

EFFECT OF PLYOMETRIC TRAINING ON UPPER & LOWER BODY STRENGTH OF FEMALE BADMINTON ATHLETES

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Abstract

The purpose of this study was to evaluate the effect of Plyometric Training on selected Physical Parameters of Collegiate Female Badminton Athletes. This study highlighted the impact of 12 weeks of plyometric training on selected physical parameters such as upper and lower body strength and anthropometric attributes such as weight and waist-hip ratio among females aged 16-22 years. The selected intervention was conducted at the Government Post Graduate College, Faisalabad, Punjab Pakistan. Experimental and randomized control trials and pre/post-intervention study design were used. The subjects/participants were randomly assigned into two equal groups (n=20). All the subjects/participants were divided into two groups with 10 subjects each as experimental and control group. Upper body strength is measured through push-ups test and lower body strength is measured through the squats test. The results of physical parameters such as upper body strength and lower body strength of female badminton athletes changed after a 12-week plyometric training program. Therefore, the mean and standard deviation values of upper body strength and lower body strength of post-intervention were found to improve. Finally, the researchers concluded that a 12-week plyometric training program affects the selected physical parameters i-e upper body strength and lower body strength post-intervention of college-level female badminton athletes. Additionally, in this research, the anthropometric variables were also entertained. The weight and waist-hip ratio, after the effect on selected physical parameters such as upper body strength and lower body strength, post-intervention of 12-weeks plyometric training of college-level female badminton athletes therefore, the mean and standard deviation values of weight and waist-hip ratio of post-intervention were changed significantly after post-training. Based on the findings, the

researchers recommend that college authorities provide maximum chances for the girls to participate in badminton games regularly to improve the selected physical parameters of upper body strength and lower body strength.

Keywords: Plyometric Training; Upper Body Strength; Lower Body Strength; Female Badminton Athletes.

Introduction

Badminton is a popular sport which is liked and played by majority of the people across the globe. It is a beginner-friendly sport because anyone can go out and start playing this game obviously not professionally but in a fun way (Jiang et al., 2022). However, the individual who intends to become an advanced level player of badminton, they need to play it at a professional level. Beginners can easily learn badminton skills. The game of badminton is viewed as a competitive, leisurely, family-friendly; outdoor activity that may be enjoyed. Physical fitness is a critical component of human lives especially for players. The development and achievement of physical fitness components have a vital impact on the health. Moreover, athletes/players could perform better in relation to the athlete sport specific event/activity. Plyometric training is employed in sports that call for high power output because it puts greater strain on the muscles than slower-paced resistance exercise. When combined with weight training, plyometric training has been proven

to increase vertical jump height and sprint time in soccer players. Depending on the goal of the training program, different plyometric training is used (Ellapen, 2007). Physical fitness is the ability to perform daily tasks effectively without undue fatigue and has ample energy for unforeseen activities. Physical fitness is a key component of human lives especially for sports players. The development and achievement of the physical fitness component have a vital impact on the health (Avinash & Mittal, 2019). Moreover, athletes/players could perform better in relation to the athlete sport specific event/activity. Athletes can sustain sports specific events for a longer period of time without undue fatigue. Furthermore, athletes have a strong sense of execution of the relevant sports in a befitting manner through the optimum level of physical fitness (Blijlevens et al., 2018). Physical training is an essential component of each and every sport. Athletes need to build and develop a solid base of physical fitness which produces positive outcomes. Physical training and

physical fitness are indispensable to each other, necessary for the mobility of the athletes sporting aspects (Xu, 2015).

Plyometric training, also known as jump training or plyos, is a kind of exercise which combines explosive movements such as leaping and bounding, with the intention of enhancing one's power, speed, and agility (Chimenti, 2023). Plyometric training includes rapidly contracting and stretching the muscles, which serves to enhance both muscle suppleness and the amount of force (Panda et al., 2022). Plyometric training focuses on upper and lower limbs and provides a variety of benefits such as enhanced muscular power production, enhanced flexible muscle contractions with more force while using less energy, faster overall speed or muscle contraction frequency and enhanced nimbleness or agility, as described by fitness experts, is the capacity to shift directions swiftly. While training for a sport, it is essential to choose workouts to the greatest extent possible, replicate the real movements that will be needed of during the competition (Araújo et al., 2019). Plyometric training can develop power, speed, agility, and general athleticism, which may be advantageous for badminton players (Panda et al., 2022). Plyometrics are workouts that feature

explosive motions that engage fast-twitch muscle fibers and increase body capacity to create force in a short amount of time (Galay et al., 2021). Badminton athletes who improve their upper body strength may find the plyometric training to be a useful strategy. Plyometrics are workouts that feature quick and explosive movements, and beneficial for improving both power and speed in upper body (Chelly et al., 2014). Plyometric training is a kind of exercise that emphasizes explosive movements such as leaping, hopping, and bounding among other similar activities. The development of lower-body strength, power, and agility may be greatly aided by the use of this form of exercise (Chaouachi et al., 2017). Plyometric training is beneficial for a number of reasons, but one of the most important reasons is to assist in developing the strength of the muscles which are used in leaping and other types of explosive movements. The quadriceps, hamstrings, glutes, and calves are all included in this category. Athletes may increase their capacity to leap higher and run faster by strengthening the muscles that create greater power (Lum et al., 2019).

Materials and Methods

The purpose of this study is to determine how upper body strength, lower body strength and anthropometric attributes

of college level female badminton athletes are affected by the plyometric training. After receiving ethical approval from the Government Graduate College for Women 122 JB, Sargodha Road Faisalabad female badminton athletes aged 16- 22, who were studying at the Government Graduate College for Women 122 JB, Sargodha Road Faisalabad Punjab Pakistan were selected for the current study. In this context, the researcher selected 20 participants for this experimental study based on inclusion criteria. The subjects were split into 2 groups:

Results

Table 1. Paired sample T-test showing the difference between Pre and Post-test upper body strength and lower body stren

Name of variable	Groups	Pre-test results (Mean \pm SD)	Post-test results (Mean \pm SD)	Pre and post-test results (Mean \pm SD) difference	t	Sig. (2-tailed)
Upper body strength (Push-up)	CG	16.00000 \pm 7.788881	21.90000 \pm 8.685237	5.9 \pm 0.896356	-3.125	.102
	EG	22.00000 \pm 8.259674	36.40000 \pm 9.834181	14.4 \pm 1.574507 -5.855		.000
Lower Body Strength (Squats)	CG	35.40000 \pm 13.368288	36.60000 \pm 12.738393	1.2 \pm 0.629895 -.890		.397
	EG	43.30000 \pm 13.013241	53.00000 \pm 11.944315	9.7 \pm 1.068926 -4.876		.001

Significant level = 0.05, SD=Standard Deviation

A paired samples t-test shows the Pre & Post-intervention characteristics of control groups and experimental groups of female badminton athletes. Table 1 displays that no meaningful difference was found in control groups (CG) regarding pre and post-intervention of female badminton athletes. Therefore, the mean and standard deviation

the experimental group and the control group. The EG was composed of 10 participants (EG, N=10) given the prescribed exercise protocol to EG, whereas the control group (CG, N = 10) received no exercise.

Data Analysis

Data was analyzed using the inferential statistical (Paired sample t-test and independent sample t-test) through International Business Machines Corporation IBM Statistical Product and Service Solutions (SPSS) version 26.

values of upper body strength (push-ups) and lower body strength (squats) of pre-intervention push-ups = 16.000 \pm 7.788881, squats = 35.4000 \pm 13.368288 to post-program push-ups = 21.900 \pm 8.685237, squats = 36.6000 \pm 12.738393 *t values* ($_{10}$) = -1.325, -.890, the p-values values greater than to the significant values, 0.05 < .102, .397.

Based on the above statistical results, no significant difference was found in the control groups (CG) regarding pre and post-intervention of female badminton athletes.

A paired samples t-test demonstrates the Pre & Post-intervention characteristics of experimental groups (EG) of female badminton athletes. Table 1 shows that a meaningful difference was found in experimental groups (EG) regarding pre and post-intervention of female badminton athletes.

Therefore, the mean and standard deviation values of upper body strength

(push-ups) and lower body strength (squats) of pre-intervention push-ups = 22.00000 ± 8.259674 , squats = 43.30000 ± 13.013241 to post-program push-ups = 36.40000 ± 9.834181 , squats = 53.00000 ± 11.944315 *t values* (10) = -5.855, -4.876 the P-values less than to the significant values, $0.05 > .000, .001$. Due to the above statistical results, a significant difference was found in experimental groups (EG) regarding pre and post-intervention of female badminton athletes.

Table 2. Paired sample T-test showing the difference between anthropometric attributes like weight, waist-hip ratio pre and post-test of (Experimental and Control Groups)

Name of variable	Groups	Pre-test results (Mean \pm SD)	Post-test results (Mean \pm SD)	Pre and post-test results (Mean \pm SD) difference	t	Sig. (2-tailed)
Weight	CG	46.50000 \pm 6.132790	45.70000 \pm 6.864563	0.8 \pm 0.731773	1.714	.121
	EG	61.50000 \pm 8.058812	55.90000 \pm 7.125073	5.6 \pm 0.933739	14.000	.000
Waist hip ratio	CG	28.90000 \pm 1.370320	28.90000 \pm 1.523884	0 \pm 0.153664	0.000	1.00
	EG	31.60000 \pm 1.955050	29.60000 \pm 1.264911	2 \pm 0.690139	6.000	.000

Significant level = 0.05, SD=Standard Deviation

This table indicates the pre and post-intervention characteristics of control and experimental groups of female badminton athletes. A paired samples t-test shows the Pre & Post-intervention characteristics of control groups (CG) of female badminton athletes. Table 2 shows that no meaningful difference was found in control groups (CG)

regarding pre and post-intervention of female badminton athletes.

Therefore, the mean and standard deviation values of weight, waist-hip ratio of pre-intervention (Weight = 46.500 ± 6.132790 , waist-hip ratio = 28.900 ± 1.370320) to post-program (Weight = 45.700

± 6.864563 , waist hip ratio = 28.900 ± 1.523884) t values ($_{10}$) = 1.714, 0.000, the p-values values greater than to the significant values, $0.05 < .121, 1.000$. Based on the above statistical results, no significant difference was found in the control groups (CG) regarding pre and post-intervention of female badminton athletes.

Also, the paired samples t-test demonstrates the Pre & Post-intervention characteristics of experimental groups (EG) of female badminton athletes. Table 2 shows that a meaningful difference was found in experimental groups (EG) regarding pre and post-intervention of female badminton athletes. Therefore, the mean and standard deviation values of weight, waist-hip ratio of pre-intervention (Weight = 61.50000 ± 8.058812 , waist-hip ratio = 31.60000 ± 1.955050) to post-program (Weight = 55.90000 ± 7.125073 , waist hip ratio = 29.60000 ± 1.264911). t values ($_{10}$) = 14.000, 6.000, the P-values are less than the significant values, $0.05 > .000, .000$). Due to the above statistical results, a significant difference was found in experimental groups (EG) regarding pre and post-intervention of female badminton athletes.

Discussion

The study's main purpose is to measure the effect of plyometric training on

selected physical parameters of collegiate female badminton athletes. This study also highlighted the impact of 12 weeks of plyometric training on the selected physical parameters such as upper body strength and lower body strength among females aged range 18-22, and the selected intervention was conducted at the Government Post Graduate College Faisalabad, Punjab Pakistan.

No significant difference was found in the upper body strength and lower body strength of female badminton athletes in the control and experimental groups before the intervention. Prior to the relevant training was highlighted insignificant differences in groups' upper body strength and lower body strength (Rawte et al., 2021; Shukla, 2019).

In the present study, significant improvement was found in the upper and lower body strength of female badminton athletes in the experimental group after the intervention (Mengesh et al., 2015). Highlighted that plyometric training significantly improved the skills of female soccer, badminton, and tennis players. On the other hand, there was no improvement for the control group participants. Zemenu (2020): Arazi & Asadi (2011) revealed a significantly improved level of upper body strength and lower body strength. Furthermore, it was

found that the plyometric training group/experimental improved more than the control group which is linked with the identified parameters/variables. In this study, strength, and other physical fitness components can be improved through physical training. The results of this study also suggested that plyometric training may improve badminton team athlete's performance in terms of a number of jump criteria, including squat jump and drop jump. In this regard, it was found that the selection of particular easy and medium plyometric exercises within the training units could improve squat jump performance. (Fröhlich et al., 2014; Markovic, 2007; Kannas et al., 2012; Sialis, 2004 ;). In order to increase the force of subsequent movements, plyometric training makes use of the naturally elastic properties of muscles and tendons, as well as the stretch reflex (Trajković et al., 2016). It is anticipated that plyometric training may improve athletes' jumping performance because jump performance ability is greatly influenced by an individual's capacity to utilize the elastic and neural benefits of the stretch-shortening cycle SSC, well-developed strength, and the rate of excursion of the activated musculature during the contraction (Silva et al., 2019). Revealed that plyometric training develops the upper body strength lower body strength and explosive

power of participants Moreover, the badminton athlete's capacity for explosive jumping can be enhanced through plyometric training. The greatest amount of improvement in vertical jump was observed in an experimental study on the effects of plyometric and resisted jump-training on speed and explosive power in young badminton athletes/players (Fatouros et al., 2000). Therefore, plyometric training is one of the most effective methods for improving explosive power and other physical fitness parameters. A wide variety of athletes can benefit from power training, particularly if it follows or coincides with a strength training program (Potteiger et al., 1999). Hence, the present study examined how plyometric training significantly improved selected physical fitness variables in female badminton athletes.

The results of the anthropometric variable values of weight and waist hip ratio were also significant. Therefore, the mean and standard deviation values of weight, and waist hip ratio of post-intervention were changed significantly after post-training. These results are linked with previous findings; long-term plyometric training is capable of improving flexibility, upper and lower body strength, weight, and waist hip ratio (Fatouros et al., 2022; Asadi, 2013; 2012).

Conclusion

The main purpose of the study is to measure the effect of plyometric training on selected physical parameters of collegiate female badminton athletes. This study also highlighted the effects of 12 weeks of plyometric training on the selected physical parameters such as upper body strength and lower body strength among females aged range 16-22, and the selected intervention conducted at the Government Post Graduate College Faisalabad, Punjab Pakistan. On the basis of results the researcher found that a significant difference in improvement was found regarding pre and post-testing of upper body strength and lower body strength of college-level female badminton athletes. The researchers also concluded that the plyometric training program has shown significant improvement in upper body strength and lower body strength performance of intercollegiate badminton players by reducing the weight, and waist hip ratio.

Limitations

1. The main limitation of this particular study is proper diet control for the subjects.
2. Absentee ratio of the subjects because of the matches causing disturbance in training protocol.

Recommendations

1. Regular plyometric training participation is beneficial for girls up to 3 to 5 days a week to improve upper body strength and lower body strength.
2. Plyometric training programs could be helpful to improve flexibility in order to reduce lower back pain in females.
3. Plyometric training programs are potentially effective to reduce/loss the weight and decrease the waist hip ratio.
4. There is a significant effect of 12- weeks of plyometric training on the selected physical parameters of upper body strength and lower body strength, the researcher was found however the researchers recommended that, college authorities may provide maximum chances for girls to participate in badminton games on a regular basis to improve upper body strength and lower body strength.

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