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Study of cardiovascular endurance and muscular strength endurance in relation to skin fold fat

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Abstract

Introduction: Cardiovascular fitness is the ability of the heart and lungs to supply oxygen-rich blood to the working muscle tissues and the ability of the muscles to use oxygen to produce energy for movement. Several studies conducted to reveal the relationship between body fat and sports performance and reported that excess fat is detrimental to physical performance and work capacity.

Purpose: Purpose of the present study was to study the relationship between selected skin folds fat with cardiovascular endurance and muscular strength endurance.

Methodology: A total of 40 active young female in between the age of 18 to 23 were selected randomly for the present study. All the subject participated moderately exercise for five days per week for at least six month. Cardiovascular endurance (CVE), muscular strength endurance (MSE), three skin folds (abdominal, supra-iliac and triceps) were the criterion measure of the present study. Skin fold Caliper was used to measure the skin fold fat. Cooper aerobic fitness test, 1-min bent knee sit-ups were used to measure the other variables of the present study. Mean and SD were computed and product moment method was used to find out the coefficient of correlation (r) between variables. All statistical calculations were done using standard statistical software and only 0.05 level of confidence was considered in this study.

Results: Results revealed that the mean value of CVE and MSE were 1898.42 m (± 194.57) and 34.05 times/min (± 5.21) respectively. The coefficient of correlation for CVE with Abd, Spl, Tri and SSK were -0.21, -0.17, 0.08 and -0.12 and the coefficient of correlation for MSE with Abd, Spl, Tri and SSK were -0.22, -0.27, 0.06 and -0.23 respectively. It was also found that all the correlations (r) computed in this study were negative in nature though the values of r were statistically not significant.

Conclusion: The trend of the findings has shown that the body fat has a detrimental effect on endurance performance.

Keywords: Cardiovascular endurance, muscular strength endurance, skin fold fat, active young female

Introduction

Cardiovascular fitness is the ability of the heart and lungs to supply oxygen-rich blood to the working muscle tissues and the ability of the muscles to use oxygen to produce energy for movement. ^[1] Muscular strength endurance is the specific form of strength displayed in activities which require a relatively long duration of muscle tension with minimal decrease in efficiency. Sports that involve strength endurance are numerous in nature from the rower to the swimmer to the wrestler on the mat ^[2]. These two fitness components are part of health-related physical fitness that is brought about by sustained physical activity. A person's ability to deliver oxygen to the working muscles is affected by many physiological parameters, including heart rate, stroke volume, cardiac output, and maximal oxygen consumption.

To facilitate optimal delivery of oxygen to the working muscles, the person needs to train or participate in physical activities or exercise that will build up the energy stores in the muscle. Development in CVE due to training also helps to attain good health in adult and older stages of life. Several study reported the beneficial effect of physical exercise on health and the risk of sedentary inactive lifestyle ^[3-6].

Measurement of performance in respect to fatness and leanness of the human body has been the interest to exercise physiologists and physical educators for many years. Excess body fat is related to injury, non-adherence to training and overall reduced athletic performance. Again, the average percent of body fat differs from activity to activity. Some people might perform

better at a higher or lower body fat percentage than others of the same age and sex. An increasing volume of research is trying to focus on establishment of optimum body fat levels for effective participation in various activities [7-9]. Kostic *et al.* (2005) conducted a experimental study to find out the relation between exercise with the cardiovascular fitness and body composition and found a statistically significant difference in the variables for cardiovascular fitness and body composition between the initial and final measuring in the experimental group and between the experimental and control group at the final measuring [10]. Mozaffer *et al.* conducted a study to investigate the relationship between cardiorespiratory fitness (CRF) and adiposity in young adults and result indicated low CRF in young females and a strong inverse relationship between fitness levels and adiposity in young adults of both genders [11]. Patkar and Joshi aimed to find out the affect of obesity on cardiorespiratory efficiency among young adults and reported that ability to do exhausting work (VO₂max/kg body weight) was less in obese group compared to non-obese group & in obese males as compared to non-obese males. They also found that the percentage body fat, triceps skin fold thickness and calf skin fold thickness strongly correlate to VO₂max/kg body weight [12]. In this context the present study was designed to find out the relationship between CVE and MSE performance with selected skin fold fat in order to judge the influence of body fat on endurance performance.

Materials and Methods

Subjects

A total of 40 active young female in between the age of 18 to 23 were selected randomly for the present study. The subject of the letter group participated moderately exercise for five days per week for at least six month.

Criterion Measure

Skin fold fat (abdominal, supra-iliac and triceps), cardiovascular endurance (CVE) and muscular strength endurance (MSE) was the criterion measure of the present study [13].

Tool and Test used

Skin fold fat was measured by Harpenden Holton skin fold caliper, Cooper aerobic fitness test was used to measure the cardiovascular endurance and muscular strength endurance was measured by one minute bend knee sit ups in the present study.

Statistical procedure

Mean and SD were computed and product moment method was used to find out the coefficient of correlation (*r*) between variables. All statistical calculations were done using standard statistical software (Excel, 2007) and only 0.05 level of confidence was considered in this study.

Results and Findings

Maximum and minimum score, mean, standard deviation for Skin fold measurements, CVE and MSE for the subjects has been presented in Table-1. Table shown that mean score of abdominal skin fold was higher than other two skin folds. The skin fold measurements of the subject have presented graphically in Figure-1. The mean value of CVE and MSE were 1898.42m and 34.05 times/min. The coefficient of Correlation between different skin folds with CVE and MSE have been computed and presented in Table-2 which revealed

that the all the computed *r* values between CVE with the skin folds were negative in nature except for triceps skin fold which was positive. All the coefficient of correlation values between MSE with skin folds were negative in nature. However the relation between sum of skin folds (SSK) with CVE and MSE were negative in nature. But table-2 also revealed that all the computed mean value in this study was not statistically significant in 0.05 level.

Table 1: Descriptive statistics for CVE, MSE and selected skin folds

Variables	CVE	MSE	Skin Folds			
			Abd.	Spl	Tri	SSK
Mean	1898.42 m	34.05	13.25 mm	11.45 mm	11.85 mm	36.55 mm
SD	194.57	5.21	2.76	3.29	2.92	7.42
N	40	40	40	40	40	40

Table 2: Coefficient of Correlation between CVE and MSE with selected skin folds

Variables	Skin Folds			
	Abd.	Spl	Tri	SSK
CVE	-0.20743	-0.16858	0.078385	-0.1211911
MSE	-0.21983	-0.27253	-0.05542	-0.2245764
Remarks	Not significant statistically [#]			

[#]CR of *r* at 35 df = 0.325

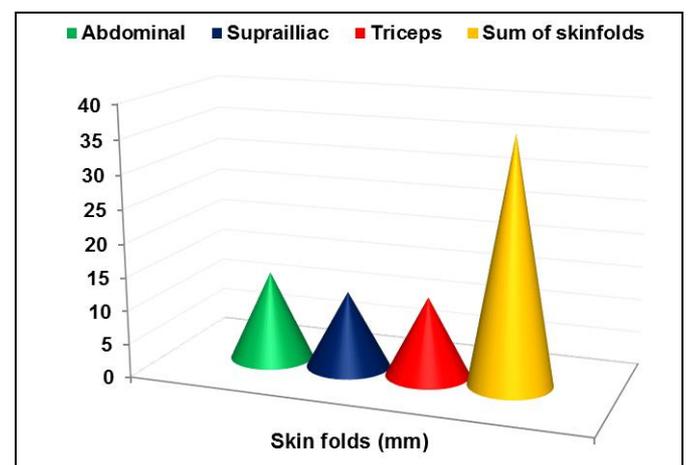


Fig 1: Comparison of means of the different skin folds for the subject

Exercise is beneficial to achieve good health. Cardiovascular endurance is considered as important health related component for both women and men in all stages of life specially in adult and older stage. In present study it has been found that adult women who were participating physical activity on regular basis had higher level of CVE and MSE, thus had higher health status in respect of aerobic capacity. They also had lower risk of several hypo kinetic diseases. Study reported that participating in moderate aerobic exercise is helpful to develop VO₂ max, other physiological capacities and health related fitness components [3]. Present study also found that the active women were participating regular physical exercise and had higher level of cardio vascular endurance and muscular strength endurance.

Present study tried to find out the relationship between subcutaneous body fat with CVE and MSE. Research on physical performance capacity of obese person found that excess fat hindered performance of jumping, agility and endurance activities. Tyagi (2001) conducted a study on this and reported that excess fat is detrimental to physical performance and work capacity.[14] González-Gross *et al.*, (2003) conducted a study on Spanish adolescents and reported a negative association between body fat and physical fitness.[15] Present study also found that there were no significant correlation between selected skin folds with CVE and MSE. Further no significant correlation ship has been observed between sum of skin folds with CVE and

MSE. Several studies in this area have reported the negative influence of body fat on sports and physical performance. Barbara et al. (2002) in their study reported that fat mass negatively influenced some domains of physical performance and overall functioning^[16]. In other study it has also been reported that the average performance of the athletes decreased dramatically as the body fat increased above 19% in females (McLeod, 1983). The ideal body composition varies with different activities, but it may be interpreted here that in general, greater the fat mass, lesser the physical performance.^[17] Nogueira *et al.* (2016) found that the VO₂max was negatively correlated with age, BMI, Waist Circumference and Body Adiposity Index (BAI) and cardio-respiratory fitness was lower in the obese compared with the non-obese for all age categories^[18].

Conclusion

On the basis of above findings it was concluded that the study observed a negative correlation between skin fold fat with cardio vascular endurance (CVE) and muscular strength endurance (MSE), however, the correlation was not significant statistically. Further study with large number of sample is recommended on this aspect for the concrete inference.

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