WHIOCE PUBLISHING PTE. LTD.
PROVIDING
FIRST-CLASS SCIENTIFIC INFORMATION
FOR TOP SCHOLARS

2025 Volume 3, Issue 7
Lecture Notes in Education, Arts, Management and Social Science
ISSN(Online): 2705-053X

Research on the Optimization Path of Resistance Training in Tennis Training in the New Era

Jiahui Li
Xi 'an FanYi University, Xi 'an 710105, Shaanxi, China

Abstract: In the development process of modern sports, tennis players need to further improve their physical fitness and skills. Resistance training, as an effective means to enhance athletes' strength, speed and endurance, has become an important part of tennis training. Based on this, this article will, in light of the current problems existing in tennis resistance training, such as insufficient integration with specific movements and neglect of training small muscle groups and stable muscle groups, elaborate in detail on the optimization path of resistance training, with the aim of promoting the sustainable development of tennis training in China.

Keywords: Tennis training; Resistance training; Optimize the path

Online publication: August 26, 2025

1. Preface

As a competitive sport that combines strength, speed and flexibility, tennis places comprehensive and efficient demands on athletes' physical fitness and competitive level. In recent years, in the process of the all-round development of competitive sports in our country, how to enhance the comprehensive quality of athletes through more scientific methods has become a key issue in the field of sports research. Resistance training is an important training method that enhances muscle strength and endurance through external resistance and has been widely applied in various sports. In tennis, resistance training is particularly effective in enhancing an athlete's lower limb explosive power, core stability and upper limb strength coordination. However, traditional resistance training methods still have certain problems in practical applications, which can affect the effectiveness of resistance training. Therefore, in the new era, how to optimize the resistance training methods in tennis to enhance training effectiveness is a key issue that people need to focus on studying.

2. Definition and Characteristics of Resistance Training

Resistance training mainly refers to a training method that enhances muscle strength and endurance by resisting external resistance, which can come from gravity, resistance bands, one's own weight or specialized training equipment, etc. This training method is widely applied in fields such as improving sports performance, fitness, and rehabilitation exercises. At present, resistance training is mainly divided into three forms, namely isometric training, isokinetic training and isometric training. Among them, isometric training mainly focuses on the dynamic contraction of muscles, including

push-ups, dumbbell lifting and other contents. Isokinetic training controls the movement speed by using professional training equipment, which is convenient for training large muscle groups. While isometric training emphasizes the static contraction of muscles and does not cause joint movement[1].

3. Analysis of the Important Role of Resistance Training in Tennis Training

3.1. Enhance offensive threat and scoring efficiency

To win in tennis, the key is to hit the ball with very strong force in a very short time, especially in the serve and active attack. Resistance training, through specific load stimulation, can make the relevant muscle groups of athletes, especially the rotator muscles of the shoulders, the core trunk muscles and the extensor muscles of the lower limbs, stronger, and also improve the collaboration between neuromuscles. Once these muscle capabilities are enhanced, it will directly manifest as an increase in the speed of the racket head. Athletes can then speed up the racket within a shorter stroke or hit a more powerful ball after the same preparatory movement. As a result, the ball will fly faster, spin more, and land further away. This optimization of explosive power is not merely reflected in a single powerful hit and it is the biological reason why they can still maintain a high hitting level when their muscles start to get tired in the later stage of the game[2].

3.2. Ensure the coverage of defense and the efficiency of transition between offense and defense

During tennis matches, athletes frequently perform actions such as starting, sudden stops, changing directions, and sliding steps, all of which impose high demands on lower limb strength, explosive power, and overall coordination. Targeted resistance training, such as emphasizing eccentric contraction force training, unilateral weight training, and multi-directional dynamic strength training, can significantly improve the strength of leg kicking off the ground. Landing shock absorption capability and lateral braking stability. Strong leg muscle groups enable athletes to immediately exert their pushing force to move in all directions after a split step, or to quickly change direction while moving at high speed. At the same time, the strengthening of core area strength, including deep stabilizing muscle groups, provides a stable support platform for the body during sudden changes in direction and sudden stops, reducing energy leakage and making movements more economical and swift. This not only expands the defensive range and enhances the success rate of saving the ball, but also enables athletes to quickly adjust their body posture after rapid movement, making full preparations for the next shot and optimizing the smoothness of the transition between offense and defense.

3.3. Prevent the risk of sports injuries and extend the lifespan of sports activities

Tennis involves a large number of asymmetrical and explosive movement patterns, such as unilateral force application and powerful trunk rotation, which exert tremendous pressure on joints, tendons and ligaments, and the risk of injury to the shoulders, elbows, knees, waist and back is relatively high. Scientifically designed resistance training is an effective means of injury prevention. On the one hand, it maintains the mechanical balance around the joint by evenly developing the strength of the active and antagonistic muscles, such as strengthening the rotator cuff muscle group to balance the powerful pectoral and shoulder power muscle groups and enhancing the hamstring muscle strength to balance the powerful quadriceps femoris, thereby reducing joint wear and ligament strains caused by muscle strength imbalance[3]. On the other hand, resistance training itself can effectively increase bone density, enhance the toughness and rigidity of tendons and ligaments, and improve the load-bearing capacity of connective tissues. In addition, the strengthening of the core's ability to resist rotation and lateral flexion has greatly enhanced the stability of the trunk during hitting and movement, and reduced the risk of shear force in areas such as the lumbar vertebrae. By building a stronger musculoskeletal system, resistance training provides a solid physical guarantee for athletes to withstand high-intensity training loads and intense competitions, and is a key support for extending their competitive careers.

4. Problems Existing in Resistance Training in Current Tennis Training

4.1. Lack of integration with tennis-specific moves

Disconnected from the actual technical movements of tennis, in resistance training, many athletes directly copy the conventional training methods in the gym, such as seated pull-ups and machine presses. Although this can enhance the athletes' basic strength, it does not significantly improve the unique abilities of tennis, such as single-sided explosive power and rapid changes. For instance, when tennis players perform heavy bench presses in the gym, the main muscles they exercise are the anterior deltoid and pectoralis major. However, in competition, athletes need core strength to drive the chain force of their shoulders and arms. There is an essential difference in the force application patterns between the two. Moreover, if such training is carried out for a long time, it will lead to the breakage of the muscle power chain and also result in poor power transmission for athletes on the field. Even if the test results in the gym are excellent, they cannot be reflected in the competition[4].

4.2. The small muscle groups and stable muscle groups lack effective training

If there is a lack of exercise for deep and stable muscle groups in resistance training, it will affect the transformation of explosive power in tennis. In tennis, actions such as sudden stops and turns, and volleys in the air are highly dependent on the stability of the small muscle groups around the knee and hip joints. In actual training, many athletes focus their energy on the training of large muscle groups, which leads to an imbalance in small muscle groups and subsequently affects the improvement of their athletic skills. This kind of problem is mainly concentrated among young athletes. Due to their young age, the stability of their joints is relatively weak. If they carry out heavy weight training for a long time during training, it will lead to joint compensation. For instance, when serving powerfully, if the strength of the scapula muscle group of the athlete is insufficient, it will lead to an overly stiff swing movement, which in turn causes an unstable swing path. Moreover, in this case, it will also pose a hidden danger to the physical and mental health of athletes[5].

4.3. The load arrangement for explosive power training is unreasonable

Although tennis players need a certain amount of explosive power when swinging their rackets, in resistance training, it is often the case that the load intensity of explosive power training does not match the characteristics of the sport. Many athletes equate resistance training with absolute strength training during their training, so they use 70% to 85% of their maximum weight for training. This training method is suitable for muscle growth, but it can lead to a decrease in individual movement speed. In tennis, the high-pressure smash and tennis serve require athletes to complete the entire movement within 0.3 seconds. Therefore, this type of training cannot meet the training needs of athletes. Meanwhile, in endurance training, some athletes will arrange more endurance resistance training. Although this can enhance muscle endurance, it will to some extent reduce muscle coordination.

5. Optimized Paths for Resistance Training in Tennis Training in the New Era

5.1. Integrate resistance training with tennis-specific movements

In the new era, tennis resistance training needs to be combined with tennis-specific movements to break the traditional state of separation between physical training and technical and tactical training. First of all, tennis involves core movements such as serving, forehand and backhand strokes, volleys, high balls and multi-directional movements. The first step in optimizing resistance training is to deeply analyze the complete biomechanical chain of each key technical movement, the main force-generating muscle groups and their contraction forms (such as concentric, eccentric, etc.), the characteristics of joint angle changes, and the peak range of force output. For instance, taking the strengthening of serve power as an example, during training, elastic resistance devices can be used to simulate the hitting trajectory instead of traditional barbell training. As for the improvement of athletes' mobility, it is necessary to combine weight-bearing equipment to carry out multi-directional movement footwork training, rather than merely relying on basic squatting

movements. Secondly, it is necessary to strengthen the training of power transmission channels. The force of tennis hitting is not isolated from the upper or lower limbs, but rather relies on a complete power chain driven by the extension and push of the lower limbs, the stable rotation and transmission of the core, and finally released by the whipping of the upper limbs. Traditional resistance training, if a single muscle group is trained in isolation, can easily lead to disconnection of the power chain and low efficiency in power transmission. The optimization path in the new era emphasizes conducting resistance training in the context of dynamic chain integration. The core area, as the hub for the transmission of force between the upper and lower limbs, its stability and rotational ability are the key to integration. A large number of closed-chain resistance exercises should be adopted in training, forcing athletes to maintain core rigidity and coordinated rotation while overcoming resistance. Finally, during the training process, the training cycle should meet the principle of specific adaptation. According to the current demands of tennis, resistance training is generally carried out 2 to 3 times a week, and in each training session, 3 to 4 resistance training modules corresponding to the technical and tactical training of the day need to be selected. For instance, after the training of tennis forehand stroke techniques, the trunk rotation resistance module is connected to achieve a balance between strength gain and movement speed through progressive loading.

5.2. Emphasize the coordinated training of muscle groups

Tennis requires muscle groups to maintain coordination. Therefore, in resistance training, the principle of systematicness should be followed, with a focus on enhancing the neural recruitment ability of deep muscle groups. Firstly, in the initial stage of training, a 20-minute dynamic activation program can be carried out, where one foot is placed on a balance pad to perform tennis ball throwing and catching exercises. This training mode can effectively and simultaneously enhance the stability of the ankle joint and its rapid response ability in dynamic environments. Through the stimulation of the unstable support surface, the deep muscle fiber tissues of the plantar fascia and the triceps surae are deeply activated. Embedding multi-plane compound action patterns into the resistance training system can effectively promote the synchronous activation effect of the coordinated muscle groups. For instance, when performing the lunge rotation training with asymmetric loads, athletes are required to complete the displacement movement on the coronal plane while holding a kettlebell with one hand. This process strongly drives the oblique muscles of the waist and abdomen and the abductor muscle groups of the hip joint to participate in maintaining the dynamic stability of the body. Secondly, every effective hit in tennis relies on the efficient coordination of the complete power chain from the lower limbs pushing off the ground, core rotation to the upper limbs swinging the racket. Optimization training needs to simulate the physiological sequence of this power transmission, and design compound resistance movements to force the relevant muscle groups to be activated in the correct order and relay the power transmission. The focus is on multi-joint, multi-plane, and closed-chain resistance exercises. For instance, design a combination training that starts with a single-leg deadlift to simulate pushing off the ground and accumulating force, then smoothly transitions to explosive medicine ball rotation and hitting the ground to simulate hip rotation and force generation, and finally connects with an elastic band to simulate racket swinging movements. Or when performing the high flip, emphasize the continuous sequence of pushing off the ground to stretch the hips, shrugging the shoulders and lifting the elbows, and quickly flipping the wrists. Use a slide plate or an agile ladder to perform lateral movement combined with chest push with a medicine ball practice to simulate the dynamic integration of connecting shots during lateral movement.

5.3. Formulate a scientific and effective load advancement plan

In tennis, explosive power training is of great significance, and in resistance training, such training needs to follow the principle of phased regulation of load intensity and neural adaptation. Firstly, the measurement and intensity of training load should be adjusted in a regular and fluctuating manner based on the annual competition cycle and the individual condition of the athletes. During the basic physical fitness reserve stage, it is essential to prioritize ensuring sufficient cumulative training volume and adopt moderate-intensity stimulation to promote muscle fiber thickening and metabolic adaptation. As important events draw near, the training focus should gradually shift to a peak induction mode of high

intensity and low training volume, with the emphasis on stimulating the maximum power output potential of the neuromuscular system. This wavy load arrangement can effectively prevent plateau periods from occurring and reduce the risk of overtraining, ensuring that athletes reach their best competitive form during crucial competition windows. Secondly, load advancement is by no means a simple linear increase in weight or frequency, but rather requires dynamic adjustment based on the real-time physiological and biochemical feedback of the athlete, subjective fatigue perception, and the quality of technical movements. Therefore, in the management of training intervals, the recovery requirements of the energy system need to be met. For instance, in resistance training, for high-intensity explosive jumping movements, the rest between sets should be extended until full metabolic recovery is achieved to prevent compensatory movements due to accumulated fatigue. In addition, it is necessary to establish a regular monitoring index system, such as tracking objective indicators like morning resting heart rate, changes in vertical jump height, and serum creatine kinase levels, combined with athletes' subjective reports on muscle soreness, sleep quality, and training desire. When the monitoring data indicates insufficient recovery or accumulated fatigue, the load intensity for the day should be decisively reduced or the rest between sets should be extended. Conversely, only when an athlete demonstrates a good adaptive state and technical stability can advanced measures be implemented with caution.

5.4. Enhance the effectiveness of resistance training by leveraging information technology

In the new era, information technology has been comprehensively applied in the field of sports. Therefore, in tennis resistance training, it is also necessary to actively apply information technology to enhance training effectiveness. Firstly, during resistance training, by installing wearable sensors and high-speed motion capture systems, key biomechanical parameters of athletes during resistance training can be collected in real time, including movement speed, force application rate, joint angle change trajectory, and body center of gravity displacement characteristics, etc. These multi-dimensional objective data provide coaches with a precise assessment basis that goes beyond subjective observation, such as accurately determining whether there is a risk of knee joint abduction during squats or lunges, or whether the acceleration phase of explosive push-pull movements reaches the ideal power output range. Secondly, during training, it is necessary to integrate historical training data based on an information technology platform and build a personalized load regulation model according to the real-time training status of athletes, so as to achieve targeted regulation of resistance training. For instance, by applying speed-based training techniques, the system can intelligently recommend the optimal load weight for the next set based on the actual output speed of each repeated movement of the athlete, ensuring that the training always remains within the preset speed range and maximizing the neuromuscular adaptation effect.

6. Conclusion

To sum up, as a necessary way to enhance the overall quality of athletes, resistance training in tennis requires athletes to formulate targeted resistance training based on their actual sports conditions, and to combine resistance training with tennis-specific movements. The resistance training optimization path proposed in this paper fully takes into account the individual differences of athletes and the complexity of the modern competitive environment, providing a practical and feasible solution for the all-round physical development of tennis players.

Disclosure statement

The author declares no conflict of interest.

References

[1] Chen X L, 2023, Research on the Impact of Unstable Resistance Training on the Athletic Performance of College Students

Majoring in Tennis, Liaoning Normal University.

[2] Qiu L T, Shen H, Wang G Y, 2024, The influence of Different resistance Training on the 2000-meter dynamometer performance of adolescent male rowers. Chinese Sports Coaches, 32(3):52-54.

[3] Qi L R, 2023, Research on the Impact of Compound Training on the Specialized Mobility of Tennis Players in Sports Colleges. Xi ‘an University of Physical Education.

[4] Chen C, 2023, Experimental Study on the Impact of Resistance Training with Elastic Bands on the Effect of Tennis Intercepting: A Case Study of Students in the Tennis Specialized Class of Xi ‘an University of Physical Education. Xi ‘an University of Physical Education.

[5] Pan H L, 2023, Research on the Impact of Resistance Training with Elastic Bands on the Hitting Effect of Tennis Players. Sports and Leisure: Mass Sports, (18): 0019-0021.