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Research on Maximum Explosive Strength and Training Methods

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Abstract: Explosive force is a form of fast power performance, explosive force athletes an important part of the overall level of athletic ability, the athletes' athletic performance enhancement has a vital important role, the vast majority of sports programs have a profound significance. But from the current athletes special explosive force training situation to discuss, many athletes explosive force training often lack of specialization and effectiveness, omitted the training of special explosive force, is not conducive to the athletes personal escape performance improvement. The article mainly uses the literature method to define the maximum explosive force and discusses the importance for human sports performance. Attempts from the factors affecting explosive force, explosive force training, development of explosive force training methods, explosive force training load selection, for athletes explosive force training to mention the new training design ideas.

Keywords: Maximal Explosive Force; Training Methods; Influencing Factors.

1. Introduction

Explosive force is the ability to overcome resistance as fast as possible when the tension in the muscle begins to increase, and is an expression belonging to one of the fast forces, the size of which can be expressed by multiplying the force by the speed. Explosive force is generated by multiple contractions of the muscle and can be expressed as the work done by the muscle per unit of time [1]. The article focuses on the design of training for maximum explosive force.

2. Factors Affecting Maximal Explosive Force

2.1. Lengthening - Reducing Changeover Time

Most of the explosive training in the body involves a process of reverse muscle movement, in which the muscles involved in the exercise are lengthened and then shortened, and this lengthening and contracting of the muscles is called the muscle lengthening-shortening transition cycle. By comparing the simple centripetal contraction with this rapid lengthening and shortening process, studies have shown that both the number of muscle fibers activated and the degree of muscle activation in the lengthening contraction process is superior to the simple centripetal contraction process, and that the maximal explosive force produced by the body during some lengthening contraction cycle movements is greater than that produced by ordinary centripetal contraction centrifugal lengthening exercises [2].

2.2. Maximum Force Level

The size of a person's muscular strength can be obtained through the 1RM test, which is the weight of a repetition of the maximum weight attempt, and is assessed by the maximum weight that the participant can lift in a single attempt [3]. If the strength of the participant is increased at slower speeds, then the explosive power of the participant's body is also increased to some extent. This is due to the fact that the increase in explosive power at slower speeds is predicated on an increase in maximal strength.

3. The Relationship Between Resistance Training, Catapult Training, and Explosive Strength

3.1. Resistance Training and Explosive Power

In terms of training slow speed and high load resistance training with centripetal contraction exercises is the main way to increase maximal strength, and many studies have shown that after a period of strength training, test scores for explosive strength have shown some degree of improvement, such as an increase in vertical jump height. Explosive strength training utilizes a faster speed and lighter load training model, which in turn will engage the rapid power output of the movement as an indication of the amount of explosive strength.

Individuals at lower strength levels will show increases in explosive power throughout the strength-velocity range at the end of a full training phase, regardless of the loads and modes of training utilized. If the participant already has a certain level of muscular strength, the increase in maximal explosive power after a full traditional strength training phase is smaller compared to those at lower strength levels. If the athlete's maximal explosive power were to be increased at this point, the entire training process would need to be designed with more specialized training tools. Therefore, in order to increase the maximal explosive power of athletes who already have a high level of strength, it is necessary to design more specialized and complex training methods and processes for the athletes.

3.2. Resistance Training and Rate of Strength Growth

Because the explosive elongation and contraction of a muscle occurs in a short period of time, all muscles must produce as much force as possible in as short a time as possible, a characteristic called maximal velocity of strength growth. Although in the squat strength training using personal 1RM of 70% ~ 120% of the large load training can improve

the individual's maximum strength. However, this kind of strength training has little effect on the increase of force growth rate, on the contrary, such as carrying out such as light load after squatting and jumping training of rapid expansion and composite training for athletes to improve the rapid power to achieve very good training results [4].

3.3. Catapult Training vs. Traditional Resistance Training

The lack of explosive power development during the deceleration phase of resistance training can be overcome if the athlete throws heavy weights at a certain speed or performs fast telescopic compound jumps with weights. Such a maneuver is called “catapult resistance training” in scientific research.

Previous studies have deeply compared the ejection bench press with the traditional bench press, and the values of maximum speed, average explosive force and maximum explosive force during the ejection bench press are significantly higher than those of the traditional bench press compared to the traditional bench press [5].

4. Training Methods for Developing Explosive Strength

4.1. Large Load Resistance Training

With the increasing demand for explosive power in specialized sports, the requirement to perform explosive power in specialized training has become more important. In explosive programs, athletes should be able to complete a barbell squat exercise of twice their body weight as a standard after strength training. This criterion also reflects the need for athletes to have sufficient strength as a prerequisite to develop maximal explosive power [6].

For those who have not received professional and complete training, there will be a significant increase in maximal explosive power after a series of high-load resistance training, however, the rate of growth of explosive power decreases as the level of strength continues to increase during the training process.

4.2. Catapult Resistance Training

Since catapult training requires the trainer to maintain acceleration toward the point of ejection throughout the process. It is because of the constant acceleration throughout the training process that the speed of muscle contraction, the force generated by the muscle contraction, the explosive force and the number of muscle fibers activated in a catapult training movement are higher than those activated in traditional resistance training. Catapult movements are more specialized and can be better adapted to the needs of specialized sports, so more catapult movements should be designed to develop the athlete's maximal explosive force during the training process.

According to the needs of special athletics catapult training usually has two forms of arrangement, one is to carry out individual 80% 1RM large load training immediately followed by small weight catapult exercises. The second method is to alternate the large load training and small load training, such as in the first day of training class arranged large load training the second day of training class arranged small load training class, the athlete usually need to arrange small load training in some training days after the competition, so this large load small load alternating arrangement training is very effective.

Carrying out catapult training can improve the explosive power of the specialized movements of athletes of different training levels. For example, catapult squat jumps can improve the explosive power of the lower limbs of athletes. Supine throw is the weight of the barbell bar will be thrown out and then catch, this exercise for the technical combat can dominate the class of fighting against the project athletes is the development of the upper limb explosive force is a very good means of training.

4.3. Super-equal Length Training

Super isometric training is a form of exercise that rapidly elongates the length of contracted muscles in a short period of time. A large number of studies have shown that after a period of time super isometric exercises have greatly improved the special explosive force of athletes.

4.4. Weightlifting

Due to the special characteristics of the weightlifting movement itself, the absolute strength and rapidity of the athletes themselves make the athletes in the weightlifting exercises can show great explosive power under various load weights. When arranging the training program for athletes, combining weightlifting with various special movements is an effective means of training for the development of athletes' explosive power.

4.5. Transformation of Strength to Explosive Force

The improvement of athletes' muscle strength needs to be adapted through training in order to be converted into explosive force, and this conversion process needs enough time, this conversion process needs to go through a complex training process in order to realize, which is a part of the periodical training program. Therefore, in the process of explosive strength training athletes in the large load resistance training, immediately after the special movement training, exercise movements should also be similar to the form of the special sport.

5. The Load Selection of Explosive Force Training

5.1. Large Load

Because there is a positive correlation between muscle strength and explosive force, after a stage of training with large loads to improve the maximum strength, but also to a certain extent to improve the explosive force, so usually also use large loads of resistance training to improve explosive force, such as greater than 80% of the 1RM training.

5.2. Small Loads

In the rapid expansion and contraction compound explosive strength training, individual 0% to 60% of 1RM small load catapult training and super-equal length training is usually used, because such small load training is conducive to athletes to train in a manner similar to the speed of the game, for the need to be in the efficiency of the strength growth of the sport is usually used small loads.

5.3. Optimal Loads

The load at which an athlete demonstrates maximum explosive power in a specialized movement is called the

“optimal load”. In different specialized movements, the load taken when the maximum explosive force is demonstrated will be different depending on the sport and the size of the load.

Because the improvement of explosive force performance is most significant under the optimal load, training is carried out to improve the maximum explosive force in specialized movements.

5.4. Combined Load

Because the use of a variety of load combinations in the form of training in the relationship between strength and speed can improve the performance of various aspects, than a single small load or large load training to a greater extent to improve the maximum explosive force and sports performance. Therefore, in order to maximize explosive power in the relationship of speed and strength, combined loads should be used in catapult explosive power training.

6. Conclusion

The article mainly discusses the factors affecting the maximum explosive force, the training methods of maximum explosive force, the specialization of training movements and the change of loads, in order to continuously improve the performance of explosive force. Various training methods using multiple load alternation and combination arrangements should be reasonable, in order to ensure that good training results, in the training process should be measured and assessed to help improve the explosive force performance of a variety of factors, and in the subsequent stage of the test, test the size of the explosive force changes. As the athlete's training level improves, more complex training methods including catapult training with large and small loads, super-equal length training, and weightlifting training or even unloaded or over-speed exercises should be used to improve the maximal explosive strength performance.

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