Effect of Treadmill Running under Varied Inclinations on Selected Cardiopulmonary Fitness Variables among Intercollegiate Athletes

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Abstract

The purpose of the study was to find out the effect of treadmill running under varied inclinations on selected cardiopulmonary fitness variables among athletes. To achieve the purpose, thirty athletes were selected at random from the colleges in Chennai district in the age group of 18 to 28 years. The selected thirty athletes were randomly assigned into two groups namely, experimental group and control group each consisting of fifteen subjects. The subjects were given treadmill running for a period of twelve weeks. The subjects were tested on the selected cardiopulmonary fitness variables namely, Vo2 Max., inspiratory capacity (IC), total lung capacity (TLC), and vital capacity (VC). After the experimental period, the collected data was analysed by using analysis of covariance. The level of significance was fixed at 0.05 level. The results showed that the twelve weeks of treadmill running under varied inclinations had a significant improvement on the selected cardioraspiratory fitness variables namely, Vo2 Max. inspiratory capacity (IC), total lung capacity (TLC), and vital capacity (VC).

Key words: Treadmill running and Cardio respiratory fitness

Introduction

Treadmill running at an inclination of 1% to 2% is equal to over ground running. Treadmill running at an inclination above 3% resembles uphill running. Two hand kettle ball exercise and grade tread mill running had similar effects on improving blood pressure and cardiopulmonary endurance **(Thomas et al. 2014).** Sport training exercises induce physiological adaptations that enhance athletic performance **(Mujika and Padilla, 2000a; Mujika and Padilla, 2000b).** Vo2 Max is the highest rate of oxygen consumption attainable during maximal or exhaustive exercise **(Wilmore and Costill, 2005).** The inpiratory capacity

is the total amount of air that can be inspired after a tidal expiration. The inspiratory capacity is the sum of tidal volume and inspiratory reserve volume **(White, 2012).** Total Lung capacity is the combination of all lung volumes **(White, 2012).** Total lung capacity is the amount of air present in the lungs after a maximal inspiration. It is the sum of tidal volume + inspiratory reserve volume + expiratory reserve volume + residual volume **(Sanghani, 2012).**

Vital capacity is the maximum amount of air that can be expired after a maximum inspiratory effort. It is the sum of Tidal volume, Inspiratory reserve volume, and expiratory reserve volume **(White, 2012).**

Vital capacity is the maximum volume of air which can be forcefully expelled after maximum inspiration **(Sanghani, 2012).** Vital capacity is more in athletes **(Sanghani, 2012).** Vo2 Max is the highest rate of oxygen consumption attainable during maximal or exhaustive exercise **(Wilmore and Costill, 2005).**

The athletes run on various surfaces to improve their physical fitness. Countries like India, particularly in Chennai metropolitan city, college athletes practice in their college track/play fields to improve their physical fitness. During rainy season, unlike developed countries, a very few synthetic track and indoor play fields are available in Chennai. The available synthetic track and indoor play fields are restricted only to elite athletes. The treadmill running is the only weapon for the athletes during rainy season to improve their physical fitness. There are a very few research studies conducted in the area of effect of treadmill running under varied inclinations on the cardiopulmonary fitness variables. Hence, the investigator was interested to find out the effect of treadmill training under varied inclinations on the selected cardiopulmonary fitness variables. The purpose of the study was to find out the effect of treadmill running under varied inclinations on selected cardiopulmonary fitness variables among athletes.

Method

Thirty (N-30) athletes were selected at random from the colleges in Chennai district. Their age ranged between 18 and 28 years. The selected thirty athletes were randomly assigned into two groups namely, experimental group and control group each consisting of fifteen (n-15) subjects.

Table-I

Demographic profile of the subjects

	Age	Height	Weight
Mean	22.33	1.70	66.1
S.D±	±2.56	±0.03	±2.56
Minimum	18	1.65	62
Maximum	28	1.77	70

Variables

The cardiopulmonary fitness variables namely, Vo2 Max. inspiratory capacity (IC), total lung capacity (TLC), and vital capacity (VC) were chosen as dependent variables.

Procedures

The subjects were given treadmill running under varied inclinations for a period of twelve weeks. The treadmill training was designed based on the FITT formula. The treadmill training was given three days a week on alternative days of a week. The training session was scheduled in the morning between 6.30 a.m. and 7.45 a.m. The grade of the treadmill was kept at zero level during warm up. The total duration of the training was 75 minutes. Fifteen minutes was given for warm up and fifteen minutes was given for cool down. The subjects performed treadmill training for a period of 45 minutes. The initial inclination was kept at 2% for a period of 15 minutes. The inclination was fixed at 3% between 15 and 25 minutes of treadmill running. The subjects ran at an inclination of 4% between 25 and 35

minutes. The final phase of treadmill running between 35 and 45 minutes was run at an inclination of 5%. The intensity (speed) was increased once in every four weeks. Initially, the subjects were asked to run at a speed of 9 km/hr on the treadmill (1st, 2nd, 3rd week and 4th week). 1km/hr was increased on every progression. The subjects were tested on the selected cardio respiratory fitness variables namely, Vo2 Max. (Cooper's 12 minute run/walk test), inspiratory capacity (IC), total lung capacity (TLC), and vital capacity (VC), (Spirometry) before and after the training period. The training schedule is given in table-II

Table-II

Training schedule

Frequency	Intensity	Time	Type
3 days a week	➤ 9km/hr (1st, 2nd, 3rd and 4th week) (3% inclination 15 minutes, 4% at 15 and 25 minutes, 4% at 25 and 35 minutes, 5% at 35 and 45 minutes) ➤ 10km/hr (5th, 6th, 7th and 8th week) (3% inclination 15 minutes, 4% at 15 and 25 minutes, 4% at 25 and 35 minutes, 5% at 35 and 45 minutes) ➤ 11km/hr (9th, 10th, 11th, and 12th week) (3% inclination 15 minutes, 4% at 15 and 25 minutes, 4% at 25 and 35 minutes, 5% at 35 and 45 minutes)	75 minutes (15 minutes each for warm up and cool down and 45 minutes for treadmill running)	Treadmill running under varied inclinations

Statistical analysis

After the experimental period, the collected data was analysed using analysis of covariance (ANCOVA) statistical procedure. The level of significance was fixed at 0.05 level.

Results

Table-III
Results on Vo2 Max (ml/kg/min)

Test	Experimental Group	Control Group	SV	SS	df	MS	F
Pre test	50.93	50.40	between	2.13	1	2.133	0.24
			within	246.53	28	8.80	
Post test	53.80	50.33	between	90.13	1	90.13	10.80*
			within	233.73	28	8.35	
Adjusted	53.55	50.59	between	65.19	1	65.19	146.56*
			within	12.01	27	0.44	

*Significant at 0.05 level   Table value with df 1, 27, 4.21

The pre test F value on the means of experimental group and control group 0.24 was lesser than the required table F value of 4.21 which reveals that there was no significant difference between the groups at the base line. The F value of post test means and adjusted means of experimental group and control group 10.80, and 146.56 respectively were higher than the required table F value of 4.21. Hence, there was a significant difference between experimental group and control group on Vo2 Max.

Table-IV

Results on Inspiratory Capacity (ml)

Test	Experimental Group	Control Group	SV	SS	df	MS	F
Pre test	3858.87	3861.40	Between	48.13	1	48.133	0.07
			Within	20329.33	28	726.05	
Post test	3880.67	3838.47	Between	13356.30	1	13356.30	3.19
			Within	117245.07	28	4187.32	
Adjusted	3882.02	3837.11	Between	15090.28	1	15090.28	4.33*
			Within	94001.79	27	3481.55	

*Significant at 0.05 level   Table value with df 1, 27, 4.21

The pre test F value on the means of experimental group and control group 0.07 was lesser than the table required F value of 4.21 which reveals that there was no significant difference between the groups at the base line. The F value of post test means 3.19 was lesser than the table F value 4.21. But the ordered adjusted means of experimental group and control group 4.33 was higher than the required table F value of 4.21. Hence, there was a significant difference between experimental group and control group on inspiratory capacity (IC).

Table-V

Results on Total Lung Capacity (ml)

Test	Experimental Group	Control Group	SV	SS	df	MS	F
Pre test	6169.67	6172.20	Between	48.13	1	48.133	0.01
			Within	137935.73	28	4926.28	
Post test	6221.67	6144.33	between	44853.33	1	44853.33	5.51*
			Within	228120.67	28	8147.17	
Adjusted	6222.90	6143.10	between	47737.87	1	47737.87	13.17*
			within	97859.89	27	3624.44	

*Significant at 0.05 level
Table value with df 1, 27, 4.21

The pre test F value on the means of experimental group and control group 0.01 was lesser than the required table F value of 4.21 which reveals that there was no significant difference between the groups at the base line. The F value of post test means and adjusted means of experimental group and control group 5.51, and 13.17 respectively were higher than the required table F value of 4.21. Hence, there was a

significant difference between experimental group and control group on total lung capacity (TC).

Table-VI

Results on Vital Capacity (ml)

Test	Experimental Group	Control Group	SV	SS	df	MS	F
Pre test	4909.60	4912.13	Between	48.13	1	48.133	0.02
			Within	61833.33	28	2208.33	
Post test	4948.07	4890.67	between	24710.70	1	24710.70	4.29*
			within	161344.27	28	5762.30	
Adjusted	4949.37	4889.37	between	26980.27	1	26980.27	7.58*
			within	96142.81	27	3560.84	

*Significant at 0.05 level
Table value with df 1, 27, 4.21

The pre test F value on the means of experimental group and control group 0.02 was lesser than the required table F value of 4.21 which reveals that there was no significant difference between the groups at the base line. The F value of post test means and adjusted means of experimental group and control group 4.29, and 7.58 respectively were higher than the required table F value of 4.21. Hence, there was a significant difference between experimental group and control group on vital capacity (VC).
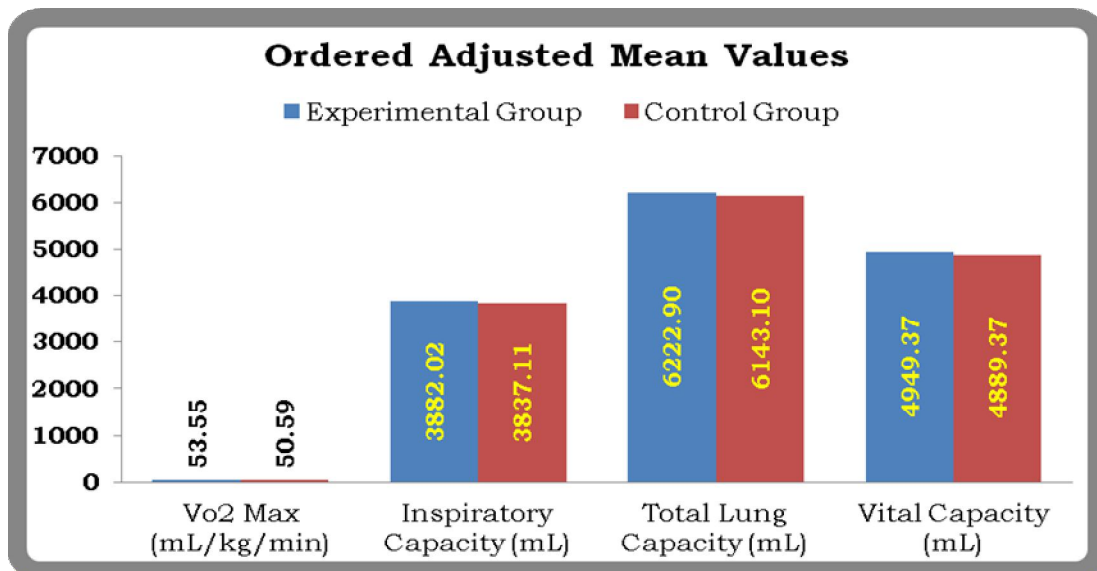
Figure-1

Ordered Adjusted Mean Values

Figure-1 shows the ordered adjusted mean values of the selected cardiopulmonary fitness variables of experimental group and control group. From the results of the study, it is understood that the treadmill running under varied inclinations had a significant improvement on the selected cardiopulmonary fitness variables namely Vo2 Max., inspiratory capacity (IC), total lung capacity (TLC), and vital capacity (VC). The result of the present study is in line with the study of **Hulsey, Soto, Koch, and Mayhew (2012).** The treadmill running under varied inclinations helped the athletes to improve their cardiopulmonary fitness variables.

Conclusions

It was concluded that the twelve weeks of treadmill training under varied inclinations had a significant improvement on the selected cardiopulmonary fitness variables namely, Vo2 Max. inspiratory capacity (IC), total lung capacity (TLC) and vital capacity (VC) among intercollegiate level athletes.

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