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THE EFFECT OF 12-WEEK DIFFERENT TRAINING METHODS APPLIED TO BADMINTON ATHLETES ON SOME BASIC MOTORIC PROPERTIES

Moatasem Azeez Khalid Albayati[i], **Yalçın Kaya**
Selçuk University,
Faculty of Sport Science,
Department of Physical Education and Sport,
Turkey

Abstract:
This study aimed to examine the effects of 12-week plyometric, elastic resistance and core strength training applied to badminton athletes on some basic motoric properties. For this purpose, 21 badminton players participated equally and randomly in plyometric (PG), elastic resistance elastic (EG) and core strength (CG) training groups. Each training group participated in the experimental training practice as well as badminton training three days a week for 12 weeks. One day before and after the 12-week period, vertical jump, agility, throwing a weighted ball, sit and lie down, hand grip, push-ups, back strength, standing long jump, 10m-50m speed, reaction tests as motoric features; with the clear, drop and smash tests as badminton basic technical skills were measured. The obtained data were analyzed with paired samples t-test for within-group analysis, one-way ANOVA and LSD post-hoc test for between-group analysis. Values were presented as mean, and standard deviation, and were analyzed at a significance level of 0.05. According to the data obtained in the study, there was a significant difference in favor of the posttests in the results of the vertical jump, agility t-test, hand grip strength test, standing long jump test and badminton drop technique test among the pre-post tests in the PG group ($p<0.05$); in the CG group, there was a significant difference in the results of the push-up test, back strength test, badminton clear technique test and badminton drop technique test in favor of the posttests ($p<0.05$); in the EG group, there was a significant difference in favor of the posttests in the results of the vertical jump, sit-reach flexibility test, push-up test, badminton clear technique test and badminton drop technique test ($p<0.05$). Among the groups, between the PG group and the EG and CG groups, in favor of the PG group; it was determined that there was a significant difference in back strength between the CG group and the EG and PG groups in favor of the CG group ($p<0.05$). As a result,

[i] Correspondence: email mutasamaziz023@gmail.com

plyometric training has positive effects on lower extremity strength and explosive power properties, core training has positive effects on trunk strength and elastic resistance band training has positive effects on both lower and upper extremity strength and explosive power properties; it can be said that these exercises applied at the same time can positively affect the basic techniques of badminton.

Keywords: badminton, plyometric training, elastic band training, core training, motor features

1. Introduction

The badminton player must go to all points of the field in a very short time, make his strokes and return to the centre. Reaching the point where the opponent sends the ball to the field in a short time requires a high level of agility in athletes. For this reason, it is very important to reach every point of the field in a fast and coordinated way and to maintain their balance after their hits in badminton. After the kick, the legs should be shoulder-width apart and the body should always be positioned to point to the opposite side without swinging to the right or left. As a result, athletes can maintain their balance more easily (Kızılet et al., 2017).

Considering the studies on core strength in the badminton branch, it is seen that badminton players with weak core muscles have stabilization problems in the spine and trunk during lower and upper extremity movements such as running, jumping and throwing, fatigue of the trunk muscles, lack of trunk dynamic stability and loss of balance control (Thomas and William, 2009).

This study aimed to examine the effects of 12-week plyometric, elastic resistance elastic and core strength training applied to badminton athletes on some basic motoric properties.

2. Method

In this study, 21 badminton players (Table 1) were randomly assigned to three groups, 7 core training groups (CG), 7 plyometric training groups (PG) and 7 elastic resistance band training groups (EG), after pre-tests were made. The first measurements of all subjects were made the day before the training program, and the last measurements were made the day after the training program. All participants were briefed about the study plan and purpose, and the groups practiced for the tests for 1 week before starting all the tests.

Table 1: Descriptive parameters

		Mean	Std.D.
PG	Height (cm)	141.71	4.50
	Weight (kg)	38.57	5.19
	Age (year)	13.43	0.53
CG	Height (cm)	138.86	4.30
	Weight (kg)	37.00	5.57
	Age (year)	13.29	0.49
EG	Height (cm)	139.29	5.65
	Weight (kg)	30.00	3.46
	Age (year)	13.14	0.69

The badminton athletes participating in the research were divided into three groups as core, plyometric and resistance band training groups. While the badminton players continued their regular badminton training 5 days a week in a 12-week period, core, plyometric and resistance band training were applied for an average of 25-30 minutes on Mondays, Wednesdays and Fridays, 3 days a week. These studies were done after regular badminton training. Core training content consists of 8 movements. These were plank, glute bridge toes up, bird-dog arm and leg, squat, quadruped bird dog, swimming, and double leg lift and push-up movements. Plyometric training movements were double-foot jumps, right and left foot hops, jumping using arms, jumping over obstacles, 180-degree funnel jumps, one-foot depth jumping, rapid jumping, and intermuscular jumps. Resistance band applications; squat and lateral leg lift, chest press, biceps curl, abdominal muscle work, shoulder lift, standing glute kickback, lateral band walk and squat and lateral leg lift movements. Those who will enter the application; before starting the study, they did warm-up and stretching exercises for 5-10 minutes.

One week before and after the training programs some test were applied such as, vertical jump (Baker, 1996), sit-reach flexibility test (Hoeger and Hopkins, 1992), 10m and 50m maximal speed test (Sheppard et al., 2008), t-agility test (Semenick, 1990), hand grip strength test (Baechle and Earle 2008), standing long jump test (Baechle and Earle, 2008), back endurance test (Yıldız 2012), weight ball throwing test (Country, 2017), push-up test (Henderson et al. 2007), reaction test (Sheppard et al., 2008), badmiton clear/slam dunk/drop technical tests (Hicks 1973).

2.1 Statistical Method

SPSS 20.00 package program was used in the statistical analysis of dependent variables within and between groups. For the analysis of the pre-post test differences of the groups, a t-test was used in the dependent groups, and for the comparison of the post-test-pre-test differences between the groups, one-way analysis of variance and LSD post-hoc test were used. Values were presented as mean, standard deviation, and analyzed at 0.05 significance level.

3. Results

Table 2: Difference between pre/post test within the group and between groups

		PG	CG	EG	Difference between groups
		X±SD	X±SD	X±SD	
Vertical jump (cm)	Pre-test	24.43±2.37	24.86±2.61	24.71±2.87	-
	Post-test	31.14±4.98a	26.86±4.41	28.00±2.94a	
T-test agility (sec)	Pre-test	10.89±0.25	10.70±0.66	10.73±1.27	-
	Post-test	10.20±0.73a	10.67±0.54	10.74±0.73	
Throwing weight ball (cm)	Pre-test	578.57±70.34	577.14±102.75	577.14±84.80	-
	Post-test	615.71±69.97	617.14±90.32	605.71±125.15	
Sit and reach (cm)	Pre-test	22.29±2.81	22.14±2.67	22.29±3.64	-
	Post-test	24.14±1.46	25.29±2.36	24.57±4.04a	
Hand-grip (kg)	Pre-test	18.13±2.49	19.61±3.82	19.49±3.78	PG-CG
	Post-test	20.15±3.16a	20.17±3.04	19.04±2.88	PG-EG
Push up (number)	Pre-test	14.71±4.07	14.43±3.87	14.71±3.95	-
	Post-test	18.43±6.02	20.14±5.11a	19.71±4.72a	
Back strength (sec)	Pre-test	1.68±0.43	1.69±0.42	1.69±0.32	CG-PG
	Post-test	1.90±0.48	2.47±0.39a	1.86±0.50	CG-EG
Standing long jump (cm)	Pre-test	175.71±19.88	175.71±17.18	175.71±19.88	-
	Post-test	194.29±17.18a	182.86±20.59	184.29±31.01	
10m sprint (sec)	Pre-test	2.45±0.38	2.46±0.21	2.46±0.36	-
	Post-test	2.32±0.31	2.27±0.24	2.50±0.35	
50m sprint (sec)	Pre-test	9.77±0.91	9.83±0.83	9.72±0.83	-
	Post-test	9.57±0.92	9.78±0.80	9.77±0.65	
Reaction time (number)	Pre-test	0.65±0.09	0.66±0.10	0.66±0.04	-
	Post-test	0.66±0.09	0.66±0.12	0.65±0.09	
Clear (number)	Pre-test	23.86±4.45	24.14±7.10	22.14±6.57	-
	Post-test	28.00±5.72	27.71±5.79a	26.57±6.24a	
Smash (number)	Pre-test	18.86±4.60	16.14±5.40	15.43±3.10	-
	Post-test	21.00±6.19	18.57±2.76	17.29±3.50	
Drop (number)	Pre-test	21.57±4.79	17.71±3.09	20.86±2.19	-
	Post-test	24.43±4.86a	20.57±3.41a	22.57±2.64a	
a = difference between pre- and post-tests within group					

In Table 2, the t-test results of the data between the pre-test and post-test in all measured properties of the PG group are given in the dependent groups. Vertical jump, agility t-test, hand grip strength test, standing long jump test and badminton drop technique test results showed a significant difference in favor of the posttests ($p<0.05$). No significant difference was found in other measured features ($p>0.05$). The t-test results of the data between the pre-test and post-test in all measured properties of the CG group are given in the dependent groups. There was a significant difference in the results of the push-up test, back strength test, badminton clear technique test and badminton drop technique test in favor of post-tests ($p<0.05$). No significant difference was found in other features ($p>0.05$). The t-test results of the data between the pre-test and post-test in all measured characteristics of the EG group are given in the dependent groups. There was a significant

difference in the results of the vertical jump, sit-reach flexibility test, push-up test, badminton clear technique test and badminton drop technique test in favor of the posttests ($p<0.05$). No significant difference was found in other measured features ($p>0.05$). A one-way analysis of variance and intergroup comparison of the differences between the posttest and posttest are given. It was determined that there was a significant difference between the groups in the results of the hand grip strength and back strength test ($p<0.05$). According to the results of the LSD post-hoc test performed to determine between which groups there was a significant difference, in favor of the PG group between the PG group and the EG and CG groups in hand grip strength; There was a significant difference in back strength between the CG group and the EG and PG groups in favor of the CG group ($p<0.05$). No significant difference was found between the groups in other measured characteristics ($p>0.05$).

4. Discussion

In our study, in the plyometric training group, there was a significant difference in favor of the posttests in the results of the vertical jump, agility t-test, hand grip strength test, standing long jump test and badminton drop technique test. In the core training group, there was a significant difference in favor of the posttests in the results of the push-up test, back strength test, badminton clear technique test and badminton drop technique test. In the elastic resistance band training group, there was a significant difference in favor of the posttests in the results of the vertical jump, sit-reach flexibility test, push-up test, badminton clear technique test and badminton drop technique test. In favor of the PG group the PG group and the EG and CG groups in hand grip strength was improved. It was observed that there was a significant difference in back strength between the CG group and the EG and PG groups in favor of the CG group.

In his study on female golfers, Kim stated that a core strength training program lasting 12 weeks created significant increases in leg and back strength in athletes (Kim 2010).

In their study, Balaji and Murugavel determined that the speed, agility, explosive power and upper extremity strength of handball players increased significantly after 8 weeks of basic training (Balaji et al., 2016).

McLeod et al. (2009) reported that 6 weeks of balance training led to significant changes between the star balance pretest and posttest results of young high school basketball players.

In a study conducted by Bashir and Al (2019), tennis players participated in core training for 5 weeks in addition to their existing training programs to examine the effects of basic training on some physical and motor performance parameters of young tennis players. At the end of the study, it was determined that the agility performance of tennis players increased in parallel with the applied basic training program.

When the studies examining the effects of plyometric training on the vertical jump performance of athletes are examined; it is seen that most of the studies were applied to

adolescent athletes for 6 - 10 weeks and some of them were given additional loads (2 - 6% of body weight on average). Increases were observed in the vertical jump values of both the control groups who continued the technical education and the study groups who applied the technical education and plyometric measurements; however, the increases in the control groups are not statistically significant (Faigenbaum et al. 2006).

Another study, conducted by athletes, revealed that plyometric training increased the explosive power level of the lower extremities (Rubley et al., 2011).

In our study, it was determined by the analysis of the pre-post test results that plyometric training positively affected vertical jump, agility, hand grip strength, standing long jump and badminton drop technique. In addition, it was determined in the pre-post test differences that it improved core training push-ups, back strength, badminton clear and drop technique. In addition to these, it has been revealed with pre-post test differences that elastic resistance band training affects vertical jump, flexibility, push-up, badminton clear and drop techniques.

It was also determined that the explosive strength and static strength properties of the applied strength training in general, and the strength and explosive power increase obtained according to the type of training applied varied between the lower and upper extremities. For example, it has been determined that while plyometric training affects lower extremity strength and explosive power properties, core training affects the trunk and upper extremities, and elastic band training affects both lower and upper extremity strength and explosive power properties. In addition to all these, it has been revealed that all applied strength training, with the exception of the dunk, also improves badminton's basic technical skills.

When comparing the more effective training, we can say that plyometric training affects the hand grip strength more and core training affects the back strength more.

It is an expected result that strength and power type characteristics will improve due to the improvement of the contractility of the muscles and the improvement of the amount of contractile protein with strength training. This result was also supported in our study.

As a result, in the light of the data we have obtained, plyometric training has positive effects on lower extremity strength and explosive power properties, core training has positive effects on trunk strength and elastic resistance band training has positive effects on both lower and upper extremity strength and explosive power properties; It can be said that these exercises applied at the same time can positively affect the basic techniques of badminton.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Authors

Moatasem Azeez Khalid Albayati is Doctoral student in Selcuk University, Department of Physical Education and Sport, Turkey. This study is a part of Moatasem Azeez Khalid Albayati's Doctoral thesis.

Yalçın Kaya is Professor Doctor at Selcuk University, Faculty of Sport Sciences, Turkey.

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