

Explosive Exercise

Explosive exercise can be defined as movements in which the rate of force development (RFD) is maximum or near maximum for a given type of muscle action (e.g. isometric, concentric, eccentric). The peak RFD has a strong association with the ability to accelerate a mass. Explosive exercise may be performed isometrically or dynamically; however, dynamic movements can produce higher RFDs than isometric exercise. As the resistance used for dynamic movements decreases, the RFD increases resulting in an inverse relationship between peak force production and RFD. Thus, a continuum of explosive exercise can be conceptualized ranging from isometric movements and high force slow movements (very heavy weights) to very fast movements performed with relatively light weights. Depending upon the resistance used, a high RFD, high acceleration and power output can be achieved within the same movement. Explosive exercises in which all three parameters (RFD, acceleration and power) are at maximum or near maximum can be termed "speed strength" exercises and may be plyometric or ballistic in nature.

Explosive Exercise Training

It is apparent in performing daily activities, and especially during many athletic activities, that a wide range of maximum strength, RFD, power and speed may be necessary for various movements. Additionally, gradations in these parameters can be required for the successful completion of various tasks.

There is little doubt that in both daily and athletic tasks maximum or near maximum efforts can be required, which depend upon high levels of strength, RFD and power. Considerable evidence suggests that periodic training with speed-strength exercises is necessary to maximally enhance RFD, power and speed. Explosive exercises, particularly speed strength exercises, are often used in the training of strength-power athletes but may be useful in training non-athletic populations as well. The efficacy of adaptations resulting from training with these exercises depends upon a variety of factors including the performance movement patterns, velocity requirements and the training state of the participants.

Untrained subjects respond to heavy weight training with a shift of the entire force-velocity curve upward and to the right. In strength-trained subjects, evidence indicates that high velocity or high power training is necessary for continued alterations in the high velocity portion of the force-velocity curve. Isometric training with a high RFD can increase the rate of force production and velocity of movement, while heavy weight training primarily increases measures of maximum strength. Additionally, high power explosive exercise training appears to increase a wide range of athletic performance variables to a greater extent than traditional heavy weight training, particularly if there is a reasonably high initial level of maximum strength. Both cross-sectional and longitudinal data suggest that in order to maximize strength, RFD, power and speed of movement, a combination of heavy and light explosive exercise provides superior results. Furthermore, evidence suggests that in order to maximize power output or speed of movement, the early portion of training should be devoted primarily to increasing maximum strength with the later portion of training being devoted primarily to power and speed training.

For example, during a 12-week training period designed to increase power and speed, the first five weeks would consist primarily of heavy explosive strength training. The next six weeks would consist of a combination of heavy and high power explosive exercise training, and the final week would be devoted to high power movements.

Exercise selection

Typical explosive exercises, including speed-strength exercises, consist of large muscle mass movements such as squats, derivatives of weightlifting movements (e.g. snatch and clean), weighted and unweighted vertical jumps and whole body ball throws. Smaller muscle mass exercises such as bench and incline pressing movements can be used as well as various types of upper body ball throws. Exercises can be selected in keeping with the principle of Specificity of Training, thus exercises can be used to stimulate movement, force, acceleration and velocity patterns of many sports and daily activities.

Injuries from strength training, including explosive exercises, are rare, with rates of occurrence and severity far lower than those in many sports such as soccer, football, basketball or gymnastics. Even though injury rates as a result of using explosive exercises are extremely low, adequate safety measures and quality instruction should always be enforced. Some evidence suggests that the injury potential associated with sports involving high RFD and accelerations can be reduced by requiring training with explosive exercises.

Summary

Explosive exercises, characterized by maximum or near maximum rates of force development, are effective for enhancing physical performance. In activities requiring high RFD, accelerations, or power outputs, explosive exercises are necessary for maximum development. Exercises can be selected in accordance with the concept of training specificity. As with other training methods, explosive exercises should be taught by experienced and knowledgeable instructors. When properly taught and supervised, explosive exercises are safe and likely to reduce the risk of injury during participation in sports and other activities that involve high RFD and acceleration.

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