

New Core Stability Strength Concept for Training Pole Vaulter

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Abstract The purpose of this study was to obtain the best effect by using fast run-up combined with quick take-off for professional pole vaulter. How to train the pole vaulter with the idea of core stability and strength, improve the quality of fast run-up combined with fast takeoff, analyze its mechanism, and explore a new method to improve the performance of the pole vaulter with fast run-up combined with takeoff speed. Innovate the thinking of sports training of pole vault, reduce the dispersing of fast run-up combined with takeoff and jump strength, discover the new idea of fast run-up combined with takeoff and jump training, transform the best competitive ability result of pole vault athlete with the core strength practice function, show the athlete pole vault high takeoff charm.

Keywords Core stability, Core strength, Rapid take-off, Run fast, Pole vault

The preface

Professional how to improve the result was a pole vaulter has practical application value of the subject, advanced training concept is applied to the field to fly is coveted, athletes training method is a must after the close of rational practice process, improve the athlete's rapid run-up combined with fast take-off technology function mechanism, increase the efficiency of the height of pole vault.

1. Core Stability Strength Concept Training Pole Vaulter Rapid Run-up Combined with Rapid Takeoff Technology

1.1. pole vault in track and field is a fast power event, an event in which the athletes change from horizontal speed to maximum vertical speed, and the sport in which the rapid flexion and extension of the hip joint turns the maximum range. This paper discusses how to improve the technical efficiency of the pole vaulting with the combination of rapid start and rapid start. Pole vaulter has very high requirements for speed, and the athlete's running speed is fast and the hole is inserted to make the pole jump. The speed is greatly

supported by the core strength, and the stable force fulcrum is determined for the athlete to kick, swing, fold, and pick the ground to make the jump, generating a strong source of strength. Core strength is related to the waist hip flexion, and hip flip exercise of power, pole vault athletes takeoff knee flexion bending stress conduction, waste, work is muscle onset of excessive torque with physical strength dispersion, lack of core strength hip flexion and hip fatigue, pressure relay leg ministry muscle, deep knee bends, joint muscle strength offset fast jump, push aren't easy and effortless. The strength of waist core affects the flexible speed of the extended hip rotation and the balance of the two arms. Before taking off, run fast and combine taking off, the athlete body plate can be hard enough to resist the pole taking off and make it bend, rebound Angle is large, bounce higher; The core strength is strong, which can make the rapid running and jumping make the body hip joint press and punch the arched arched bar and swing the leg. The strong core force can make the pull-body movement not inclined, and the two arms and two large legs are perfectly coordinated. The strong core strength can make the fast start run combined with the undulation of the body, control the steady acceleration of the center of gravity; The core strength is strong, which can automatically control the athletes' fast start speed and fast start speed. The core strength is strong, which can push the leg to the ground quickly and forcefully, and it can run fast and connect with the jumping technology accurately and elegantly.

1.2. core stability exercise was applied in the training period of track and field, which was earlier than other sports and limited to limitations. Research on the mechanism of the

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Published online at <http://journal.sapub.org/health>

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high and rapid start speed function combined with the rapid start speed function of the core strength training. Think core stability training can strengthen human body under unsteady control ability, balance function, coordinate each muscle group show strength, improve the operation technology, pole vault body core control ability is the basis of limb motor function activities, core stability to the human body in motion under effective control of the stability of the torso posture; Strengthening the core stability force is conducive to the control of the center of gravity, which can determine the coordinated force of the force fulcrum for the motion of limbs, and the transmission and control of the generated force reach the optimal level. The core parts of the body include the spine, hip pelvis, between the foot diaphragm and the pelvic floor muscle, and in the upper and lower limbs, it plays a pivotal role, and the function plays an important role in maintaining stability in human movement. Core stability depends on the control and contraction of the trunk and pelvic core muscle groups. [1] The core part of the body is the root of the speed force generated by the pole vaulter, driving and controlling movements.

1.3. the mechanism of the rapid run-up combined with the rapid jumping technology of pole vaulter

1.3.1. the core stability strength shows the speed and explosive power of the core muscle group. All the physical qualities come from the control of the nervous system. The central nervous system ACTS on the body muscle feeling, drives the muscle joint force, and moderately controls the muscle group to make the core stability reflect the dynamic sense. Body core stability depends on the strength of the core muscle, ligament tissue, the coordination between the pelvis and trunk of the spinal cord joint muscles to complete human movement, the core muscles to contract for athletes limb muscles to determine capability to stand, and increase the efficiency of the athletes limb muscle contraction and assist each muscle contraction joints, to speed up the transmission power, improve the efficiency of human movement. The core stability force is the propeller of the body movement, which plays an important role in regulating the body function by training. Core strength training can auxiliary pole vaulter core stability and core strength can stabilize the core parts of the body and control body movement center of gravity, kinetic energy transfer arms force, stress equilibrium stability and fixation of further smaller muscle groups, complete the emphasis on the ability of the muscles in the neural control to speed, as an important power source, pole vault sports need core support, control of body gravity balance, reduce the resistance factor, raise the core strength is starter athletes jumping height. [2]

1.3.2. core stability training for pole vault tion, increase muscle strength as the core torso motion together, and build a point for athletes limb muscle contraction, provide more muscle contraction force, coordinate each joint muscle into pole vault, make different joints, muscle contraction, makes the whole body of each joint muscle, coordination between each muscle movement, strengthen the core parts of the lumbar spine, hip pelvic muscles, enhance the core strength

of the overall control of transmission capacity. Through more than resistance strength training can improve the waist muscle coordination, collaborative fast raise and nerve impulse frequency, increasing pole vaulter limb muscle contraction force, fast transmission power, improve signal transmission, improve the ability of athletes special speed, create athletes quick run-up in combination with quick jump pole vault muscle contraction power efficiency. [3]

1.3.3. hip rotation at the height of pole vault, together with the weakness of lumbar segmental muscle strength and muscle tone dysfunction, affects the stability of lumbar spine, and strengthening the core muscle strength exercise is an important measure. The core muscle groups of the torso from the middle of the body below the chest to the legs, from the front and back and the two sides can regulate the body's center of gravity to maintain the balance and stability of the trunk, mainly including the internal and external oblique muscle, transverse rectus muscle, quadratus lumbar muscle, iliopsoas muscle, gluteus muscle, erector spine muscle and other core muscles. Movement of the body core muscle group pelvic control will effectively control the pole vaulting movement. The lumbar vertebra of human body lacks the support of large muscle group in the movement, when the pole vault is high, the leg is in the state of no support, also is the weak part when the movement, the organism needs the core strength training to protect the movement center to strengthen the core stability. At present, the pole-vaulting project mainly focuses on leg training, and insufficient attention is paid to the training of core muscle group strength. The method of pole-vaulting is simple. [4]

1.4. fast sprinting combined with rapid takeoff and pole vaulting can be re-integrated through the body waist and back muscles, supplemented by core stability strength exercises in body jumping exercises, which can promote the improvement of motor function. The mechanism is as follows: Nervous system through the physical stability of core strength training of the waist muscle control, strengthen the small muscles and big muscles strength coordination effect, can enhance signal input, to the athlete limb muscle conduction stimulation signal, to promote coordinated movement, each joint muscle group training can enhance the body of the contralateral limb sensory sensitivity, through the training can accelerate the brain function of the body control ability, the core muscles adjust reaction is closely related to the physical stability and control, the nervous system for professional athletes various muscle has a fine ability to dominate and control. [5]

1.5. Stability through the core strength training, can happen is making adjustment, central nervous movements of pole vault athletes body movement direction and the limbs movement direction on the dynamic were four line, ensure the body main body and pole vault action form the rapid transfer, promote fast physical approach combined with fast jump function, core muscle group source dominate bilateral pyramidal tract of nervous system, and promote the normal function of pole vaulter physiological basis. The stability of the core body muscles contraction, limb muscles to do work

for pole vault athletes can determine to stand, and increase the efficiency of the athletes body muscle contraction and coordinate all joints, muscles, body strength promotion function of pole vault, core stability training can improve the athletes physical system coordination control ability, make the speed of pole vaulter can give full play to the power function. [6]

1.6. Exercise motion mechanism distribution through the stability force, and work through the coordination of the core part of the body to establish stable support points for the high strength of the pole vault, so as to reduce the load pressure of the limb muscle terminal; The stability strength exercise can strengthen the important protection function to the spine, strengthens the core muscle strength to decide the spinal function size. Pole vaulter core strength training effectively promote nervous system around quickly raise lumbar muscles, nerve impulse frequency together more muscle coordination work movement size, activation of spinal muscle coordination added together, improve muscle nervous regulation function, improve the lumbar flexor perceived sensitivity, activate muscle nerve input speed fast, and impulse response time was shortened, and the ability of fast synchronization control each muscle group, improve the lumbar muscles contraction force together. The central nervous system controls the size of the extensor flexor muscle and works together to maintain the stability of the lumbar spine. [7] If lumbar abdomen muscle groups load sharing mechanism is imperfect, motor neuron receives input stimulus does not directly sensitive, unbalanced distribution way, will not be able to improve the load balance, muscle feel the sensitivity of location, maintain the dynamic stability of the lumbar area, pole vaulter more need stability of core strength training. [8]

1.7. Improve the lumbar stability of the pole vaulter by improving the sensitivity of the lumbar intervertebral joint movement; To enhance the precision of lumbar joint movements; The ability to exert force by the muscular movements of the waist; By improving the lumbar nervous system recruitment muscle efficiency and contraction efficiency. The core stability of the athletes is dynamic stability, and the dynamic control of the lumbar extensor flexor to the joint exercises can improve the stability. The change of the original structure of the pole vault high and rapid run-up combined with the rapid takeoff needs to be repositioned, and the fulcrum of the leg rapid takeoff needs to be re-determined, which is the physiological basis of the core stability strength training. The positioning error can be avoided in the dynamic stability sports organization, and the sensitive accuracy of the lumbar extensor flexor relocalization can be improved through practice. Can reduce the speed loss degree. [9]

2. Core Stability Strength Training Improves the Rapid Start and Lift Speed of Pole Vaulter

2.1 special core strength training can help athletes to reduce loss in fast start and run combined with jump speed, improve physical fitness speed level, exercise has different and interactive relations, and the stability of core stability strength development mode, emphasizing the combination of strength ability and coordination ability, and emphasizing the transmission and connection of strength. Pole vault core strength is a fast and exact balance, pay attention to the small muscles fixed effect, the nervous system is fine for multi-level muscle dominate and control the ability of resistance to practice combining with the core skill training, special speed strength, core strength training combined more closely combined with the specific speed ability, training force cohesion, cohesion high performance ability, consolidate physical preparation for athletes to create good grades infrastructure. Core strength training improves special pole vault ability. The strength of core muscle group is directly related to the sport technology of pole vault. Strong core stability is a guarantee of high performance. During core strength training, the athlete first stabilizes the body center of gravity to create the fulcrum for the movement of the limbs and torso, and then controls the free limbs for movement. The aim is to develop the movement ability of the body and trunk, and change the body center of gravity through the position change of the body link, so as to increase the difficulty of controlling the stability of the core muscle group, so that the core stable muscle and the whole movement muscle are developed. The key in core strength training is to make people's body under the state of imbalance and instability. Non-balance strength training is to adjust the unstable body state from the human body to achieve the goal of training the balance control ability of the muscle system and the sense of proprioception. The reinforcement of the nervous and muscle system of athletes with unstable training is much stronger than the steady training. The use of unstable equipment for training can activate multiple core muscle groups and improve the strength and athletic ability of the body. Physics of the rotational torque in a closed constant principle of athletes in cadence to produce a forward force, in order to balance other parts necessary to produce a opposite rotational torque, with ground leg on the upper side of the lower limbs with can keep the balance function of movement, a strong core muscle group has play an important role. There are various ways of core strength training, such as upright knee lifting, supine leg lifting, static support and hackle squatting. The core strength training needs to pay attention to the one-dimensional motion exercise, and also to the two-dimensional and three-dimensional motion exercise in the training mode. The core strength training adopts the oblique rotary flexion and extension multiple multi-dimensional motion. [10]

The core explosive force of the pole vault movement increases the explosive force on the action control feedback speed and improves the level of force transmission and power generation. Increase the energy output from the core to the extremities and muscle groups. The core strength can be fixed at the proximal end, improve the strength of the

terminal muscles, increase the cooperation between different muscles, and the strength of different parts of the body can participate in the movement in an orderly way, increase the output of total energy, improve the coordination efficiency of the body and limbs, and reduce energy consumption. The specific strength depends on the coordination between the sports muscles and the control ability of the center of gravity in the movement. The core strength is ensured. The support of the trunk support is stable, and the stress of the body and limbs can be reduced accordingly. [11]

2.2. core stability strength combined with pole vaulting high technology training

2.2.1. core stability strength exercise is carried out to maintain high level sports skills for athletes with fast start and jumping. Special speed ability, control body center of gravity, and promote refreshing height of pole vault have special effects. Increase the strength of lumbar and back muscles, establish the strength support point for active muscles, promote the coordination and concentration of all joints and muscles of the whole body, create the function of sports training, and reduce the load of negative energy of joints and muscles. The goal of the core stability strength training is to master the effective dynamic control of the body's center of gravity. Control exercises of lumbar and dorsal muscles, trunk and pelvis, deep assistance of muscles between lumbar vertebrae, small muscle exercises, exercise methods and means of light load, more centripetal contraction than centrifugal contraction exercises; The method USES the static practice which is fixed at both ends more than one end. Multi-dimensional motion direction than single Angle exercise. Athletes maintain the ability of body joints to control the center of gravity in rapid movement, improve core strength exercises, meet the standards of special sports requirements, and transform the best sports skills with good effect of core strength. The combination of core strength and special technology, and the combination of core strength and core muscle power can guarantee the improvement of athletic performance, showing the takeoff charm of the sport of pole vaulting. [12]

2.2.2. the body core strength training to enhance low back muscle, abdominal core muscle strength exercise promote between the lumbar abdomen, waist and back muscle, improve the lumbar segmental stability, for pole vault athletes training effect, improve the body waist and back muscle group to support, protect the spine and increase power has a good effect, the waist and back muscle strengthening core is beneficial to maintain good posture, to improve the pole vault balance has a positive role in sports training, the body balance ability is closely related to the core muscle strength. When maintaining the upright posture and movement of the spine, the paravertebral muscle plays a greater role in maintaining the dynamic stability of the spine, enhancing the muscle strength to maintain the moving height, and the dorsal abdominal muscle and lumbar muscle strength can maintain the stability of the spine and the role of aerial rotation. [13]

2.2.3. comprehensive physical exercises can promote neuromuscular exercises, muscle stretch, enhance muscle strength and balance the body. Supported by the core strength stability exercise, the rectus abdominis, the division, the iliopsoas, the gluteus, the trunk pelvic control exercise. Physical exercise plan practice application principles first speed after lumbar back muscle, back muscle practice after practice jumping ability first, practising lower limbs after upper limb strength training to the waist and back muscle, weights from light to heavy, instrument combination practice complete decomposition after first combination, waist and back muscle strength exercise practising small muscles after the first big muscle strength, in order to prevent muscle atrophy, practising after side waist under muscle first. Improve the ability to support and maintain pole vaulting by stabilizing joint forces. The weekly balance, functional, special exercise techniques and load enhancement exercises are helpful to achieve the goal of core stability strength training. Training methods include unbalanced equipment training, suspension training, elastic belt training, rope pulley training, and skateboard training. According to the physiological characteristics of the core muscle group and the training principle, the practice method is summarized as steady state practice and unsteady state practice. The static practice without the aid of equipment is mainly based on the practice of the closed power chain, namely the practice mode of limb distal fixation, and the core muscle group exerts effective control of the body, involving the core stable muscle group. [14]

2.3. pole-vaulting related proprioception exercises

2.3.1. The body sense exercise of gymnastics has a good application effect in the pole-vaulting exercise. In the exercise, the body sense is relatively recessive, which may be ignored by the exercisers and affect the exercise effect. Body strength exercise combined with body feeling exercise has a synergistic effect on improving athletes' muscle strength, balance ability and lower limb movement function. The mechanism is to improve the intervention method of human muscle force and deep proprioception function. The reduction of proprioception ability will affect the sensitivity of lumbar extensor movements and the accuracy of exertion, as well as the stability of lumbar, spine and hip pelvis. Muscle strength exercises mainly focus on strengthening muscle exercises for lower back and lower back muscle groups. It is advisable to mainly exercise the exercise load with medium and medium intensity and moderate amount of exercise. The training plan should be systematic, and the training methods and methods should be diversified and diversified, so as to guarantee the training continuity without injury and muscle injury. The combination of increasing the core strength training gradually reflects the objective of functional stability strength training. Stable core strength training is the core of the dynamic stability of muscle proprioception exercises, core strength training methods to overcome resistance to change his body posture, maintain the balance of the body to adjust movement, and stability

under the condition of strength training, the stability condition can improve the effect of practice, can raise more muscle movement, deep in the small muscles have been mobilized in order to maintain the balance of the body, to increase muscle fiber reflective contraction force. [15]

3. The Conclusion

3.1. the core strength training of the athletes of pole vault combined with the rapid start technology is different from that of other sports. A good plan is made.

The pole-vaulting athletes use the core strength of stability to train the athletes for regular evaluation of their functions, analyze their training content adjustment plan, and revise the athletes' functions in a good way, discover innovative ideas, and transform the best practice results into the athletes' best sports technology status.

3.2. perfect connection of fast start and fast start technique is pursued, strength is exerted by flexion hip and extension hip rotation, and good methods are used to train athletes of pole vault with core stability strength. Traditional physical exercises are combined with core stability strength training to balance the proportion of special ability content. Give attention to both fast start and pole vault function.

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