

Effects of core strength training on jump shooting performance of basketball major students

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Abstract: Basketball is a high-intensity competitive sport. With the increasing diversification of basketball skills, jump shooting has become the most practical and important scoring technique in basketball matches. As the body is in an unstable airborne state during jump shooting, core strength of the body greatly facilitates physical stability and coordination. By adopting the methods of literature review and logical analysis, this paper discusses the influence of core strength training on improving students' jump shooting ability. It analyzes and summarizes the impacts of core strength training on jump shooting techniques and its functions in each phase of jump shooting movements. Meanwhile, it puts forward training methods and precautions of core strength training for students majoring in basketball.

Keywords: Core Strength Training, Basketball Specialization, Jump Shooting, Shooting Technique

1. Introduction

In high-intensity basketball competitions, players frequently perform sudden starts and stops. When confronting opponents, they constantly adjust body posture to regain balance so as to execute various techniques and tactics under stable conditions. Jump shooting is completed at the highest airborne point after takeoff, which requires a new balanced posture to ensure coordinated and stable shooting movements. Traditional training for jump shooting mainly focuses on limb strength, such as strength exercises for the forearms and wrists, while the understanding of core strength training and its impacts on basketball competition remains insufficient. This paper elaborates on the influences of core strength training on jump shooting techniques, aiming to provide references for further improving athletes' jump shooting capabilities.

2. Concept, characteristics and functions of core strength training

The concept of core strength originates from core stability, which is derived from spinal stability. Core stability possesses three functions: force generation, force control and force transmission. Core strength training emphasizes force transmission, coordinated technical movements and improved muscle control. It involves the simultaneous participation of multiple muscle groups across the whole body in multi-dimensional integrated movements. Training loads mainly rely on body weight and light external loads, and training is often carried out under unstable conditions. Conventional strength training mostly targets the limbs. By contrast, core strength training prioritizes isometric strength exercises for the core region. Such training stimulates small core muscles, strengthens core strength, and enhances athletes' ability to stabilize joints and control the center of gravity during exercise. The main functions of core strength training are as follows: the core muscle groups stabilize the spine and pelvic girdle; improve athletes' motor control and balance during posture adjustment; boost athletes' energy output; raise the coordination efficiency of limb movements; reduce athletes' energy consumption in competitions; prevent sports injuries caused by distorted body postures; enhance the body's capacity to maintain control under unstable conditions induced by posture changes during exercise and improve motor balance.

3. The influence of core strength training on jump shooting techniques

3.1. Core strength training improves shooting stability

In basketball matches, players need to perform sudden starts and stops while dribbling and moving. Jump shooting is a technical movement that transitions from movement to takeoff, followed by releasing the ball at the highest point of the jump; the whole sequence of movements is completed amid continuous motion. The enhancement of core strength during posture changes enables athletes to transition more smoothly and effortlessly from running to jumping, greatly improving their stability when executing jump shooting.

3.2. Core strength training can effectively guarantee the coordination of movements

Jump shooting is completed by athletes at the highest point of their jump. During the phase from takeoff to ball release, lower limb force needs to be transmitted to the lumbopelvic core, which in turn drives the coordinated exertion of the upper limbs, arms, fingers and wrists. Insufficient core strength hinders effective transmission of the ground reaction force generated by leg push-off through the core region, resulting in uncoordinated jump shooting movements. Accordingly, sound core strength facilitates more coordinated jump shooting techniques and improves shooting accuracy.

3.3. Core strength training improves athletes' hang time during jumping

When watching NBA games or other major basketball competitions, we can frequently observe that basketball players adjust their upper body movements in the air during jump shooting, allowing their upper torso to stay airborne longer. This is commonly referred to as hang time. Longer hang time represents superior airborne capacity, which exerts a vital influence on the execution of aerial technical movements after takeoff. Core strength refers to the strength of the human trunk, which plays a critical role in stabilizing the spine and pelvis and maintaining proper body posture. Sound core strength enables athletes to sustain stable overall body center of gravity during jump shooting, thus achieving stronger hang time and gaining more time and space to complete shooting motions.

3.4. Core strength training reduces athletes' physical energy consumption

A fierce basketball match usually lasts for a long period, during which athletes strive to integrate and apply various techniques and tactics. Elite athletes follow the principle of energy conservation. The core serves as the connecting link between upper and lower limbs. Without core connection, limb energy consumption will increase rapidly, leading to quick fatigue; insufficient physical fitness prevents athletes from completing technical movements smoothly. Strong core strength enables athletes to utilize limb power more efficiently, conserve physical energy, and support rational and stable execution of techniques and tactics throughout the competition.

3.5. Core strength training reduces the risk of sports injuries

In basketball matches, athletes constantly dribble or move to create favorable shooting opportunities. The transition from movement to jump shooting converts horizontal movement velocity into vertical takeoff velocity. Insufficient core strength at this stage increases stress on the spine and pelvis, raising the probability of sports injuries. Such injuries can only be prevented when the small muscle groups surrounding the spine and pelvic girdle possess adequate strength. Meanwhile, core strength stabilizes movements while athletes are airborne, protecting them from injuries caused by collisions during shooting.

4. Roles of core strength training in jump shooting movements

4.1. Effects of core strength training on the take-off phase of jump shooting

During the take-off phase of basketball jump shooting, athletes convert horizontal velocity into vertical upward jump velocity. At the instant of take-off, extensor muscle groups of the lower limbs including the triceps surae, quadriceps femoris and gluteus maximus exert force against the ground to generate upward ground reaction force for the aerial movement. The upward jumping force transfers sequentially from bottom to top through the ankle, knee and hip joints. The hip area belongs to the core region and serves

mainly for force transmission. Core strength training helps strengthen core muscle groups and improve muscle work efficiency. When the limbs generate force, the core muscles act as a medium for force transmission. This allows the body to exert lower limb power more fully and enables smoother transfer of push-off force from the lower limbs to the hips and pelvis, minimizing energy loss during force transmission.

4.2. Effects of core strength training on the ball release phase of jump shooting

The basketball jump shooting movement is completed under unstable airborne conditions, and core strength provides favorable stability for jump shooting. Core strength training helps improve basketball players' body control and balance capacity. Only supported by sufficient core strength can the upper trunk gain stable support, the limbs exert force with less effort, and limb mobility be maximized. Consequently, the ball release movement of jump shooting becomes more coordinated. When releasing the ball in the air, a sequence of movements including driving the elbow via the upper arm, lifting the arm above the head, flicking the fingers and snapping the wrist can be performed more smoothly. This whole movement chain relies on the force generated by lower limb push-off, the transmission of force from the core region to the upper limbs, as well as the stabilizing support provided by core strength during airborne movement.

4.3. Effects of core strength training on the landing phase of jump shooting

After completing aerial ball release, athletes begin descending. Upon landing, substantial loads are imposed on the ankle, knee, hip joints and spine. During this cushioned force transmission, core muscle groups help mitigate pressure exerted on the ankles, knees, hips and spine. Effective core strength training can reduce injuries to the ankle, knee and hip joints, accelerate force transmission of the limbs, enhance the cushioning capacity of muscles, joints and ligaments, and lower the load on body joints.

5. Methods and precautions of core strength training for students

5.1. Core strength training methods for basketball majors

In the initial training stage, basketball specialized students can perform abundant unstable isometric exercises to adapt the body to unstable conditions. This helps improve students' body control and muscle stability, and lays a solid foundation for subsequent specialized training.

During the intensive core strength training phase for basketball specialized students, stability training should be combined with dynamic training, and coordination between movements and breathing rhythm during training should be emphasized. Excessive development of dynamic muscle groups may lead to insufficient strength of stabilizer muscles, which increases the risk of force transmission loss in the core region and raises the probability of sports injuries.

5.2. Precautions for core strength training of basketball specialized students

During strength training, appropriate methods and means of core strength training and traditional strength training should be rationally selected and combined with each other.

Core strength exercises should be matched with basketball jump shooting techniques, following the training principle from easy to difficult.

In core strength training, different training methods, training load and training duration shall be chosen according to various learning stages of jump shooting techniques.

6. Conclusion

Compared with traditional limb strength training, core strength training can more effectively stabilize athletes' trunk and center of gravity, significantly improve the movement quality throughout the whole process of take-off, hang time, ball release and landing in jump shooting. It enhances shooting stability and coordination, saves physical energy and reduces the risk of sports injuries. Scientific and systematic core strength training possesses important training value and practical significance for optimizing basketball jump shooting techniques and improving specialized competitive ability.

7. References

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