

Original Article

Optimizing the Sports Performance of U20 Junior Volleyball Players After Applying a Program Based on the Development of Physical Skills

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Abstract

The aim of this study was to optimize sports performance after a 6-week training program, based on skill development in U20 junior players, in the pre-competitive period. The hypothesis of the study started from the idea that the application of a program based on the development of physical skills, in accordance with the demands of the volleyball game, will lead to an improvement in the parameters of the indices of physical skills, which will also lead to an increase in efficiency in the game. Based on what emerged from our study, we can say that a conditioning program based on the development of skills, in the pre-competitive period, led to the development of speed and agility, an important factor in the development of power, specific to the game of volleyball and which led to increasing efficiency in attack and jump blocking.

1. Introduction

Sports performance encompasses many factors, some of which are trainable (psychology, physiology, and skills), some teachable (tactics), and some beyond the control of the athlete and coach (genetics and age) (Smith, 2003). Currently, sports science support personnel are investigating evidence-based approaches to both scientific activities, designing and monitoring appropriate and effective training programs with the ultimate goal of increasing athlete performance, which fosters success beginning with the development of youth athletes (Halson, 2014).

Volleyball is a sport with technical characteristics in which precision is the most important aspect in achieving an effective action (Raiola & Di Tore, 2017).

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It must be emphasized that the main objective of any volleyball team is to score points in order to win. That is why it is very important to focus on performance by performing the final actions, on a background of very good physical preparation, because they relate to the result of the game and the success of the team in the competition (Campos, Stanganelli, Pasquarelli, Campos & Gómez, 2014). Volleyball players perform approximately 300 jumps in a maximum game of 5 sets, which represents a high-power activity, in a resistance regime specific to the game of volleyball. These actions based on jumps are the attack shot and the block, about 50% of the total game actions and which bring a lot of points to the teams (Marques, Van Den Tillaar, Vescovi, & Gonzalez-Badillo, 2008). In addition to technical and tactical skills, muscle strength and power are the most important factors that provide a clear advantage for successful participation in volleyball games.

Strength training involves many principles and there are various methods for evaluating its effectiveness. The improvement in muscle strength during the initial period of training is due to either a neural mechanism of training or an improvement in the recruitment capacity of motor units. Both resistance and plyometric training are fundamental elements in the structure of sports training programs, contributing significantly to improving physical performance (Bompa, 1994).

Performing these exercises over a period of 3-6 months can lead to a significant improvement of 20% to 100% in muscle strength.

Skill-based conditioning is increasingly used as a means of improving the performance of athletes in skill-based sports (Allison & Thorpe, 1997). Gabbet 2006 showed that skill-based conditioning games simulating the physiological demands of competition in elite junior volleyball players provide a specific training stimulus.

2. Material and methods

It is a longitudinal study that analyzed the physical characteristics achieved by volleyball athletes of the U20 national team after 6 weeks of conditioning program. The players underwent a skill-based conditioning program. Measurements of speed (3x6 m, 10 m sprint), muscle strength (vertical jump [VJ]), and agility were performed before and after the training periods.

The aim of this study was to optimize sports performance after a 6-week training program based on skill development in U20 junior players in the pre-competitive period. The athletes tested were those of the Romanian national team, aged 19.11 years.

The hypothesis of the study started from the idea that the application of a program based on the development of physical skills, in accordance with the demands of the volley game, will lead to an improvement in the parameters of the indices of physical skills, which will also lead to an increase in efficiency in the game.

For this study, 14 volleyball players, members of the U20 National Volleyball Team, participating in the European Championship Qualifiers participated.

Table 1. Characteristics of subjects

Age (y)	Training experience (y)	Body height (cm)	Body weight (cm)	Standing reach height (cm)
18.11 ± 1.1	8.3 ± 1.2	198.3 ± 4.2	88.5 ± 3.8	254 ± 6.4

Research methods and techniques

Physical tests: Vertical jump, with momentum, reaching the maximum point with 1 hand, for the attack shot. From a lunge attack, a vertical jump is made, aiming to reach the highest point with the arm fully extended. The best performance of two attempts is recorded.

Vertical jump, standing, reaching the maximum point with 2 hands for blocking.

With the help of a swing of the arms, a vertical jump is performed and an attempt is made to reach the maximum point with both hands.

Move back and forth 3x6m (agility) From the starting position of the feet, an accelerated run is performed, followed by a backward movement with the back.

Speed running over a distance of 10 m, done at the signal.

Training program. A mesocycle lasting 6 weeks was carried out. The objective was to increase the intensity of specific training and attention was paid to exercises and volleyball skills. A week before the training program, the players performed prophylaxis exercises to prevent accidents.

The duration of training sessions was recorded, with sessions typically lasting 120 minutes. In addition to these sessions, tactical and low-intensity skills training was conducted. During the 6 weeks of follow-up, the team played 3 friendly matches. Exercise intensity were selected. In the beginning, exercises were used specifically for the attack shot, blocking, defense exercises, all used progressively so as to increase the resistance to jumping, moving to blocking, with several jumps, etc. (Gabett, 2008). More complex exercises were carried out, based on games on small and effective pitches, so as to dominate the skills of the players, to control the ball with increased efficiency (2x2, 3x3, 6x6).

Table 2. Preparation planning

Objective: conditioning individual skills		
Daily lessons		
	Exercises	Dosage
Heating	General warm-up and warm-up with the ball	30 minutes
Strengthening attack, block, defense	Exercises with low and high intensity, combined, Exercises with 2-minute breaks between them.	30 minutes
3x3, 4x4 game	Games on small fields	20 minutes
6x6	Game	30 minutes
STRETCHES	Stretching for the muscle areas involved in training	5 minutes

For the statistical analyses, the SPSS program was used, where descriptive statistics were calculated for all experimental data. Changes in physical characteristics, lower body muscle strength, speed, agility of the players during the training period were compared using univariate analysis of variance.

3. Results and Discussions

The tests showed that the data are normally distributed. Comparing the data before the application of the program and after the application of the program, highlighted a significant improvement ($p \leq 0.05$), especially in the development of speed on 10 m, which improved by 5.16% after the application of the program.

There were no significant differences for the muscular strength of the lower body, represented by the vertical jump with momentum, without momentum and agility.

This study attempted to present the effects of applying a training program based on increasing fitness in U20 male volleyball players. There was a significant improvement in speed and little change in muscle strength as measured by the vertical jump and agility tests.

Table 3. Mean Comparative results \pm SD of parameters measured between T1 and T2.

Tests	T1	T2	p	Es	%
Jump Attack (cm)	64.54 ± 5.40	68.89 ± 5.20	0.108	0.007	4.40
Jump Block (cm)	229.34 ± 10.53	229 ± 9.56	0.824	0.01	-0.12
Speed 10 m (s)	1.82 ± 0.03	1.79 ± 0.01	0.001	0.45	1.02
Agility (s)	6.82 ± 0.45	6.40 ± 0.55	0.173	0.05	2.48

The results observed in jumps were not relevant, probably due to the fact that the athletes come from different teams, to the national team, with different treatment of physical training, uneven, which would lead to a relationship between the physical form and the skills, abilities of the athletes and the efficiency of technical-tactical actions in the game (Thissen-Milder & Mayhew, 1991).

The greatest positive changes in fitness, leading to increased performance, can also occur when the training stimulus simulates the physiological and technical demands specific to the competition, which is related to the level of preparation of the athletes at their clubs.

This study revealed an increase in speed indices among athletes from the national team, after the application of the 6-week program, based on the development of skills, and this may have the answer, the type of training, which highlighted the selected skills volleyball, those of explosive power encountered when blocking, the attack shot, the defense from the 2nd line). Conditioned games based on coordination have induced the development of speed, vertical jump, agility and even aerobic power (Gabbett, 2008).

Skill-based volleyball training improves the performance of speed and agility, passing accuracy, lifting, receiving technique, but in terms of physical appearance, it is reduced to the level of athletes. From this point of view, training based on skill development should be supplemented with specific means to develop the energy system of the athlete, by increasing the physiological and anthropometric indices (Gabbett, Sheppard, Pritchard-Peschek, Leveritt, Aldred, 2006).

Previous research has shown that adaptations made in training with these types of specific tests have produced changes due to the applied tasks. Furthermore, these exercises specific to the jumping game have made relevant contributions to improving performance during matches. (Stanganelli, Dourado, Oncken, Mancan, Da Costa, 2008).

4. Conclusions

Previous research has concluded that training of these types, which targeted vertical jump tests specific to the game of volleyball, significantly improved performance in such a specific type of test.

The training program based on the development of skills, improved the speed of the 10 ma players, but also the level of the performance of the attack jump and blob, but not so relevant, despite the multitude of jumps made in the training sessions performed.

Based on our results, it could be concluded that the preseason skill-based conditioning program does not provide a sufficient stimulus for volleyball players. General conditioning and hypertrophy training, along with volleyball-specific conditioning, are necessary during the preseason to develop lower body strength, agility, and speed in volleyball players.

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