

## SHORT REPORT

# Effect of a Volleyball Course on Health-Related Fitness Components of University Students

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## Abstract

Physical educators need to evaluate the physical education (PE) curriculum they provide to their students. One way is through regular health-related fitness assessments. Physical education programs have improved fitness levels of schoolchildren, but such data is rare for university students. The aim of this study was to determine the effect of a volleyball course on the health-related fitness of male university students. The participants were non-PE majors from King Fahd University of Petroleum & Minerals. They registered for a volleyball course which was done twice a week for eight weeks (31 October-29 December 2016, 50 minutes per session). The parameters assessed were as follows: 1) body composition through body mass index (BMI), 2) muscular endurance through the 60s curl-up test, 3) flexibility through the sit and reach test, 4) leg explosive strength through standing long jump, and 5) cardiovascular endurance through a 1.6 km run. Pre and post measurements were taken and the data were analyzed using descriptive statistics and paired t-test with SPSS 16. P-values for statistical significance was set at  $<0.05$  while a Cohen- $d > 0.2$  was considered of practical significance. Data from 145 students were analyzed (mean (SD) age = 20.8 (0.64) years). There were improvements from pre to post in all variables except body mass and BMI. The data shows evidence that the volleyball course improved the health-related fitness variables of the students. This shows a course designed for non-PE majors may improve their fitness levels if well designed.

**Key words:** volleyball, university students, health-related fitness, physical education

## Introduction

Physical educators need to evaluate the physical education (PE) curriculum they provide to their students. This is important as PE can contribute in giving the required amount of physical activity needed by students. This, in turn, can reduce the prevalence of physical inactivity existing among students, thus contributing in countering the obesity growth reported by the World Health Organization (2016). One way to evaluate a PE curriculum is through health-related fitness assessments.

PE programs have improved fitness levels of schoolchildren (Jarani et al., 2016; Kriemler et al., 2011; Siegrist, Lammel, Haller, Christle, & Halle, 2013). But such studies are rare for university students. Moreover, there are no studies that determine the effect of volleyball training on non-athletic university students. This is of interest as volleyball is a competitive sport that relies mainly on explosive strength and en-

durance to perform techniques such as blocking and smashing (Marques, van den Tillaar, Gabbett, Reis, & González-Badillo, 2009). Thus, the aim of this study was to determine the effect of a volleyball course on the health-related fitness of male university students.

## Method

### Participants

The participants were students from King Fahd University of Petroleum & Minerals (KFUPM) who registered for the volleyball course provided by the university. The participants were non-PE majors.

### Ethics

The study conformed to the Declaration of Helsinki. This study was approved in advance by the Ethical Committee of the



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Physical Education Department of KFUPM and KFUPM. Each participant voluntarily provided written informed consent before participating. The privacy of their results was guaranteed.

### Course activities

The volleyball course was done twice a week for eight weeks (31 October-29 December 2016, 50 minutes per class). Each class began with a 10 minutes warm-up. After the warm-up, the students were asked to jump in the same position and to do some sit ups and pushups.

After these exercises, the students were taught fundamental volleyball rules and skills. The skills taught included overhead pass, dig, overhand serve, underhand serve, block, and smash. Basic footwork was taught to the students in order to move around the court and to play the ball correctly using the skills they were taught. All of these lessons were practically demonstrated to the students.

Matches among the students were played in five classes and a practical test was given to them after the matches. The aim of the matches and the practical test were to test their mastery of the skills. The practical test required students to perform correctly the underhand and overhand serves, and the overhead pass. The matches among the students were played in five classes and a practical test was done in the last two classes.

### Health-related fitness assessment

The following health-related fitness parameters were assessed before and after the course: 1) body composition through body mass and body mass index (BMI), 2) muscular endurance through the 60s curl-up test, 3) flexibility through the sit and reach test, 4) leg explosive strength through standing long jump, and 5) cardiovascular endurance through a 1.6 km run. The students were asked to give their best effort when performing the fitness tests and they were assured that the results of the tests will not affect their final grade.

### Data analysis

Data were analyzed using descriptive statistics and paired t-test with SPSS 16. P-values for statistical significance was set at  $<0.05$  while a Cohen- $d > 0.2$  was considered of practical significance.

### Results

There were 145 students with complete data after the completion of the course. The results are shown in Table 1. There were statistical improvements in all parameters before and after the course. But the improvements in body mass and BMI were not of practical significance.

**Table 1.** Pre and post health-related assessment (N=145)

Test	Pre	Post	p-value	95 % Confidence interval	Percent improvement	Cohen d
Age (years)	20.8 (0.64)	-	-	-	-	-
Height	173.2 (6.24)	-	-	-	-	-
Body mass (kg)	76.1 (17.3)	75.5 (16.7)	0.039*	[-1.16, -0.03]	0.780	0.173
BMI (kg/m <sup>2</sup> )	25.35 (5.52)	25.15 (5.27)	0.041*	[-0.40, -0.01]	0.797	0.171
60s Curl ups (repetitions)	35 (8)	41 (10)	0 <sup>†</sup>	[5, 7]	16.5	0.931
Sit & reach (cm)	28 (7)	31 (7)	0 <sup>†</sup>	[2, 4]	10.6	0.744
Standing Long Jump (cm)	178 (27)	190 (28)	0 <sup>†</sup>	[9.5, 14.6]	6.76	0.777
1.6 km run (s)	10.99 (2.55)	9.88 (2.14)	0 <sup>†</sup>	[-1.33, -0.89]	10.1	0.836

Note. Values in Mean (standard deviation); \* $p < 0.05$ ,  $†p < 0.001$

### Discussion

The aim of the study was to determine the effect of a volleyball PE course on the health-related fitness of male university students who were non-PE majors. All the parameters except body composition improved from pre to post. The improvements in 60s curl ups, sit and reach, standing long jump, and the 1.6 km run show that the following health-related fitness parameters of the students improved, respectively: muscular endurance, flexibility, explosive strength, and cardiorespiratory fitness. This could be due to the exercises the students performed in each session.

Volleyball requires the players to move in various directions to get the ball. Performing such movements require a good flexibility (Taware, Bhutkar, & Surdi, 2013) and muscular endurance. The drills and matches most likely improved the flexibility and muscular endurance of the students. The regular sit ups most likely contributed to the improved muscular endurance of the participants.

The explosive leg strength was most likely improved because of the blocking and smash drills given to the students. Blocking requires that the defending team prevents the ball

from entering their side, while a smash requires one to hit the ball with force into the opposing team's side. These techniques require one to jump in order to be performed (Schmidt, 2015). Regular jumping due to these drills most likely improved the explosive leg strength of the students. Adolescent non-athletes have also experienced an improvement in explosive leg strength due to volleyball training (Kousi, Papadopoulou, Bassa, Ikonou, & Lazaridis, 2014). Moreover, because volleyball has both an aerobic and anaerobic component (Taware et al., 2013), the aerobic component of the course most likely improved the cardiorespiratory fitness of the participants.

The absence of significant improvements in body mass and BMI after the program was possibly due to the short duration and intensity of the course. The intensity was low to moderate as the students needed to go for the other classes they had during the day without being tired.

A limitation of this study is that there was no control group. Moreover, the study was conducted on male university students. It will be important to know the effect of such a program on female university students.

Despite the limitations of the study, there is evidence that volleyball designed for physical education can improve the health-related fitness of university students.

#### Acknowledgements

The author thanks the King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia for supporting this research.

#### Conflict of Interest

The authors declare there are no conflict of interest.

**Received:** 15 March 2017 | **Accepted:** 03 May 2017

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