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CORE TRAINING ON STRENGTH AND MUSCULAR ENDURANCE OF VOLLEYBALL ATHLETES OF ADEYEMI COLLEGE OF EDUCATION, ONDO STATE. NIGERIA.

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Abstract
Volleyball is a sport with numerous complicated demands that need an aggregation of fitness, skill, team tactics and strategies, and motivational attitude. Therefore, to be successful, volleyball players can use integral training for conditioning quick volleyball maneuvers through bursts of intense exercises and drills. The study investigated the effect of 6 weeks of core training on the muscular strength and muscular endurance of volleyball athletes of Adeyemi College of Education volleyball players. A pre-test post-test control group quasi experimental design was adopted for this study. All the 26 registered volleyball athletes in Adeyemi College of Education, Ondo were selected for this study using purposive sampling technique Isometric core exercises were used as the intervention exercise for a duration of six weeks. The instruments used for this study include the tape rule, weighing scale, plank test and push-up test were used to collect data on the muscular endurance and muscular strength of the participants. The results of the findings show a significant effect of the 6 weeks' core training intervention on muscular endurance, F (1, 20) = 5.072, p = .036; and the F value of F (1, 20) = 4.543, p = .0.46 was obtained for muscular strength which indicated that the effect of the intervention was significant. Based on the findings of the study, it was concluded that there is an observable improvement in the participants' endurance after the intervention training and the core training intervention led to improved muscular strength of the participants.

Keywords: Volleyball, Maneuvers, Team Tactics, Training

Introduction

Volleyball is a team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules (Vassil & Bazanovk, 2012). Today, with a history of more than a century, volleyball is a complicated team game that demands multi-faceted athletic activities and constantly changing positions (Gül *et al.*, 2019). Volleyball is characterized by frequent short bouts of high-intensity exercise, followed by periods of low-intensity exercise and short-term rest periods (Gabbett, 2013).

Volleyball is a sport with numerous complicated demands that need an aggregation of fitness, skill, team tactics and strategies; and motivational attitude. Therefore, to be successful, volleyball players can use integral training to condition them for quick volleyball

maneuvers through bursts of intense exercises and drills. Volleyball players must have to be good with endurance, speed, strength, power, flexibility, technical skills, and understanding of basic volleyball strategies (Barth & Linkerhand, 2007). Although volleyball players must be good with all physical fitness qualities, the researcher on this study focused on two specific physical fitness qualities: muscular endurance and muscular strength.

Muscular endurance is the ability to repeat a series of muscle contractions without fatigue (Getahun, 2022). Volleyball has been described as a sport with both anaerobic as well as aerobic components. In long matches or tournament play, the players have to bend, jump and move thousands of times which need good muscular endurance. It is one of the required qualities for excelling in volleyball (Steven, Cibor & Rochelle, 2005). Endurance is the ability one needs to handle the long-term physical strain that includes not getting tired quickly from strenuous training, a long game with all sets, a tournament day, or even during trips to competitions and recovering quickly from fatigue (Barth & Linkerhand, 2007). Volleyball matches with a current rally point system allow the game to last for quite a long time, which can vary from 1 hour to more than 3 hours depending on how close the participating teams are in ability. Muscular endurance is very influential in maintaining performance throughout the game (Sahar, 2019). Players with better muscular endurance will be able to maintain their performance and increase the opportunity to win (Nasuka, Setiowati & Indrawati, 2020).

Muscular strength has been viewed as the capacity of the individual to exert muscular force (Dominic, Talabi & Niyi-Odumosu, 2016) or the ability to make use of the needed number of muscle fibres to execute a given task (Uche, 1988). Strength is not only to apply force, but the ability to maximize that force for a well performed physical task like spiking volleyball. Greater strength often results in better performance and there is no physical performance without a factor of strength (Nossek, 1982).

A volleyball player requires lots of arm strength for spiking, leg strength for jumping, as well as a strong core (back & abdominal) muscles to be able to handle the stresses and strains that their bodies are put under as they move, spike, block, and dig around the court (Barth & Linkerhand, 2007). The strength of arm muscles is very important in volleyball games. Strength of the arm is one factor that is used to predict the quality of volleyball players (Ahmad & Ahmad, 2018; Grgantov et al., 2013). The strength

of handgrip correlates with the strength of spike, the stronger the handgrip, the stronger ball hits were produced (Koley & Kaur, 2011).

Volleyball is a complex and demanding game requiring sophisticated training methods. To create a training program that addresses the multiple physical and technical demands of the game, a player must become familiar with the different methods of training (Getahun, 2022). Bakinde, (2015) also asserted that training will enable volleyball players to be equipped with the fundamental and basic components of the technical, tactical, physical and psychological demands of modern volleyball. There are several types of training which includes resistance training, circuit training, plyometric training, endurance training among others. However, training involving the full body linkage such as core training, has been advocated to enhance the capacity of transmitting force through the body linkage (Schoenfeld et al., 2014).

Core training refers to a set of exercises specifically designed for a core muscle or muscle activity. Core muscles include abdominal lower muscles and latissimus dorsi and they are responsible for the power transfer between the lower and upper half of body. Core muscles play an important role for daily activities and immobilizing the spine during weightlifting exercises for the welfare of lower dorsal part (Fig, 2005). The core muscles generate the strength, stability, and mobility needed to carry out everyday activities such as carrying shopping, climbing the stairs, and getting into a car. They also play a crucial role in more demanding dynamic sports like volleyball, helping to transmit increased power and stability, and performance, while also reducing the risk of sustaining injury. As a result, core development is a key objective of elite athletes and their coaches (Gareth, 2013).

Specific knowledge regarding core training necessary for performance excellence of volleyball players has not been well established. Therefore, the researchers examined the effect of core training on the muscular strength and muscular endurance of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria.

Statement of the Problem

There is a wide range of scientific research on athletes, competitions and physical training by several authors (Dominic, 2011; Bakinde, 2015; Amira & Mansour, 2015). The use of plyometric, strength and power training have been consistently shown to improve strength, power, agility and other performance fitness components of volleyball athletes

(Sadeghi, 2013; Yakup, 2014; Abraham, 2020). However, they most time results in a recurring rate of injuries associated with the use of traditional strength training methods for training athletes using free weights, resistance bands, weightlifting among others.

It is therefore imperative for trainers to be directed to alternative power training methods that requires the use of the individual's body weight due to developmental and injury related risks that power trainings implemented with free weights may cause in athletes. Krieger and Sonmez, (2014) further advocated for exercises involving the full body linkage such as core training for enhancing the capacity of transmitting force through the body linkage. However, the use of specific core training on volleyball performance has not been well defined, Hence, the need to investigate the effect of core training on their motor performance variables, such that the research outcome may provide practical information about core training and motor performance in order to prevent further incidence of injuries and to enhance motor performance.

Objective of the Study

The objectives set for the study were to:

i investigate the effect of core training on the agility of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria

ii examine the effect of core training on the balance of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria.

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significant:

H_{01}: There is no significant effect of six weeks' core training intervention on the muscular endurance of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria.

H_{02}: There is no significant effect of six weeks' core training intervention on the muscular strength of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria.

Methodology

This research design adopted for this study is a pre-test post-test control group quasi experimental design. 26 volleyball athletes in Adeyemi College of Education, Ondo were selected for this study using purposive sampling technique.

Isometric core exercises were used as the intervention exercise for a duration of six-weeks. The instruments used for this study include the tape rule, weighing scale, plank test and push-up test were used to collect data on endurance and strength of the participants respectively.

Data were analysed with Statistical Package for Social Science (SPSS) version 23.0 using descriptive statistics of mean, standard deviation and simple percentage and inferential statistics of analysis of co-variance (ANCOVA) with alpha level of 0.05 for hypotheses testing.

Results

Demographic Characteristics of the Respondents

Table 1: Descriptive Analysis on Demographic Data of Participants

		Frequency	Percent
Gender	Male	16	69.6
	Female	7	30.4
	Total	23	100.0
Age	20 and below	2	8.7
	21 - 25	17	73.9
	26 - 30	4	17.4
	Total	23	100.0

Table 1 shows the demographic information of the participants in this study. The table shows that the majority of the participants fall within the age bracket of 21 – 25 years (73.9%) while others fall within the age bracket of 26 – 30 years (17.4%) and 20 years and below (8.7%). Majority of the participants are male (n=16, 69.6%) while 7 (30.4%) were female.

Hypothesis One

There is no significant effect of the 6-weeks core training intervention programme on the muscular endurance of volleyball athletes in Adeyemi College of Education, Ondo.

Table 2: One-Way ANCOVA Test showing the Effect of Core Training on the Muscular Endurance of the Participants

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	134005.706a	2	67002.853	55.417	.000
Intercept	15728.512	1	15728.512	13.009	.002
Pre_ MEndurance	127107. 220	1	127107.220	105.129	.000
Group	6886.878	1	6886.878	5.696	.027
Error	24181.155	20	1209.058		
Total	920781.602	23			
Corrected Total	158186.861	22			

$p \leq 0.05$

Table 2 reveals that the Muscular Endurance F (1, 20) =5.696, p = .027 is less than the alpha level of significance (0.05) thus, the null hypothesis is rejected. This implied the 6-week exercise intervention had a significant effect on the muscular endurance of volleyball athletes in Adeyemi College of Education, Ondo.

Hypothesis Two

There is no significant effect of the 6-weeks core training intervention programme on the muscular strength of volleyball athletes in Adeyemi College of Education, Ondo.

Table 3: One-Way ANCOVA Test showing the Effect of Core Training on the Muscular Strength of the Participants

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2438.001a	2	1219.000	787.581	.000
Intercept	7.668	1	7.668	4.954	.038
Pre_MStrength	1938.870	1	1938.870	1252.680	.000
Group	7.850	1	7.850	5.072	.036
Error	30.956	20	1.548		
Total	46909.000	23			
Corrected Total	2468.957	22			

$p \leq 0.05$

Table 3 reveals that the Muscular Strength F (1, 20) = 5.072, p = .036 is less than the alpha level of significance (0.05) thus, the null hypothesis is rejected. This implied that the 6-week exercise intervention had a significant effect on the muscular strength of volleyball athletes in Adeyemi College of Education, Ondo.

Discussion

Hypothesis one stated that there is no significant effect of six weeks' core training intervention on the muscular endurance of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria. The null hypothesis was rejected because the calculated *p*-value is less than .05 alpha level. The findings from this study revealed that there is a positive effect of core training on the endurance of volleyball athletes in Adeyemi College of Education, Ondo after a 6-week intervention programme. This is in line with the findings of Aditya (2014) that revealed that complex training with core exercises has a significant improvement in the endurance of the intercollegiate football players aged 18 –

25years. Lehman (2006) also observed that a core training programme in which exercises are performed two times per week on separate days for 8 weeks shows a significant improvement in the muscular endurance of the participants.

Hypothesis two stated that there is no significant effect of six weeks' core training intervention on the muscular strength of volleyball players in Adeyemi College of Education, Ondo, Ondo State, Nigeria. The null hypothesis was rejected because the calculated *p*-value is less than .05 alpha level. The findings from this study revealed that there is a significant increase in the muscular strength of the participants after the 6-week core training intervention. This finding is in line with the findings of Kursat et al., (2016) who reported a significant increase in the explosive strength of female volleyball players aged 8-11. They reported that muscle strength of athletes increases after the core training program. Anantyo, Fadjar and Isnaini (2016) also reported the effect of core exercise with a frequency of 3 times a week for 1 month was shown to significantly improve leg muscle strength and performance in male volleyball athletes aged 18-25 in Surakarta.

Conclusion

Based on the findings of this study, the following conclusions were made:

1. Core training intervention conducted for six weeks had positive effects on the muscular endurance.
2. There is an improvement in the muscular strength of the volleyball players in Adeyemi College of Education, Ondo after the 6-week core training intervention.

Recommendations

It was recommended in line with the findings that.

1. Core training program should be incorporated into the regular training regimen for volleyball players at Adeyemi College. This regular inclusion will help maintain and further enhance the observed improvements in muscular strength and endurance.
2. To ensure continued progress beyond the initial 6 weeks, the intensity and duration of core exercises over time should be gradually increased. This ensures continued improvement in muscular endurance and strength. Coaches should monitor athletes' progress and adjust training accordingly.

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