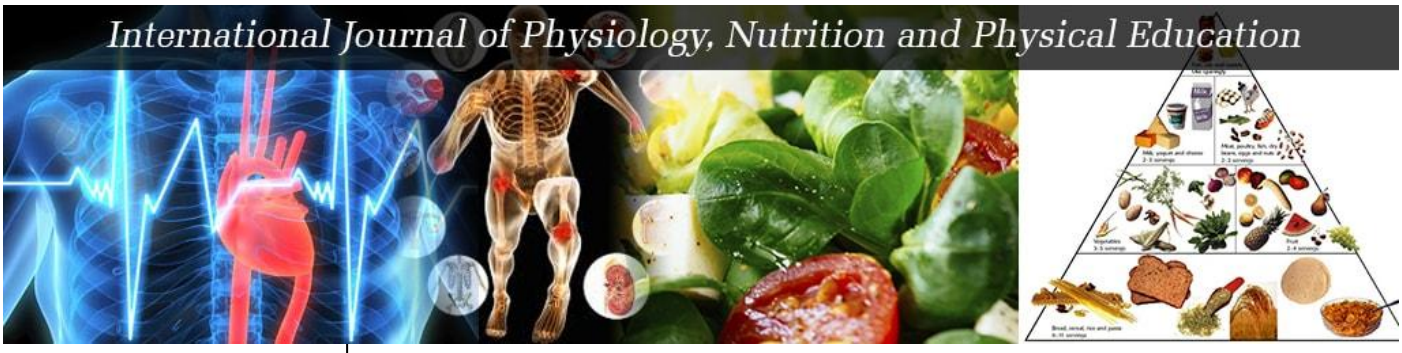

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Javead Ahmed Itoo
Ph.D Full Time Research Scholar, Alagappa University College of Physical Education Karaikudi, Tamil Nadu, India

Dr. C Vairavasundaram
Assistant Professor, Alagappa University College of Physical Education, Karaikudi, Tamil Nadu, India

Correspondence
Javead Ahmed Itoo
Ph.D Full Time Research Scholar, Alagappa University College of Physical Education Karaikudi, Tamil Nadu, India

Influence of high altitude training on selected physical fitness variables on long distance runners

Javead Ahmed Itoo and Dr. C Vairavasundaram

Abstract
The purpose of the study was to find out the influence of high altitude training on selected physical fitness variables on long distance runners. To achieve the purpose of the study thirty long distance runners from affiliated colleges of Kashmir University, Srinagar were selected at random and their age ranged from 18 to 28 years. The subjects were divided into two equal groups of fifteen each. Group I acted as Experimental Group High altitude training given Gulmarg and Group II acted as Control Group. The requirement of the experiment procedure testing as well as exercise schedule was explained to the subjects so as to get full co-operation of the effort required on their part and prior to the administration of the study. The study was formulated as a post test only random group design. The duration of experimental period was 8 weeks. After the experimental treatment, all the subjects were tested on their physical fitness variables. This final test scores formed as post test scores of the subjects. The post test scores were subjected to statistical analysis using independent 't' test. In all case 0.05 level of confidence was fixed to test hypotheses. The High Altitude training, both in natural/terrestrial and artificial conditions, has been established as an effective means to improve on speed, agility, muscular endurance and coordination among long distance runners after undergoing high altitude training for a period of 8 weeks.

Keywords: High altitude training, physical fitness, long distance runners.

Introduction
Ben Levine, M.D (2016) When refer to "high altitude" we generally mean 7,000 to 8,000 feet above sea level or higher. Low altitude is approximately 4,000 feet above sea level or lower. In high-altitude environments, you draw in less oxygen per breath than you would at lower altitudes. That means each breath will deliver less oxygen to your muscles. This may sound like a negative thing, but living in higher altitudes and getting used to breathing "thinner" air can enhance elite athletes' athletic performance in competitions at lower altitude. During workouts at high altitude, athletes feel like they're putting forth more effort to perform as well as they do closer to sea level. The increased rate of perceived exertion is caused by altitude-induced hypoxia, which is a decrease in the amount of oxygen being delivered to the muscles to burn fuel and create energy.

Altitude and hypoxic training is common among endurance athletes and recommended by many coaches for potential benefits during subsequent competition at or near sea-level. As altitude increases, atmospheric pressure decreases, and although the fractional concentration of oxygen remains the same (20.9%), the partial pressure of oxygen decreases, reducing the amount of oxygen available for delivery to exercising tissues. The selection of an appropriate altitude for training, the daily exposure to moderate altitude and the altitude at which training should occur are all important considerations. A number of factors influence these decisions including the time course of EPO response and RBC production, potential changes in exercise economy, desired training intensity and volume, as well as logistical concerns such as available time and financial costs. In general, living at 2,000–2,500 m while training at 1,250 m or lower for 3–4 weeks with over 12 h of continuous altitude exposure per day appears to be sufficient to improve sea-level performance in most athletes Jacob A. Sinex (2015).

Statement of the problem
The purpose of the study was to find out the influence of high altitude training on selected

physical fitness variables on long distance runners.

Hypothesis

It was hypothesized that there would be significant difference on the physical fitness variables of long distance runners due to high altitude training.

Delimitation

1. The study was delimited to long distance runners male subjects only.
2. In this study, the subjects were selected from Srinagar based on high altitude training in Gulmarg.
3. In this present study, totally thirty long distance runners were selected randomly and treated as subjects.
4. In distribution of samples to experimental group used in the study, the present study was confined to equal number of samples. Thus, each group consisted of 15 subjects. The age of the subjects was confined to the range from 18 to 28 years.
5. The duration of training programme for the present study was confined to 5 days a week with about 8 weeks as total period.
6. The variables were delimited to only physical fitness variables namely speed, agility, co-ordination and muscular endurance.

Limitation

1. Certain factors such as life style, rest period, day to day activities, family factors and food habits will not be taken in to consideration.
2. Socio-economic background was not be taken into consideration.

Review of Related Literature

Jacob *et al*. (2015) assessed the endurance athletic performance is highly related to a number of factors that can be altered through altitude and hypoxic training including increases in erythrocyte volume, maximal aerobic exercise capacity, capillary density, and economy. Physiological adaptations in response to acute and chronic exposure to hypoxic environments are well documented and range from short-term detrimental effects to longer-term adaptations that can improve performance at altitude and in sea-level competitions. Many altitude and hypoxic training protocols have been developed, employing various combinations of living and training at sea level, low, moderate, and high altitudes and utilizing natural and artificial altitudes, with varying degrees of effectiveness. Several factors have been identified that are associated with individual responses to hypoxic training, and techniques for identifying those athletes most likely to benefit from hypoxic training continue to be investigated. Exposure to sufficiently high altitude (2,000–3,000 m) for more than 12 h/day, while training at lower altitudes, for a minimum of 21 days is recommended. Timing of altitude training related to competition remains under debate, although general recommendations can be considered.

Methodology

The purpose of the study was to find out the influence of high altitude training on selected physical fitness variables on long distance runners. To achieve the purpose of the present study, thirty long distance runners from affiliated colleges of Kashmir University, Srinagar were selected at random and their age ranged from 18 to 28 years. The subjects were divided into two equal groups of fifteen each. Group I acted as Experimental Group (High altitude training given Gulmarg) and Group II acted as Control Group. The study was formulated as a posttest only random group design. The duration of experimental period 8 weeks. After the experimental treatment, all the subjects were tested on their physical fitness variables. This final test scores formed as post test scores of the subjects. The post test scores of control and experimental group were subjected to statistical analysis using independent 't' test. In all case 0.05 level of confidence was fixed to test hypotheses.

Table 1: Variables & Test Selection

S. No	Variables	Tests	Units
1	Speed	30 Meters Run	Seconds
2	Agility	Shuttle Run	Seconds
3	Co-ordination	Alternate Hand Wall Toss Test	Numbers
4	Muscular Endurance	Sit Ups	Numbers

Results and Discussion

Table 2: Post Test Score of Control Group and Experimental Group on Selected Physical Fitness Variables

S. No	Variables	Control Group posttest mean	Experimental Group posttest mean	Mean difference	Std Dev (±)	^{a}DM	't' Ratio
1	Speed	5.06	4.65	0.41	0.12	0.03	12.91*
2	Agility	12.30	11.13	1.16	0.46	0.12	9.64*
3	Co-ordination	24.26	31.53	7.26	2.98	0.77	9.42*
4	Muscular Endurance	45.26	51.20	5.93	3.73	0.96	6.15*

Table II showed the obtained 't' ratio values of posttests mean difference in the selected variable of speed (12.91), agility (9.64), co-ordination (9.42), and muscular endurance (6.15). The obtained values when compared with the table value of 2.048 with degrees of freedom (1, 28), it was found to be statistically significant at 0.05 level of confidence. It was observed that the mean gain and loss made from post test were significantly improved the physical fitness variables.

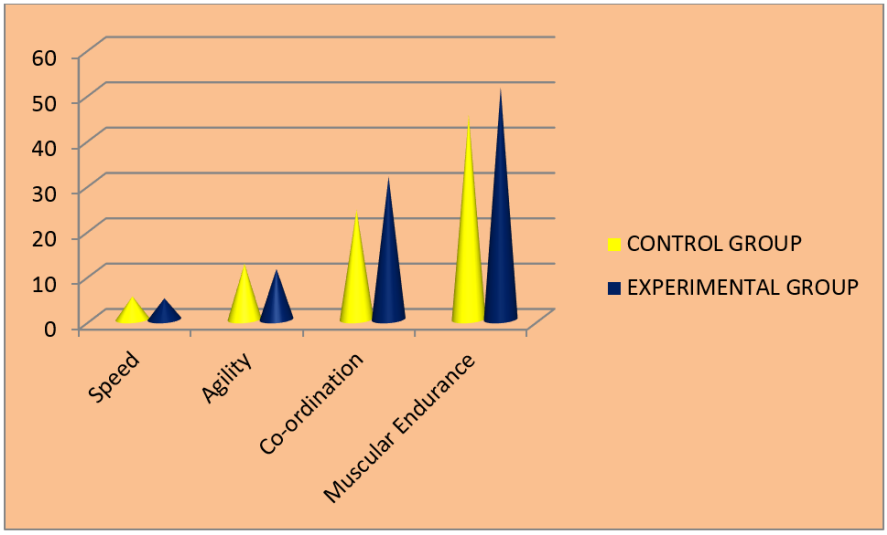

Fig 1: Post Test Differences of the High Altitude Training and Control Groups on Selected Variables

Conclusions

1. The high altitude training had shown significant improvement in speed among long distance runners after undergoing high altitude training for a period of eight weeks.
2. The high altitude training had shown significant improvement in agility among long distance runners after undergoing high altitude training for a period of eight weeks.
3. The high altitude training had shown significant improvement in co-ordination among long distance runners after undergoing high altitude training for a period of eight weeks.
4. The high altitude training had shown significant improvement in muscular endurance among long distance runners after undergoing high altitude training for a period of eight weeks.

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