control for changes in lean mass. Student-athletes and/or coaches who desire more frequent body composition or weight measurement should shift their focus to assessments of objective performance-related measurers.

Summary

The assessment of body composition can be a useful tool in helping the student-athlete and coach understand the changes that are occurring as a result of training and nutritional factors. However, the body composition measurement process and the values obtained can be a sensitive issue for the student-athlete. A legitimate purpose for body composition assessment should dictate the use of these measurement techniques. Health professionals involved in obtaining body composition data should focus on using the same technique with the same prediction equations to derive valid comparative data over time. Institutions should have a protocol in place outlining the rationale for body composition measurements, who is allowed to measure the student-athlete, who is permitted to discuss the results with the student-athlete and what frequency of body composition measurement is appropriate. The student-athlete should not feel forced or obligated to undergo body composition or weight measurement.

Everyone involved directly or indirectly with body composition measurement should understand that inappropriate measurement and use of body composition data might contribute to the student-athlete experiencing unhealthy emotional stress. This stress can lead to the development or enhancement of eating disorders in the student-athlete (see Guideline 2f). All coaches (sport or strength/conditioning) should be aware of the sizable influence they may have on the behaviors and actions of their student-athletes. Many student-athletes are sensitive about body fat, so care should be taken to apply body composition measurement, when appropriate, in a way that enhances the student-athlete's well-being.





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