STRENGTH AND CONDITIONING
SEMESTER 2, GRADING PERIOD 3
STUDY GUIDE

PHYSIOLOGICAL CONSIDERATIONS FOR ATHLETIC IMPROVEMENT

Fiber Type

1. SLOW-TWITCH (TYPE I) - These fibers develop force rather slowly, but are more enduring-contracting for longer periods of time before fatigue occurs. These fibers are recruited for aerobic-oriented events.

2. FAST-TWITCH (TYPE II) - These fibers develop force rapidly, but they fatigue quickly. Hypertrophy occurs more rapidly in these muscles. These fibers are recruited for events requiring high levels of explosive strength.

3. GENETIC POTENTIAL - Not everyone possesses the same proportions of fast-twitch and slow-twitch fibers. Individuals who posses a greater number of fast-twitch fibers have a greater genetic potential to be stronger and, therefore, to be more successful in certain "strength-dependent" sports or in an activity like weight training. Conversely, individuals with a high percentage of slow-twitch fibers have greater genetic potential to be successful in events requiring lower levels of strength and greater levels of endurance, such as long-distance swimming or marathoning events.

Contraction Type

4. ISOMETRIC - This type of contraction occurs when tension develops in a muscle but no observable shortening or lengthening is observed. An example would be during the execution of a repetition, a sticking point is reached, and there is a momentary pause in movement. Best results occur with multiple sets of maximal or near-maximal muscle action done for 3-10 seconds everyday.

5. CONCENTRIC - This type of contraction occurs when force is applied while a muscle shortens and a joint moves. For example, during the upward phase of a biceps curl, the muscle fibers in the biceps and other elbow flexors shorten and the elbow joint bends to move the bar from the waist to the shoulders.

6. ECCENTRIC - This type of contraction occurs when force is produced while a muscle is lengthening. Using the biceps curl as an example, the lowering of the bar from the shoulders to the waist is eccentric.

7. COMPARISON - The best results for strength gains is when exercises include both concentric and eccentric contractions. Examples would be the bench press and parallel squat.

8. MUSCLES IN PAIRS - During a movement, the muscle responsible for moving the body part contracts or shortens; this muscle is called the agonist. The antagonist muscle acts against or in opposition to the agonist muscle, stretching when the agonist contracts. The antagonist muscle is responsible for moving the body part back to its original position. A muscle acts as the agonist in one action and as an antagonist in the opposite action. For example, when bending the elbow and raising the hand toward the shoulder, the biceps muscle contracts and is the agonist; the triceps muscle stretches and is the antagonist. When the movement is reversed and the elbow is extended, the triceps muscle contracts (is the agonist) and the biceps muscle lengthens (is the antagonist). An example is the bench press, where the pectorals and lattisimus dorsi work together.

Biomechanical differences

9. MOVEMENT ABILITIES - The mastering of the following movement phases is a factor for improvement of an athlete in training. Those who have mastered these phases will have the potential for more athletic success compared to those who haven't mastered these phases.
    - Stabilizing movements - Maintaining one's equilibrium in relation to the force of gravity. An example would be the erect torso required to support a barbell overhead or on the back or chest.
    - Locomotor movements - A change in location of the body relative to a fixed point on the surface. Walking, hopping, jumping, and lunging are examples.
    - Manipulative movements - Motor actions that use an object. Most weight training exercises in which a bar, dumbbells, or an apparatus is acted upon are examples.

10. POSTURE DIFFERENCES - An athlete's hip and shoulder posture can indicate problems and potential successes with certain lifts.
    - Hip posture - An athlete that has the hips tucked under the torso and the lower back is flat may indicate that they have tight hamstrings and gluteals, or weak spinal erectors. Such an athlete will find the correct, rigid torso position difficult to maintain in squatting and cleaning. Typically, this error is displayed when the lower back rounds during the pull from the floor and in the bottom position of the squat and clean. This rounded torso cannot effectively transfer force to the bar, and the amount of weight that can be lifted is reduced. A program that addresses both stretching of the hamstrings and strengthening of spinal erectors is necessary to correct this imbalance. The opposite, an exaggerated curve in the lower back, may be the result of tight hip flexors and shortened spinal erectors and weak, lengthened abdominal muscles. This may prevent an athlete from achieving full hip extension in the second pull of the clean, with the result that heavier attempts are lost in front, unable to be completed. A combination of improvement in hip flexibility and strengthening of the abdominals is needed for the athlete to lift more correctly.
    - Shoulder posture - A slumping, round-shouldered posture may be the result of both weakness or the upper back and inflexibility of the upper chest and anterior shoulder. In pulling from the floor, the scapulae are too easily pulled away from the spine, the upper back collapses, and the correctly locked torso cannot be maintained. In cleaning and front squatting, the chest cannot be held upright under the weight of the bar and the upper back rounds. Stretching of the anterior shoulder and the use of a sufficiently light weight to maintain proper torso posture during lifting can correct this weak link.

11. BODY SIZE - An athlete that is shorter or taller can have an impact on how training affects them.
    - Smaller athletes - They have the potential in weight training to become stronger than a taller athlete. This is explained by considering the definition work = force x distance. The distance that a bar of a given weight must travel from the floor to shoulder in the clean, from the floor to arms' length in a deadlift, or from the chest to arms straight in a bench press, is less in people of shorter stature. There is a good correlation between the amount of cross-sectional area of muscle and the ability to exert force, so a muscular individual with a shorter skeletal frame has an advantage of greater strength potential to be exerted through a shorter distance.
    - Bigger athletes - They must exert force over a longer distance and must therefore perform more work with the same bar weight compared to shorter athletes. There is a higher risk of injury in a bigger athlete when weight training because the mass of the athlete and bar when accelerating and decelerating is much greater than a smaller athlete.

12. BODY PROPORTIONS - Some athletes may benefit from their body proportion as they relate to the proper execution of some major free-weight exercises.
    - Ectomorph - Long arms, long legs, short torso. On the clean it is harder for the lifter to keep the hips close and the shoulders over the bar at the same time.
    - Endomorph - Short arms, short legs, long torso. The lifter with short legs has an advantage in the squat over a lifter with long legs. Those with long legs have a harder time keeping feet flat on the floor. Also, the lifter with short arms has an advantage in the bench press over a lifter with long arms.
    - Mesomorph - Arms, legs, and torso more proportioned. These lifters may struggle with the same problems as an ectomorph, but may have some of the advantages of an endomorph.