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## Comparative effects of aerobic fitness test on selected physiological variables on different surfaces in young soccer players

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### Abstract

The purpose of the study was to compare the effects of aerobic fitness test on selected physiological variables on different playing surfaces. Total 50 subjects on the basis of Purposive sampling technique of age 15 to 19 years were selected as a subject from different schools of Gwalior. All the subjects were divided into two different groups' i.e. grass surface (25) and treadmill (25). To compare the effects of aerobic fitness test on selected physiological variables on different playing surfaces the Analysis of Variance (ANOVA) was employed and found significant effects on VO<sub>2</sub> max, Respiratory rate, and diastolic pressure and found insignificant effects on Systolic blood pressure and Heart rate at 0.05 level of significance.

**Keywords:** VO<sub>2</sub> max, respiratory rate, diastolic pressure, systolic blood pressure and heart rate

### Introduction

“Sports science is the application of scientific principles to the promotion, maintenance, and enhancement of sports and exercise-related behavior”. It mainly refers to the mental exertion and physical activity, carried out to maintain mental and physical fitness. Moreover, develops the student's cognitive and psychomotor abilities for learning lifetime. The purpose mainly serves the athlete in maximizing his/her perspective with the least risk of injury. Sports exercise and health science primarily focus on testing the athletes scientifically during the phase of competition season, pre-season and off season. Sports science has a component of physical fitness which focuses on aerobic capacity, muscle endurance, muscle strength, agility, and speed.

Research has beautifully helped in coming across varieties of researchers that have been conducted towards the field of sports and it has contributed and assisted us to comprehend physiology, psychology along with biomechanics of the athlete while performing sports. Gathering of data like facts, evidence and information for the progression of knowledge which includes research can be exploring or creative and also it helps us to find the root cause of linked elements of a process.

“Through research life has made innovative discoveries and progress in the fields of medicine, nutrition, and health. All these things have improved the life anticipation and health conditions of the human race in all parts of the world”

Physiological variables like heart rate, blood pressure, and Vo<sub>2</sub> max play a vital role in physical exertion and also in our daily life. It is very important to keep track of blood pressure and heart rate to maintain good health. “Heart rate is usually called your pulse, which is the number of times your heart beats each minute (bpm)”. Heartbeat's rhythm and strength can be noted and it is viewed on the monitor. “Blood pressure is the force exerted by the blood against your arteries”. “Aerobic fitness refers to your ability to transport and utilize oxygen, measured by VO<sub>2</sub> Max, the maximal amount of oxygen you can use during intense exercise”. The heart and lungs act as a vital character and supply oxygen to the muscles via the blood stream. The cells of the muscles have the ability to extract oxygen from the blood and it's used for the production of ATP, which is the unit of energy.

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Aerobic fitness is the blood pumped by the heart and the amount of oxygen used to transport to the working muscles of the body. The production of aerobic energy in our body is from the mitochondria of the muscle cells with the help of fats and carbohydrates. Aerobic metabolism is controlled by mitochondria which function as a factory for energy. “High-intensity exercise that challenges your aerobic limit has a more profound effect on mitochondria adaptations and oxygen extraction than low-to moderate-intensity activity, according to Olympic coach David Joyce of peak performance”

**Methodology**

**Selection of subjects**

The present study considered twenty-five male football (soccer) players as the participant. The participants who were considered to be a part of this study had been going under sports training for a specific period, which shows the participants fitness level. The objectives of the study were clarified and enlightened to the participants who wished to be a part of this research study. The participants aged 17±2 years old.

**Selection of Variables**

1. Independent variables: Different surface (treadmill and natural grass)
2. Dependent variable: Heart rate, Systolic blood pressure, Diastolic blood pressure, Vo2max and respiratory rate

**Criterion measures**

1. Performance of copper’s 12 minutes run and walk was used to measure the physiological variable.
2. The apparatus digital blood pressure monitor was used to measure the heart rate and blood pressure.
3. Respiratory rate was measured by counting number of breaths per minute.
4. An estimation of the VO<sub>2</sub> max is calculated as : (Distance covered in meters - 504.9) ÷ 44.73

**Statistical Procedure**

To figure out the difference between Natural Grass surface and Treadmill, One way of ANOVA was used with the help of (SPSS) Statistical Package for Social Science version 20. To test the experimental hypothesis the significance level was fixed at 0.05 levels.

**Findings**

To determine the significant variance between the two experimental groups (Natural Grass surface & Treadmill) one shot of data was collected. After, the collection of data the scores of the participants were analyzed by using One Way of ANOVA. For each variable, the results of this present study were presented in tabular form.

**Descriptive statistics**

**Table 1:** Illustrates the descriptive statistics of selected physiological variables in two experimental groups (Natural Grass surface & treadmill)

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Heart Rate	Treadmill	25	135.8000	13.60760	2.72152	130.1831	141.4169	109.00	154.00
	Natural Grass	25	138.6400	8.56290	1.71258	135.1054	142.1746	128.00	157.00
	Total	50	137.2200	11.34306	1.60415	133.9963	140.4437	109.00	157.00
Systolic pressure	Treadmill	25	137.8800	12.66004	2.53201	132.6542	143.1058	103.00	156.00
	Natural Grass	25	141.4800	8.81816	1.76363	137.8400	145.1200	124.00	158.00
	Total	50	139.6800	10.94968	1.54852	136.5681	142.7919	103.00	158.00
Diastolic pressure	Treadmill	25	79.7600	14.23692	2.84738	73.8833	85.6367	54.00	98.00
	Natural Grass	25	89.8800	11.07294	2.21459	85.3093	94.4507	72.00	107.00
	Total	50	84.8200	13.61825	1.92591	80.9497	88.6903	54.00	107.00
Respiratory Rate	Treadmill	25	37.6400	5.83724	1.16745	35.2305	40.0495	28.00	48.00
	Natural Grass	25	42.4000	8.73689	1.74738	38.7936	46.0064	26.00	58.00
	Total	50	40.0200	7.73671	1.09414	37.8213	42.2187	26.00	58.00
VO2 MAX	Treadmill	25	39.7292	6.35867	1.27173	37.1045	42.3539	30.07	50.19
	Natural Grass	25	32.0756	7.92175	1.58435	28.8057	35.3455	22.25	46.84
	Total	50	35.9024	8.09220	1.14441	33.6026	38.2022	22.25	50.19

**Table 2:** Represents the use of ANOVA test on physiological variables in young soccer players.

		Sum of Squares	Df	Mean Square	F	Sig.
Heart Rate	Between Groups	100.820	1	100.820	.780	.382
	Within Groups	6203.760	48	129.245		
	Total	6304.580	49			
Systolic pressure	Between Groups	162.000	1	162.000	1.361	.249
	Within Groups	5712.880	48	119.018		
	Total	5874.880	49			
Diastolic pressure	Between Groups	1280.180	1	1280.180	7.871	.007
	Within Groups	7807.200	48	162.650		
	Total	9087.380	49			
Respiratory Rate	Between Groups	283.220	1	283.220	5.130	.028
	Within Groups	2649.760	48	55.203		
	Total	2932.980	49			
VO <sub>2</sub> MAX	Between Groups	732.220	1	732.220	14.192	.000
	Within Groups	2476.482	48	51.593		
	Total	3208.702	49			

The table no.2 shows the significant difference in VO<sub>2</sub> max, Respiratory rate, and diastolic pressure, whereas it shows insignificant difference in Systolic blood pressure and heart rate. As the p-values of VO<sub>2</sub> max, Respiratory rate and diastolic pressure are less than the level of significance, so there is a significant difference in VO<sub>2</sub> max, Respiratory rate, and diastolic pressure.  $p < 0.05$ ,  $0.000 < 0.05$ ,  $0.028 < 0.05$  and  $0.007$ ,  $0.05$  shows the significant difference. The p-value of Systolic blood pressure and Heart rate is greater than the level of significance,  $p > 0.05$ , which shows the insignificant difference.

### Discussion of findings

The present study's results are obtainable in tabular form for each physiological variable above. Table 1 which is presented above is based on descriptive statistics clearly states the mean and standard deviation of each physiological variable. The Table 02 above shows one way of ANOVA test which was used to determine the level of significance. The selected physiological variables are arranged in tabular form and the level of significance is found. There is gradually a decrease in the physiological variables on two surfaces.

As the value was set at 0.05 levels the significance level of two selected physiological variables (Systolic blood pressure and Heart rate) was higher than the significant level (0.05) which directly illustrates insignificant variance. The standard deviation of heart rate, systolic and diastolic blood pressure deviates far away from its mean, it displays the data is scattered far away. The standard deviation of Vo<sub>2</sub> max and respiratory rate is less scattered from its mean, it doesn't deviate far away from its mean.

With the help of further researcher, there was a significant variance amongst two experimental groups. Furthermore, Rocco Di Michele (2009) [8] did the study to compare the physiological response of soccer players which was to determine the lactate thresholds on different surface Treadmill and Natural Grass. The study conducted showed that the heart rate and Lactate threshold displayed no significant variance between Treadmill and Natural Grass.

The findings of the study were supported by "Mr. Manoj Singh Rana Asstt. Prof" 2012 where he found that the Vo<sub>2</sub> max and vital capacity is higher in male badminton players. "Dr. A. Manoj Kumar & Dr. C. Manoj Assistant Professor" 2017 the study showed the significant relationship of selected physiological variables such as diastolic and systolic blood pressure, resting heart rate and breath holding time showing the playing ability of male soccer players.

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