



ACSM Sports Medicine Basics

HIGH VELOCITY TRAINING



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Interest in the science of strength training and its associated benefits is popular within fitness circles. Traditionally, training methods have followed an overload concept of low speed movements paired with heavy resistance. Nearly all contemporary resistance training prescriptions consist of detailed periodized (an organized process involving a progressive cycling of sets, reps and resistance) programs lasting a minimum of eight weeks in order to increase muscle size and strength. The consensus position supported by hundreds of experimental studies is that gains in strength are the primary result of increased muscle size, referred to as hypertrophy. What is less well known is the phenomenon that results in the manifestation of increased strength (force development) and power (rate of force development) after only two or three training sessions. Studies have shown that short-term resistance training can increase strength and power in the absence of hypertrophy. Speculation is that these short-term effects are the result of changes in neural factors and are largely attributed to an increase in maximal muscle activation of higher order motor units.

High Velocity

The effects of high velocity training are related to an individual's ability to move quickly and maximize power output. Experiments investigating short-term velocity specific training have had untrained subjects participate in either slow or fast training and found that strength did not change following slow training but fast training exhibited an approximate 20 percent increase in strength and speed development. In addition, measurement of muscle cross sectional area has revealed short-term improvements in strength at moderate velocities. Thus, the literature supports an interaction between

velocity and force development. A high velocity training program lasting only a few days may also result in significant performance gains, such as jumping, if the exercise is novel. Therefore, resultant movement speed can be increased if training exercises are performed very fast and with a light load.

Over-speed

The ability to generate maximal velocity is an essential quality of athletic performance and fitness. Over-speed training is a method that enables the athlete to increase limb velocity beyond their maximal level (supramaximal), via assistance. In contrast to resisted, where weights or elastic bands pull against the movement, assisted employs elastic bands that pull in the same direction as the movement. Following the over-speed paradigm, assisted sprinting maximizes running speed by reducing the athlete's body weight and increasing step frequency and stride length. Recent studies have also applied this to vertical jumping and demonstrated increased jump height and take off velocity via assistance. Previous studies found that acute jumping performance was greatest at 30 percent body weight reduction following one minute of rest. Therefore, using short-term explosive training may illicit significant short-term performance gains lasting a few minutes to a few days.

Training Adaptations

The initial changes in strength following high velocity training occur at a rate too fast to be accounted for by hypertrophy. Therefore, neural changes probably play the major role in acute strength gains. Previous investigations of neural and hypertrophic contributions to muscle strength gains have had trained and untrained subjects perform eight weeks of

progressive resistance-training. At the end of training, all subjects exhibited increased maximal strength, but more importantly, measurements of neural electrical activity indicated that it was primarily responsible for these early strength increases while hypertrophy gradually increased as a contributory factor over time.

Summary

It is clear from the research that high-velocity, low-load training is related to an ability to produce force quickly and has implications for activities of daily living as well as athletic endeavors. High velocity exercise results in specific high velocity adaptations and should be employed when attempting to increase high speed movements. Sports that require athletes to sprint faster or jump higher may benefit from assisted training that mimics sport specific movement speeds. Since maximizing speed is one of the most desired goals for fitness and performance, implementing innovative over-speed methods within a training program can aid in maximizing performance. In addition, short duration training is effective for the acute adaptation of neural factors, which results in an acute increase in performance in the absence of muscular hypertrophy.

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