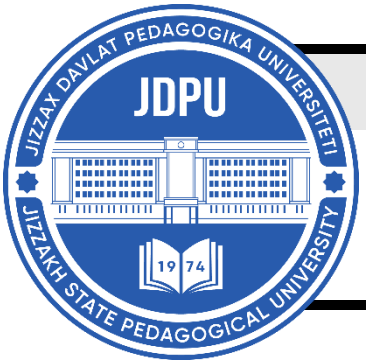
DOI: https://doi.org/10.37547/mesmj-V6-I2-37 Pages: 301-312

MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL



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DEVELOPMENT CHARACTERISTICS OF SPEED-STRENGTH ABILITIES IN YOUNG VOLLEYBALL PLAYERS

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ABOUT ARTICLE

Key words: development of technical-tactical preparation, improvement of physical preparedness of zonal players.

Received: 16.03.25
Accepted: 18.03.25
Published: 20.03.25

Abstract: This article discusses the characteristics of developing speed-strength abilities in young volleyball players. Due to the lack of scientific research on improving the physical preparedness of volleyball players during the training phase, the study provides information on developing a methodology for enhancing speed-strength qualities through specialized exercises.

Introduction

The global popularization of volleyball and the establishment of a selection system for young athletes into long-term training programs are of great importance. Additionally, the creation of modern sports infrastructure and the training of professional volleyball coaches and referees are being given special attention. The study of the need for training, retraining, and professional development of volleyball specialists, as well as monitoring these processes and incorporating modern technologies to enhance the physical preparedness of volleyball players, is becoming increasingly significant. At the same time, developing a methodology for improving

the physical abilities of volleyball players in the preparation phase is considered one of the pressing issues.

International sports organizations regulate age-based volleyball competitions, expanding youth participation in the sport. Scientific research has been conducted to popularize volleyball among students and young athletes, increase public interest, and develop volleyball clubs. Studies on long-term training phases focus on enhancing technical-tactical skills and improving the physical preparation of zonal players, particularly developing young volleyball players' jumping abilities. However, due to the lack of scientific research on improving the physical preparedness of volleyball players during the training phase, there is a need to develop a methodology for improving speed-strength qualities through specialized exercises.

Research Objective

To identify and assess the characteristics of developing speed-strength abilities in young volleyball players.

Research Tasks

1. Study and analyze literature related to the topic.
2. Identify tools and methods for developing speed-strength qualities.
3. Implement selected tools and methods into training sessions and assess their effectiveness.

In developing speed-strength training for young volleyball players in the initial preparation stage, we focused on selecting specific exercises. These included overcoming body weight using one or two legs, executing movements at different speeds, heights, and distances, and incorporating various equipment such as gymnastic apparatus. Additionally, exercises like running with added resistance (medicine balls), high and long jumps, and plyometric drills were systematically applied.

To enhance physical conditioning, external environmental factors were incorporated, including stair climbing, uphill and downhill running, and movement on different terrains (sand, forest paths, rocky surfaces, grass). Resistance-based partner exercises were also emphasized. These included working with weights such as wrist and ankle bands (0.5 kg), weighted belts, medicine balls (2-5 kg), dumbbells (16-32 kg), and sandbags (5-15 kg). Moreover, throwing weighted objects (medicine balls, stones, and shot puts weighing 2-10 kg) was used to develop upper body strength and explosive power.

When selecting training tools, the specificity of exercises was considered to closely replicate competition conditions. The adaptation of muscles to competitive activities was ensured by using sport-specific drills.

To assess the progress of young volleyball players' speed-strength qualities, pre- and post-training tests were conducted. These included:

- Push-ups on parallel bars or benches
- Rope jumping
- Sit-ups from a bent-knee position
- Hanging leg raises on a high bar
- Triple jump (alternating legs or single-leg)
- Vertical jump (with and without arm swing)
- Medicine ball throws (1-3 kg) from various positions using one or both hands

The training process helped improve throwing distances and jumping elements. Based on the study, benchmarks were established to categorize performance into high, medium, and low levels. Developing an optimal methodology for speed-strength training is crucial to ensuring young volleyball players reach optimal performance levels. As their explosive power increases, movement execution speed also improves, leading to enhanced rhythm, muscle relaxation, and overall athletic performance.

A methodology for applying various physical exercises as a concluding part of the training sessions for young volleyball players in the initial preparation stage has been developed. The main methodological feature of these exercises is that they are performed in contrast to the previous activities. During the training sessions, a contrast effect was introduced following anaerobic loads. After anaerobic loads in volleyball training, exercises aimed at relaxing the muscle groups involved in the previous activity, along with psychohygienic self-regulation (autogenic training), were applied. Additionally, during the execution of these exercises, psychohygienic self-regulation autogenic training sessions were conducted to facilitate muscle relaxation.

When performing speed-strength exercises, the development of strength and speed movement capabilities in young volleyball players is characterized by a high manifestation of force orientation. The larger the proportion of the strength component, the greater the external resistance; conversely, if the load is low, the effect of speed is more pronounced. The development of speed-strength abilities in young volleyball players is significantly influenced by genetic factors, particularly muscle composition. Enhancing the speed-strength abilities of

volleyball players is crucial. The extension and flexion of muscles play a vital role in executing volleyball elements. Special attention was given to developing slow and fast muscle fibers, which are divided into two groups. Their ratio differs between athletes and non-athletes and remains unchanged throughout life. If fast muscle fibers dominate, this contributes to the optimal expression of speed and speed-strength qualities. However, genetic development also plays a role in the advancement of speed-strength qualities. Systematic long-term training should take into account genetic predisposition and the individual characteristics of the volleyball player. In volleyball, the earlier the development of speed-strength qualities begins, the better the chances of mastering sports elements and achieving results during the preparation stages.

During our research, a weekly training cycle was developed to enhance the speed-strength abilities of young volleyball players in the initial preparation stage. According to this cycle, training sessions were conducted on Mondays, Wednesdays, Fridays, and Saturdays. At the beginning of the week, intensive training sessions were planned, while at the end of the week, recovery measures aimed at restoring the functional capacity of the body were applied.

Monday:

1. Accelerated sprints of 6-9 meters from different starting positions (standing, sitting, lying) and in various directions.
2. The volleyball player stands at the front line in zone 6, while the coach is in zone 3. The coach throws the ball in different directions, at different heights and distances. The athlete must quickly respond, move, receive the ball, and return to zone 6.
3. The athlete and coach are positioned in zone 1. The coach rolls the ball under the net, and the athlete must run around the volleyball court and reach the ball before it crosses the boundary.
4. Catching a ball thrown by a teammate while jumping and throwing it backward before landing.
5. Performing attack strikes from zones 4 (3, 2) and returning quickly without breaks between strikes.
6. Receiving attacking hits from the opposing hitter by a defender in zones 6 and 1.
7. Jumping rope at different heights and tempos multiple times.
8. Jumping as high as possible from a standing position and a running start, trying to touch targets of various heights with hands.
9. Simulating an attack hit (block) while jumping from a specific height.

10. Jumping from a specific height and throwing a tennis ball at an object attached to the top rope of the volleyball net.

11. Jumping from a specific height and accurately throwing a volleyball over the net.

12. After movement, touching the top rope of the volleyball net with hands while jumping, simulating a blocking action.

Wednesday:

1. Players are positioned along the front line of the court with a ball placed at the center line (one ball per two players). At the signal, they run to the center line and try to grab the ball. The drill is performed from various starting positions.

2. One player holds the ball while the other stands with their back turned. The first player throws the ball and calls their partner's name. The second player must turn, locate the ball, accelerate towards it, and catch it.

3. Same as exercise 5 from Monday, but this time the coach throws the ball over the net, and the player must receive it after one or two bounces inside the court.

4. Imitation drills that refine technical skills after quick movements.

5. Blocking attacking strikes from zones 3 and 4 (2) by a single volleyball player.

6. Group blocking and defensive play when an attacker from zones 4 (3, 2) hits the ball. During deceptive attacks, the defender supports the hitters.

7. Consecutive jumps over benches, barriers, or chairs.

8. Jumping from a specific height to touch a hanging ball with the hand.

9. Jumping into a depth and then jumping to a height.

10. Jumping over platforms of different heights sequentially and then executing attacking hits (blocking).

11. Running, pushing off with one foot, and then throwing a tennis ball over the volleyball net.

12. Jumping with both feet from a standing position and throwing a tennis ball over a rope positioned at a specific height. This can also be performed while running.

Friday:

1. Jumping consecutively over benches (obstacles, chairs).

2. Jumping from a certain height and touching a suspended ball with the hand.

3. Jumping into a pit and then jumping onto a height.

4. Jumping over platforms of different heights one after another, followed by attacking strikes (blocking).

5. Jumping with a single-leg push-off and then throwing a tennis ball over a volleyball net.

6. Jumping from a standing position with both feet and throwing a tennis ball over a rope set at a specific height. The same exercise is performed while running.

7. Circular arm movements with dumbbells (3 kg) – 3 sets of 15 rotations.

8. Bending forward and sideways, as well as rotating the body with a weight not exceeding 10 kg (2 sets of 10-15 rotations).

9. Raising the upper body while lying face down, with a partner holding the legs (2 sets of 25 raises).

10. Raising the upper body from a supine position until reaching an upright sitting position, with hands behind the head (2 sets of 25 raises).

11. Rotating a stick with a cord wound around it, with a 5-10 kg weight attached (15 lifts).

12. Half-squatting with a barbell weighing 70-80% of the maximum load, followed by rapid extension onto the toes (2 sets of 10-15 repetitions).

Saturday:

1. Jumping rope at various heights and speeds multiple times.

2. Jumping from a standing position or after a run-up to reach a metric mark, aiming for the highest possible reach (grabbing objects suspended at different heights with the hand).

3. Jumping from a certain height while simulating an attacking strike (blocking).

4. Jumping from a certain height and throwing a tennis ball at an object attached to the top rope of a volleyball net.

5. Jumping from a certain height and accurately throwing a volleyball over the volleyball net.

6. Jumping after movement and touching the top rope of the volleyball net with the hands, simulating a block.

7. Tossing weighted balls (1 kg) with both hands using only the fingers (2 sets of 20 throws each).

8. Throwing weighted balls (0.5 kg) with the left and right hand, imitating an attacking strike (2 sets of 15 throws for each hand).

9. Performing attacking strikes from a standing position and while jumping (50 strikes).

10. Squatting and standing up with a barbell weighing no more than 70-80% of the maximum load (2 sets of 10-15 squats).

11. Raising the upper body from a supine position until reaching an upright sitting position, with hands behind the head (2 sets of 25 raises).

12. Sitting with a partner holding the legs, leaning the upper body backward slowly, then returning to an upright position quickly (2 sets of 25 raises).

During the final stage of the Ministry of Internal Affairs Cup competition in volleyball among sports schools, it is planned to provide the winning educational institutions with the necessary sports equipment and gear based on their actual needs.

As a result of systematic and targeted training, when speed-strength exercises are applied to fast-twitch muscle fibers, significant physiological changes occur in volleyball players' bodies. Their muscle thickness increases, the quantity of contractile proteins actin and myosin, as well as the energy source myoglobin, rises. Additionally, the impulse activity of motor neurons in the muscles changes, the strength and frequency of neural impulses increase, and impulse synchronization improves. This contributes to the improvement of both internal and intermuscular coordination among volleyball players at the initial training stage.

Speed-strength training at the initial training stage ensures the development of speed and strength qualities in their broadest combination. Three main directions were used to develop these qualities. This classification is conditional and was adopted for the simplicity, precision, and clarity of exercise application and description.

In speed-oriented training for young volleyball players at the initial preparation stage, primary competition exercises focused on running, jumping, and throwing, as well as the absolute speed of various movements of the arms, legs, and body. Additionally, special attention was paid to the combination of these movements, including initial acceleration, running across distances, body acceleration during ball throwing, the final phase of movements, the run-up phase in jumping, and the take-off phase.

During our research, we primarily used tools from track and field as well as weightlifting. The conditions for performing these exercises were facilitated by implementing methods such as sprinting from a crouched start, reducing stride length and distance between obstacles while increasing acceleration, running downhill, repeated jumping, running with the wind, and take-off from a height of 5-10 cm. Special training machines and resistance blocks were used to reduce body weight by 10-15% during sprints and take-offs.

We also focused on facilitating exercise conditions. For example, sprinting from a low start, shortening stride length and the distance between obstacles, and modifying running techniques were applied. In volleyball training, these tools were used to accelerate speed, enhance sprinting or high jumps, and incorporate modern equipment such as wind-assisted sprinting and special resistance devices that reduce body weight by 10-15% to improve performance.

During the initial training phase, the development of strength abilities in young volleyball players was primarily achieved through specific exercises. These included the use of weights or resistance at 80% of maximum load, with variations in execution speed and intensity, reaching up to 60% of maximum velocity. The more actively contraction force was applied, the more effectively the muscles and associated voluntary movements developed. Performing these exercises enabled young volleyball players to achieve peak absolute muscle strength.

In our research, we implemented various weighted objects to develop the speed-strength abilities of young volleyball players. We progressively increased the maximum possible speed and acceleration of movements during volleyball training sessions.

The following methodological recommendations were developed for improving the speed-strength abilities of young volleyball players during the initial training phase:

1. In volleyball training, exercises were planned based on technique, rhythm, amplitude, angle values, and the time required to demonstrate maximum muscle strength.

2. The most effective way to develop speed-strength qualities in young volleyball players at the initial training stage was to perform exercises with concentrated willpower, focusing on explosive strength development.

3. In preparing young volleyball players, it is essential to apply targeted and selective exercises to specific muscle groups, including the ankles, knees, hip joints, calf-ankle connections, abdominal muscles, and back muscles.

4. Training young volleyball players involved utilizing the pre-stretch strength of muscles and their elasticity. Exercises were performed in a flexible, spring-like oscillatory mode, continuously improving the reflexive response to stretching. In volleyball training, special attention was given to the manifestation of explosive strength at the beginning of jumps or during changes in movement direction. The faster the transition from bending to extending arms and legs, the more positive the impact of exercises on the musculoskeletal system of volleyball players.

5. In optimizing training methods, exercises with weighted objects were emphasized. This included running, jumping, and special movement exercises performed alternately with and without weights. Small belts or weighted vests, accounting for 0.25% to 1% of an athlete's body weight, were used in these exercises.

6. In each volleyball training session, the number of repetitions per set should not exceed 20-25. For jump exercises, the standard was set at 3-5 repetitions for medium-weight exercises and higher loads for maximum-weight exercises.

7. During the training process, exercise repetition frequency was gradually increased (up to maximum movement speed). At the same time, the manifestation of strength and movement freedom in volleyball players was monitored. This methodological approach helped prevent excessive strain on young athletes.

8. Additionally, in strength training, loads were progressively increased on a weekly basis. Exercises incorporating increased weight or movement speed were applied in stages. In such training, the leading factor was the increase in weight load, which led to an improvement of up to 2% after 1-2 microcycles.

During our research, the following methods were used to develop speed-strength abilities in young volleyball players at the initial training stage. In particular, strictly regulated exercise methods, the competition method, and game methods were applied. The strictly regulated exercise methods included repetitive execution of volleyball techniques, which allowed achieving maximum movement speed. Additionally, variable (changing) exercise methods were used in volleyball training sessions. Specially designed programs were studied and improved to develop speed and acceleration abilities. The circuit training method was also used in unconventional training of volleyball players. This method involved exercises such as jumping with both feet, rope jumping, and other means to develop speed-strength qualities.

During training, exercises were performed until young volleyball players experienced fatigue without reducing intensity. The use of repetition and circuit training methods enhanced their speed-strength and endurance capabilities.

Furthermore, the most common method for developing speed abilities in young volleyball players during our research was the repetition method. Using this method allowed for targeted development of specific muscles. For example, throwing a weighted ball from the chest contributed to the development of shoulder muscles.

Circuit training is considered the most effective method for influencing different muscle groups in a comprehensive manner. The selection of exercises, equipment, and rest intervals

must be adjusted accordingly. Each subsequent exercise group should engage new muscle groups, which significantly increases the workload when applied correctly. During the execution of exercises, both constant and variable load levels were used. In squat exercises, different load variations were applied to ensure a full-body workout for volleyball players.

In our research, a specific pedagogical sequence was followed to develop speed-strength abilities. During training sessions, speed and its forms were developed and assessed. Additionally, flexibility, agility, and other physical qualities were enhanced by optimizing neuromuscular activity. Attention was given to reducing stress and managing psycho-emotional conditions. As fatigue increased in young volleyball players at the initial training stage, exercises focused on developing speed-strength and power abilities were utilized. Speed exercises were planned to be performed before strength exercises. In volleyball training, the final stage of the main training session was aimed at developing endurance, as endurance capabilities improve when players train under fatigue.

During our research, speed-strength exercises were combined with muscle relaxation exercises in volleyball training sessions. While performing exercises, muscle-relaxing techniques were selected accordingly. For instance, in volleyball, jumping elements were combined with relaxation techniques for calf muscles after push-off running movements.

A methodology for training young volleyball players at the initial preparation stage was developed. This methodology includes specific training exercises, their execution methods, the number of repetitions, and rest periods aimed at enhancing the speed-strength abilities of young volleyball players.

1-table

Methodology for Developing Speed-Strength Abilities

Preparation Phase (8-12 weeks)

Name of the exercise	**Type of acting**	**Number of repetitions**	**Number of series**	**Resting**
1. Standing Vertical Jump	Arms at the sides, feet shoulder-width apart, jump to the maximum height from a standing position.	10-12 times	3-4	30-45 seconds
2. Elbows resting on the ground, engage the abdominal muscles (Plank).	Maintain a straight body position, engage the abdominal muscles.	30-45 times	3	45 seconds

3. Run at high speed while lifting your knees as high as possible.	Sprint 15 meters at maximum speed.	5-6 times	3	1-2 minute
4. Jump onto the bench.	Jump onto a bench or a platform with both feet.	8-10 times	3	45-60 seconds
5. Quick passes with a ball (reaction drill).	Pass the ball quickly to a partner or against a wall.	15-20 times	4	30-45 seconds
6. Jump sideways with both feet.	Powerful jumps to the left and right sides.	10 times	3	30-45 seconds
7. Jumping with hand support.	Jump with straight legs, pushing off the ground while raising the hands.	10-12 times	3	45 seconds
8. Run at high speed and jump explosively.	Run-up and jump to the maximum height.	8-10 times	3	1-2 minute

The primary goal of this methodology is to develop volleyball players' speed-strength abilities through systematic training. It aims to increase jump height, enhance explosive power, and improve movement coordination.

One of the key aspects of this approach is repetitive jumping exercises, which significantly improve jump height and develop the explosive strength of leg muscles. Sprint exercises help athletes enhance their starting speed. Upper body strengthening drills improve reaction speed during passing and blocking. Core muscle training ensures body stability and enhances the ability to deliver powerful strikes.

Intensity and Recovery

- Exercises should be performed at moderate to high intensity to effectively develop explosive power.
- Optimal rest intervals between sets and exercises help prevent excessive fatigue and maximize efficiency.

Expected Outcomes

- Jump height can increase by 10-15%.
- Reaction speed and movement coordination will improve significantly.
- Faster sprint starts and running speed will enhance dynamic movements in volleyball.

- Synchronized muscle coordination between arms and legs will improve attack precision and blocking effectiveness.

Implementation Duration

This methodology should be followed for 8-12 weeks, with a gradual increase in training load each week to maximize results.

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