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Analysis of Strength Training in the Training of Shot-Putters

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Abstract: The shot put is a sport that requires very high explosive power and precise technique. Strength training occupies the core position in the training of shot-putters, which can not only improve the throwing distance of athletes but also enhance their competitive state and prevent sports injuries. The purpose of this paper is to analyze the principles, classification, methods, and specific exercises of strength training in the training of shot-putters, in order to provide scientific training guidance for shot-putters.

Keywords: Shot-put movement; Strength training; Explosive power; Maximum power; Functional training

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1. Introduction

As a throwing event in track and field, the shot put has a very high demand on the athletes' physical quality and technical level. Strength is the basis for shot-putters to achieve excellent results, and strength training is an effective means to improve their strength quality. This article discusses the four aspects of strength training principle, classification, methods, and specific practice, in order to provide a theoretical basis and practical guidance for the training of shot-putters [1].

2. The principle of strength training in the training of shot-putters

2.1. Principle of individuality

The principle of individuality emphasizes the development of training plans according to the athlete's personal characteristics, physique, skill level, and training objectives. The implementation of this principle requires coaches to have a deep understanding of each athlete's physical, psychological, and technical characteristics in order to tailor training programs for them. The principle of individuality requires the coach to carefully evaluate the athlete's physical qualities, including strength, speed, endurance, flexibility, and coordination. Each athlete's psychological quality, motivation, ability to withstand pressure, and competition experience are different. Coaches need to adjust the intensity and content of training according to these factors to ensure that athletes can adapt to the challenges of training at the psychological level [2]. In addition, the principle of

individuality also means that the training plan needs to be adjusted according to the skill level of the athlete. For beginners, the training may focus more on the building of basic strength and the mastery of basic techniques; for more experienced athletes, there may be more emphasis on the development of specialized strengths and the perfection of advanced techniques.

2.2. Principle of gradualism

The principle of gradualism requires that the design of the training plan must follow the logic from easy to difficult, and gradually increase the difficulty and intensity of the training. When athletes start strength training, they should start with a lower load and gradually increase the weight and intensity of training as the body's adaptability improves, which helps to avoid sports injuries while ensuring that the athlete's strength level steadily improves [3]. In the early stage of strength training, athletes may mainly carry out some basic strength exercises, such as squats, hard pulling, etc. With the deepening of training, more special strength exercises can be gradually introduced, such as explosive power training simulating the shot-put throwing action. In addition, the principle of gradualism also involves the arrangement of training frequency and training cycle, coaches need to reasonably arrange the frequency and cycle of training according to the athletes' recovery ability and competition schedule, to ensure that athletes can get adequate stimulation in training, and can get full recovery [4].

2.3. Principle of functional training

The principle of functional training requires that the training content and method must be closely related to the athletes' competition needs and special skills. Coaches should choose those strength exercises that can directly or indirectly improve the effect of shot putting, such as explosive power training and core stability training [5]. The principle of functional training also requires that the training equipment and tools used in the training must match the competition environment, for example, in the shot-put training, a solid ball with a similar weight to the shot can be used for strength training to improve the athlete's control of the shot. In addition, the principle of functional training also involves the simulation of the training environment, coaches should trytheir best to simulate the competition environment in training, including field conditions, climate factors, etc., in order to improve the athletes' adaptability and competition performance.

3. Classification of strength training in the training of shot-putters

3.1. Maximum strength training

Maximum strength training is the basis of strength training for shot-putters, and the training goal is to improve the athlete's muscle strength so that it can produce maximum power output, including training with low repetitions using heavier weights to stimulate muscle fiber growth and strength improvement [6]. In the maximum strength training, the athletes will use 1–6 repetitions of high-intensity training, and the rest time between groups is long, to ensure that the muscles are fully recovered, this training method helps to increase the volume and strength of the muscles, to lay a solid foundation for the subsequent explosive power and speed strength training [7].

3.2. Explosive power training

Explosive training is concerned with improving the speed of the athlete's power output, that is, producing the greatest power in the shortest time, this training is crucial for the shot-putter, and directly related to the efficiency and effect of the throwing movement [8]. Explosive training typically involves training with moderate weights and higher repetitions, as well as the use of various forms of ballistic training, such as Olympic weightlifting and throwing exercises, whose purpose is to improve the ability of the muscles to contract quickly

and thus increase the athlete's explosive power.

3.3. Speed strength training

Speed strength training is a form of training that falls somewhere between maximum strength and explosive power. The goal is to improve an athlete's power output in fast motion, which is essential for a shot-putter to maintain consistency of power and speed during throwing. Speed strength training typically uses moderate weights and high repetitions while focusing on the speed and rhythm of the movement, and this training can help athletes improve the strength of their muscles during rapid contractions, resulting in faster acceleration when throwing the shot put [9].

4. Methods of strength training for training of shot-putters

4.1. Free weight training

Barbell squats are basic exercises to build lower limb strength, and for shot-putters, strong lower limb strength is key to propelling a shot-put throw. Athletes need to keep their backs straight, their heels shoulder-width apart, and their knees no higher than the top of their feet while squatting, then stand up hard and repeat. Hard pulling is a full-body strength training that is especially effective for developing strength in the waist and hips [10]. The athlete grabs the bar by bending down and then using hip and thigh strength to lift the bar into a standing position. This exercise works for the entire posterior chain muscle group. The dumbbell bench press focuses on upper body strength, especially the muscles in the chest and shoulders. Shot-putters need a strong push to complete their throwing motion, and the dumbbell bench press works well to build up this part of their strength. Barbell rowing is a training exercise that targets the muscles of the back and shoulders [11]. It helps build up the strength of the upper body, which is also essential for the shot-put throw.

4.2. Equipment training

The leg lift machine is a device that specifically targets the thigh muscles, allowing the athlete to increase the strength of the thigh muscles while reducing the pressure on the waist. The chest lift machine is a machine that increases the strength of the chest muscles through a fixed trajectory to ensure the accuracy of the movement and reduce the risk of injury. A shoulder press machine is specifically designed to strengthen shoulder muscles, which is just as important for shot-putters because the strength of the shoulder directly affects the power and accuracy of the throw. The pullers can be used for a variety of pull training, such as high pull-downs, sitting rows, etc. that help build strength in the back and shoulders [12]. Core stability trainers such as Swiss balls, balance pads, etc. can help athletes strengthen their core muscles and improve their body stability and balance, which is very important for shot-putters to maintain stability during throwing.

4.3. Core stability training

Core stability training refers to increasing the strength and stability of the core muscles of the body through a series of exercises, thereby improving the balance and power output efficiency of the athlete when performing technical movements. Core muscles include the muscles in the abdominal, back, buttocks, and pelvic areas, which are the center and support points of the body and are essential for maintaining body posture and transmitting strength. Shot-putters can use a variety of exercise methods when performing core stability training, such as balance ball training can effectively activate the core muscle group and improve the athlete's balance and coordination. Athletes can perform various postural holding exercises on the balance ball, such as planks, push-ups, etc. These exercises require the athlete to control the body on an unstable surface, thereby enhancing the stability and strength of the core muscles.

4.4. Functional training

Functional training refers to simulating the actual movements in the shot put and improving the athletic skills and strength performance of athletes through specific training methods. The purpose of functional training is to allow athletes to simulate the technical movements in the competition as much as possible in training, so as to improve the conversion rate of athletic performance. In shot putting, functional training usually involves simulating a shot-put move, such as using a lighter shot or dumbbell. This exercise can help familiarize the athlete with the technique and strength requirements of the push motion, as well as reduce the risk of injury associated with using a heavier shot put. In addition, functional training can include some compound strength training moves such as squats, hard pulls, and clean and jerk. These movements not only enhance the athlete's lower limb and trunk strength but also improve the athlete's coordination and explosive power [13]. Through the training of these compound movements, athletes can better simulate the power transmission and coordination requirements when putting the shot.

5. Specific exercises for power training of shot-putters

5.1. Upper body strength exercises

Upper body strength is the main source of motivation for a shot-putter when performing a throwing motion, therefore, building upper body strength is essential to improving athletic performance.

5.1.1. Dumbbell press

The dumbbell press is a basic upper body strength training movement that effectively exercises the shoulder and upper arm muscles. The athlete should choosethe appropriate weight, keep the back straight, hold the dumbbell with both hands on either side of the shoulder, push up until the arms are straight, and then slowly lower to the starting position. This is performed 8–12 reps per set for a total of 3–4 sets.

5.1.2. Pull-ups

Pull-ups are a full-body strength training exercise that works especially well on the muscles of the back and upper arms. Athletes can use the horizontal bar to keep their body straight, hold the horizontal bar with both hands, pull the body up until the chin is above the horizontal bar, and then slowly descend to the starting position.This is performed as many reps as one can in each set, for 3–4 sets.

5.1.3. Barbell curls

Barbell curls primarily work the biceps in the upper arms. Athletes should choose the appropriate weight, stand with their feet shoulder-width apart, hold the barbell with both hands and let it hang naturally, then bend up to the maximum and lower it slowly. This is performed 8–12 reps per set for a total of 3–4 sets.

5.1.4. Bent-over lateral raise

Bent-over lateral raise is an exercise that targets the shoulder muscles. Athletes stand with their feet shoulder-width apart, lean forward, hold the dumbbells in their hands and let them hang, then lift them to the sides to shoulder height, then slowly lower them. This is performed 10–15 reps per set, a total of 3–4 sets [14].

5.1.5. Hammer bends

The hammer bend works the forearms and biceps. Athletes stand with their feet shoulder-width apart and hold dumbbells in their hands, palms facing inward, then bend up to the maximum and lower slowly. This is performed 10–15 reps per set for a total of 3–4 sets.

5.2. Core strength exercises

Core strength refers to the strength that surrounds the central areas of the body, including the muscles in the abdominal, back, and pelvic areas. A strong core is essential for a shot-putter to keep their body stable and improve the efficiency of their movements during a throw [15].

5.2.1. Plank

The plank is a classic core stability exercise. Athletes take the starting position of a push-up, then bend their elbows and support themselves on their forearms, keeping their bodies in a straight line and avoiding sinking or raising their hips. This position is held for as long as one can and repeated 3–4 times.

5.2.2. Russian twist

The Russian twist focuses on the oblique muscles of the abdomen. Athletes sit on the ground with their feet raised, their upper body slightly back, their hands holding dumbbells or barbell pieces in front of their chest, and then turn their upper body to one side and to the other side. This is performed 15–20 reps on each side for a total of 3–4 sets.

5.2.3. Push-ups

Push-ups are whole-body strength training, especially having a good exercise effect on the core muscle group. The athlete takes the starting position of a push-up, holding the body in a straight line, then lowering the body until the chest is close to the floor, then pushing up until the arms are straight. This is performed as many reps as one can in each set, 3–4 sets in total.

5.2.4. Sit-ups

Sit-ups are a basic exercise for building the abdominal muscles. The athlete lies on his or her back on the ground with feet flat and knees bent, hands behind the head or in front of the chest, then sits up until the upper body is at a 90-degree angle to the thighs, then slowly lies down. This is performed in 3–4 sets of 15 to 20 reps per set.

5.2.5. Side plank

The side plank is an exercise that targets the oblique muscles of the abdomen and the muscles of the back. The athlete lies on his or her side with one elbow supporting his or her body in a straight line, holding the position for as long as possible, then switching to the other side. This is performed in 3–4 reps on each side.

5.3. Lower limb strength exercises

Lower limb strength is an important foundation for shot-putters to complete their push motion. Strong lower limb strength can provide solid support for athletes and help them better use their upper body strength during the push.

5.3.1. Squats

Squats are a classic exercise for strengthening the lower limbs. Athletes can start with freehand squats and gradually increase the barbell weight to increase the intensity of the workout. When performing squats, athletes should keep their backs straight, their knees no higher than the top of their feet, and stand up after squatting until their thighs are parallel to the floor.

5.3.2. Deadlifts

Deadlift is a kind of systemic strength exercise, especially for the lower limbs and waist muscles. Athletes

should keep their backs straight and use the strength of their legs and hips to lift the bar to a standing position when performing a deadlift.

5.3.3. Leg lifts

The leg lift is an isolated exercise that targets the thigh muscles. Athletes can use a leg lift to train by targeting different parts of the thigh by adjusting the weight and angle.

5.3.4. Leg curls

Leg curls work the muscles at the back of the thigh. Athletes can perform leg curls in a sitting or prone position, keeping the waist close to the backrest during the movement and using leg strength to bend the weight.

5.3.5. Box jumps

Box jump is a type of explosive strength training that can improve the athlete's lower limb strength and coordination. Athletes should choose the right height for the box jump, jump from a standing position to the box jump, and then jump off, taking care to cushion the pressure on their knees when they land.

5.4. Full-body explosive power exercises

Full-body explosive power is the key for a shot-putter to generate power quickly during the push. The following are several effective full-body explosive exercises.

5.4.1. Barbell press

The barbell press is a classic full-body explosive exercise. Athletes can start with the sitting press and gradually transition to the standing press to increase the intensity of their training. When performing the press, the athlete should keep the core stable and push the bar to the top of the head with full-body strength.

5.4.2. Clean and jerk

The clean and jerk is an Olympic lifting move that has a remarkable effect on improving overall explosive power. When performing the clean and jerk, athletes should master the correct movement technique and use the leg and upper body strength to lift the barbell from the ground to the head.

5.4.3. High pulls

A high pull is a technical move in weightlifting that improves an athlete's explosive power and coordination. While performing a high pull, the athlete should keep his back straight and use leg and upper body strength to pull the bar to his chest.

5.4.4. Snatch

The snatch is another Olympic weightlifting exercise, which has a good effect on improving overall explosive power and speed. When performing the snatch, the athlete should master the correct movement technique and use whole-body strength to quickly lift the barbell from the ground to the head.

5.4.5. Medicine ball throws

Medicine ball throw is a functional exercise that improves an athlete's overall explosive power and coordination. Athletes can use different throwing styles, such as chest throwing, over-the-top throwing, etc., to exercise different muscle groups.

6. Conclusion

Strength training for shot-putters is a systematic engineering that needs to be scientifically planned and rigorously executed. This paper analyzes the principles, classification, methods, and specific exercises of strength training, aiming to provide comprehensive and systematic guidance for shot-putters. In the future, it is necessary to further study the combination of strength training and shot-put techniques and tactics, as well as how to improve the athletes' competitive state andsports performance through strength training.

Disclosure statement

The author declares no conflict of interest.

References

[1] Zhao M, 2023, The Influence of Core Strength Training on the Performance of Young Female Shot Putters. Chinese Sports Coaches, 27(3): 35–37.

[2] Peng J, 2019, Study on the Function and Method of Core Strength Training for Shot-Putters. Western Leather, 42(12): 56–57.

[3] Xiao H, Zhou L, 2016, Influence of Core Strength Training on the Competitive Ability of Shot Putters. Sports Science and Technology LiteratureBulletin, 24(9): 47–48.

[4] Wu Y, 2016, The Important Role of Core Strength Training on Shot Put Athletes. Track and Field, (2): 41–43.

[5] Chen S, Huang X, 2020, Feasibility Analysis of the Application of Core Strength Training in Shot Put Competition. Slam Dunk, (18): 20–22.

[6] Shen Y, 2021, Research on Teaching Design of High School Mathematical Modeling—Taking "Throwing Shot Put" Problem as an Example. Shanghai Middle School Mathematics, (12): 24–27.

[7] Sun R, 2021, Application of Core Strength Training in Sports Training ofMiddle and Long-Distance Running Special Students in High School. Sports and SportsSupplies and Technology, (19): 25–26.

[8] Han K, 2021, Experimental Research on the Influence of Core Strength Training onthe Training Effect of High School Basketball Special Students, dissertation, Tianjin Normal University.

[9] Li F, 2023, Research on Shot-Put Training Strategy for Sports Special Students. Sports Vision, (07): 125–127.

[10] Xu Y, 2023, Shot-Put Training Method in Place. New Sports, (06): 28–30.

[11] Chen Y, 2023, Intervention of Elastic Belt on Shot Put Throwing. Health and Beauty, (03): 99–101.

[12] He X, 2023, On the Training Methods of Spot Shot-Put for PE Candidates. Track and Field, (03): 6–7.

[13] Ren B, 2022, A Study on the Correlation Between Special Quality and Special Achievement of Second-Level Male Shot Put Athletes. Martial Arts Research, 7(12): 154–156.

[14] Feng J, 2022, Research on Strength Training Methods for Middle School Students' Shot Putters. Sporting Goods and Technology, (18): 73–75.

[15] Cao B, 2022, Application of Plate Training in the Annual Training of Shot Putter Feng Jie Preparing for the 14th Olympic Games, dissertation, Xi'an Sports Institute.