

Effects of Regional Plyometric Trainings on Agility Performance of Male Volleyball Players

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Abstract

The study aims to investigate the regional plyometric trainings' effects on the agility performance of male volleyball players. Süleyman Demirel University Volleyball Team with 20 players attended to the study voluntarily. Players were randomly divided into volleyball training group (VTG) (n = 10) and plyometric training group (PTG) (n = 10). As the VTG continued with their routine volleyball training; regional plyometric trainings for the lower extremity were performed to the PTG for 6 weeks, 3 days a week, at least 30 minutes a day in addition to volleyball training. T and Pro-Agility Tests were applied to the groups at the beginning and end of the 6-week period. Descriptive Statistics, Paired T-Test, and Independent T-Test were used for comparison. "p < 0.05" significance level was accepted for the results' evaluation. Results of comparison of the T and Pro-Agility pre and post tests' values of the groups, differences were statistically significant in PTG's values (p < 0.05), but no differences were found in VTG' values (p > 0.05). Also, no differences were found as a result of the comparison of the pre and post T and Pro-Agility Test values between the groups (p > 0.05). Considering that plyometric trainings provide maximum contraction in the shortest time possible and its effect on the characteristics like sudden changes of location and direction in the volleyball, applying plyometric trainings may be thought to be effective in

volleyball training programs.

Keywords: Plyometric, Agility, Volleyball

1. Introduction

Volleyball is one of the most popular sports of our age which is performed for both performance and recreational purposes is a very enjoyable sport played according to various rules. It drags large masses in Turkey as well as in the whole world. Professionally, with the international success of some of the Volleyball clubs and national teams, volleyball is taking firm steps towards becoming a global brand (Arslan, 2013).

Volleyball movements should generally be done quickly and explosively. The player needs power, speed, and agility for fast movements (Baacke, 2005). The performance expected from volleyball players is agility and speed capability for movement and skills to different sides in the playing field (Turnagöl, 1995). Agility is the effective combination of deceleration, direction change, and acceleration movements in a short time (Günay et al., 2017).

A high level of efficiency is demanded from the players due to the sprints in which the explosive force is exhibited, the vertical jump more than once for the attack, and the block where effective and fast movements are applied against the attack made by the opposing team, and the capacity to adapt to the course of the match for five sets (Aydoğan, 2006).

Plyometric training, which is defined as training that allows the muscle to contract with maximum force in the shortest possible time, can be described as fast dynamic loading or tension exercises in the involved muscle in response to strong muscle contraction. Plyometric movements are widely used in sports where force is used (Chu, 1992). Plyometric training is a method used to improve explosive power. Plyometric trainings have been used in training programs by trainers and players since their performance enhancing effect was seen. Generally, it is very useful in sports where rapid strength and jumping ability are used a lot (Radcliffe & Faratinos, 1999; Muratlı, Şahin, & Kalyoncu, 2005; Boreham, 2006).

In Volleyball, plyometric exercise includes jumping, jumping and limiting movements, besides shooting that is performed the explosive strength (Behm et al., 2008; Cappa & Behm, 2013). These movements are also related to the development of agility (Craig, 2004; Miller et al., 2001; Young et al., 2001). In the light of the given literature information, this study aims to investigate the effects of regional plyometric trainings on the agility performances of male volleyball players.

2. Method

2.1 Participants

Süleyman Demirel University Volleyball Team with 20 players attended to the study voluntarily. Players were randomly divided into volleyball training group (VTG) (n = 10) and plyometric training group (PTG) (n = 10). The mean age of the players was in VTG 20.60±1.37, in PTG 21.10±2.11 years; mean height was in VTG 181.4±2.91, PTG

182.50±3.63 cm; mean weight was in VTG 78.4±6.64, in PTG 77.5±4.54 kg. The participants were verbally informed about the study method, and “Informed Consent Forms” were obtained from all players.

2.2 Measures and Tests

2.2.1 Height Measurement

The height was measured using a measuring tape with an accuracy of 1 mm. The players stood in a flat body position on bare feet during the measurement. Values were recorded in cm (Alp & Suna, 2020).

2.2.2 Weight Measurement

The weight was measured using a digital scale with a sensitivity of 0.001 kg. The players also dressed lightly during the measurement in order to get accurate data. Values were recorded in kg (Alp & Suna, 2020).

2.2.3 Agility Tests

All agility tests were taken with the wireless Fusion Sport, Brisbane, AUS brand Smartspeed with 0.001 timing accuracy with two gate systems.

(1) T-Test

Four cones were lined up on the track. When the player was given the command to start, he started from the cone “A”, ran straight to the cone “B” and touched the cone with his right hand. Then he ran to the left towards the “C” cone with side step and touched the “C” cone with his left hand, then to the right he touches the “D” cone with his right hand. Then, after touching the “B” cone with a side run and touching it with the left hand, it returned to the “A” cone with a run. As soon as you reach the cone “A”, the stopwatch was stopped. In this study, the participant did 3 maximum repetitions with full rest. The best time of the participant was recorded (Kızılet, 2010; Pauole, 2000).

(2) Pro-Agility Test

The pro-agility agility test area, also known as the 20-yard running test, was determined by placing markers 5 yards (4.57 m) to the left and right of the starting line. Photocell door was placed on the starting line. Repeated transition times could be taken in this way. The participant took his place at the starting line before the application started. When it was ready, it ended the test by touching the right pointer first, then the left one, passing through the baseline (Bayraktar, 2013).

2.3 Procedure

As the VTG continued with their routine volleyball training; regional plyometric trainings for the lower extremity were performed to the PTG for 6 weeks, 3 days a week, at least 30 minutes a day in addition to volleyball training.

2.3.1 Content of Regional Plyometric Training

Zigzag Hops: The players were made to stand approximately 1-2 feet to the left of the agility ladder. Then they were made to jump on both feet and descend to the other side of the ladder. The exercise was repeated, they lowered their feet to the other side, and continued down the ladder like this. They were warned not to “double jump” on each landing and to keep ground contact time to a minimum.

Depth Jumps: The players stood with their feet shoulder-width apart on the box. Then they jumped out of the box and landed on both feet. They jumped high, reaching out with both hands as quickly as possible. When the players practice this plyometric exercise, they were warned and controlled about the jump should be vertical rather than horizontal; the short contact time with the ground and the soft landing.

Single Leg Tuck Jump: It was ensured that the plyometric exercise was the same as the tight jump exercise performed on one leg. Immediately after landing, the next jump was achieved with the same foot for minimum contact time with the ground and desired repetitions. Exercise was applied again for the other leg after resting.

2.4 Statistical Analysis

The data were analyzed by statistics program. The results of “Shapiro-Wilk” test was that the data showed normal distribution. Descriptive Statistics, Paired T-Test, and Independent T-Test were used for comparison. “ $p < 0.05$ ” significance level was accepted for the results’ evaluation.

3. Results

According to Table 1, which shows the results of groups’ Paired T-Test, significant difference was found in PTG’s results ($p < 0.05$); but there was no difference in VTG’ results ($p > 0.05$).

Table 1. Results of groups’ T-Test

Groups (sec)	Test Sequence	Mean±SD	t	p
VTG	Pre-test	9.89±0.71	6.87	.197
	Post-test	9.81±0.69		
PTG	Pre-test	9.82±0.55	7.41	.000
	Post-test	9.71±0.54		

Table 2 shows the results of Pro-Agility Test. As shown in Table 2, difference was found significant in PTG’s results ($p < 0.05$); but no difference was found in VTG’ results ($p > 0.05$).

Table 2. Results of groups' Pro-Agility Test

Groups (sec)	Test Sequence	Mean±SD	t	p
VTG	Pre-test	6.38±0.67	3.64	.251
	Post-test	6.36±0.71		
PTG	Pre-test	6.32±0.34	5.25	.000
	Post-test	6.24±0.34		

According to Table 3, which indicates the results of comparison of groups' T-Test, no differences were found in each groups' pre- and post-test results ($p > 0.05$).

Table 3. Results of comparison of groups' T-Test

T-Test (sec)	Groups	Mean±SD	t	p
Pre-Test	VTG	9.89±0.71	2.72	.169
	PTG	9.82±0.55		
Post-Test	VTG	9.81±0.69	3.11	.157
	PTG	9.71±0.54		

Table 4 shows Independent T-Test's results of Pro-Agility Test. As indicated Table 4, no differences were found in each groups' pre- and post-test results ($p > 0.05$).

Table 4. Results of comparison of groups' Pro-Agility Test

Pro-Agility Test (sec)	Groups	Mean±SD	t	p
Pre-Test	VTG	6.38±0.67	1.97	.103
	PTG	6.32±0.34		
Post-Test	VTG	6.36±0.71	2.17	.097
	PTG	6.24±0.34		

4. Discussion

The effects of regional plyometric trainings on the agility performances of male volleyball players were investigated in this study. In our study, in the comparison of the T and

Pro-Agility pre and post tests' values of the groups, significant difference was found in PTG's values ($p < 0.05$), but no differences were found in VTG' values ($p > 0.05$). Also, no differences were found as a result of the comparison of the T and Pro-Agility Test values ($p > 0.05$).

Since sprint performance requires the generation of explosive force in the lower extremity muscle groups, the ability of athletes to use and optimize elastic and neural properties after plyometric training is utilized (Akilandeswari & Pushparajan, 2012). Agility is a complex feature that depends on many factors and is also supported by plyometric training that includes muscle adaptations (Markovic, 2007; Ozgul, 2018).

In a study investigating the effect of six-week plyometric training period on different agility test values, it was observed that plyometric training made a statistically significant difference in agility test values compared to the pre-training period (Vácz, 2013). Many researchers found that plyometric training periods positively affected the agility test values (Miller et al., 2006; Suna et al., 2016; Işıldak, 2020).

Some studies tested the effects of plyometric training on the agility of volleyball players. Lehnert et al. (2009) observed a significant increase in performance in shuttle running (6 mx 6 m) in their study performed for eight weeks in women. In another study, it was observed that 12-week plyometric training in young adult males significantly increased the agility of the athletes in shuttle running and improved the time to complete the shuttle run (Veličković et al., 2017). Studies prove that plyometric training increases agility.

Tillaar et al. (2015), in their study on 26 athletes, additionally applied for the plyometric training program twice a week. At the end of 6 weeks, they found an increase in agility tests in both groups. Erdoğan (2014) applied 8-week plyometric training in their study. Results of the evaluation indicated that, a significant increase in agility parameters was found. Baydemir et al. (2020) investigated the components of speed, quickness, and agility performance in amateur players in their study. They emphasized the significant and positive changes in agility parameters (Baydemir & Yurdakul, 2020). Turna (2019) also found positive and significant changes in agility parameters.

In the study conducted by Sökmen (2018), difference was found to be statistically significant as a result of comparison in soccer players' test values. When the literature regarding our research is examined, the findings discussed support our study.

5. Conclusion

In conclusion, our study shows that plyometric training positively affects agility performances in volleyball players. Agility performance is a feature developed through plyometric training due to the increase in motor units and nerve conduction speed due to the increase in muscle strength and movement efficiency. Considering that plyometric trainings provide maximum contraction in the shortest time possible and its effect on the characteristics like sudden changes of location and direction in the volleyball, applying plyometric trainings may be thought to be effective in volleyball training programs.

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