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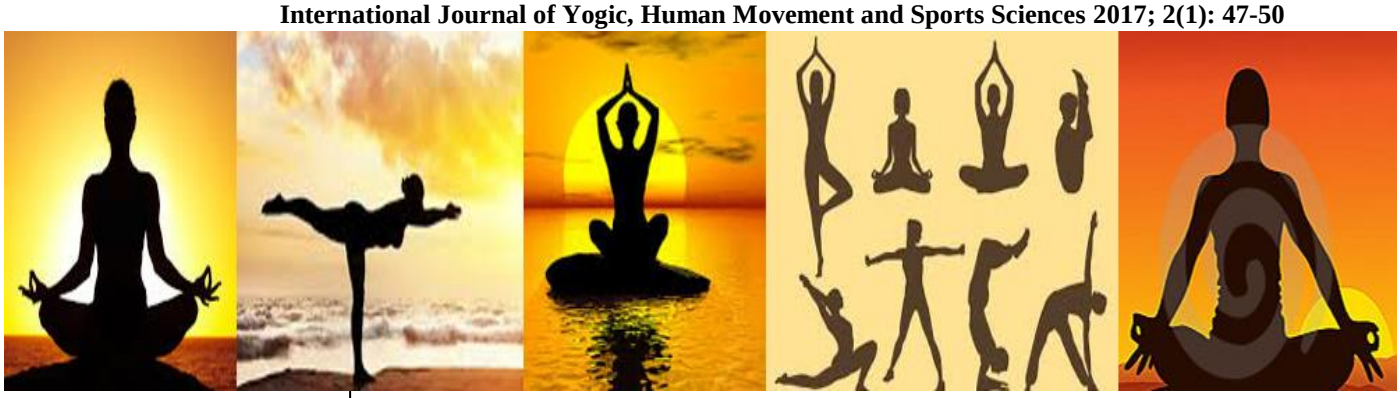

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Impact of high altitude on selected physical fitness variables

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Abstract
The purpose of the study was to find out the impact of altitude training on selected physical Fitness variables.
Methodology: for the present study 30 male students of physical education Department University of Jammu who were enrolled for UG/PG courses and were shortlisted for 10 tracking programme held at leh ladhak. One day before leaving from Jammu Pre test was take on selected physical fitness variables and after completing 10 days tracking programme post test was taken after one day. The study was formulated as a pre and post test single group design. To discover the distinction among Pre and Post trials of every gathering, paired t test was utilized and Analysis of covariance (ANCOVA) was figured at 0.05 level of significance.
Result: The result of the study indicate that the tracking group had shown significant improvement in all selected physical fitness variables.
Conclusion: Study shows that high altitude training improve physical fitness.

Keywords: Yoga, pranayama, aged women, breath holding capacity, vital capacity

Introduction
Sport is the way which we use our physical capacities to play. Sports is an important in other ways, when one's body works better his mind works better, his brain and his body are interrelated. Training is a systematic process of repetitive exercise of work involving learning and acclimatization. Training is the net summation of adaptations induced by regular exercise. Students on the exercises with reference to fitness state that it enables to tolerate more effectively, subsequently stresses of similar nature. The process of stressing the sportsman and his adaptation to this stress is called sports training and it is the mean by which sports performance is improved. The effect of altitude on the human body, especially in relation to training, is gaining more popularity than ever. The many physiological effects of altitude on the body are being investigated much more thoroughly than previous research, especially in athletes who train and compete at altitude (Finaud *et al*. 2006, Pialoux *et al*. 2009). Along with the physiological changes that are happening in the body in response to altitude, there have also been a lot of studies done on different types of altitude training (Del Rio *et al*. 2009). Fitness includes the mental, emotional social as well as the physical aspects and all these components of total fitness play a significant role for a full happy life. Further freedom from disease organic development, efficient movement, alertness of mind emotional maturing and social adjustment provide the frame work fitness.
Proper physical fitness practices lead to a healthy lifestyle. In general, physical stamina and a healthy lifestyle are necessary to meet the vigorous demands of daily living. The benefits of physical fitness are well documented in the literature and are no different for persons with mental retardation than the general population. A successful programme needs to be designed with this balance and the goal in mind. Researchers have been done on many training programmes like aerobic, plyometric, strength, fartlek training etc. However the effect of low altitude training was rarely attempted. So the researcher felt the need to do it, that coaches and athlete can benefit from the training methods that comes as a proof at the end of the study. Though several studies have been conducted on Hockey players with various sports specific training, low altitude training was not studied deeply.

In order to find out the impact of low altitude training on selected physical variables the investigator motivated to take up the study.

Methodology

The purpose of the study was to find out the impact of high altitude training on selected physical fitness components variables namely speed, strength endurance agility and physiological variable namely Cardio respiratory Endurance, The study was formulated as a pre and post test random group design. The study was conducted on 15 male physical education students of university of Jammu who were enrolled for post graduation courses and were selected for 10 days trekking programme held at Leh Ladhak (situated at high altitude). The selected players are active in their specific sports like hockey football and other sports. Vast review is available which suggest that high altitude effect on physical and physiological variables of an individuals. The purpose of the study was to find out the impact of high altitude on selected physical and physiological variables. For this pre test was applied on selected subjects one day before they were leaving to leh and after trekking post test was applied when then reach back to low altitude that is Jammu. The researcher had consulted with the experts, physical education professionals, Reviewed various literatures accessible to him and selected the following test items, which were standardized, appropriate and ideal for the selected variables.

Physical fitness Variables

1. Speed (50 meters) to measure the speed of subjects. The Subjects take their position the starting line. The starter used the command "Ready" and blew the whistle. The latter was accompanied by a downward sweep of the starter's arm as a signal to the timer. On hearing the whistle sound, the subjects started running as fast as possible up to the finishing line. **Scoring:** The Score is the elapsed time to the largest one tenth of a second between the starting and the instant the subject crosses the finish line.

Strength Endurance (Sit ups) To measure the abdominal muscular endurance.T he subjects has lied flat on the back with knees have bent and have a feet on the floor with the heels no more than one foot from the buttocks. The knees angle have to should be no less than 90o degrees. The fingers have interlocked and have placed behind the neck with the elbows touching the floor. The feet have held securely by a partner. The subjects have curled up to a sitting position and touch the chest to, the knees. Scoring The score is the maximum number of sit ups completed in 60 seconds

Agility (Shuttle Run) To measure the agility. To assess agility Two lines parallel to each other are placed on the floor 30 feet apart. Since the student must over run both of these lines, it is necessary to have several feet more of floor space at either end. Two blocks of wood and stopwatches are needed. The student stands at one of the lines with the 2 blocks at the other line. On the signal to start, the student runs to the blocks, takes one, and returns to the starting line, and places the block behind that line. He then returns to the second block, which is carried across the starting line on the way back. Two trials are necessary to return the blocks each race. The score is the elapsed time recorded in seconds and tenths of seconds for the better of 2 trials.

Cardio respiratory Endurance (Cooper's 12 Minutes Run/Walk Test) To assess the cardiovascular endurance of the subjects.For this test, a 400 meters track was prepared with marking at every tenth meter. The investigator and the tests served as the lap scores. The subjects were asked to stand on the starting are drawn at the finish line of the 400 meters track and they were given instructions to cover as much distance as possible by running/walking. They were instructed to continue the run/walk till the final whistle. The race was started with a whistle and at the end of the nine minute again. The whistle was blown. The number of minutes left was announced to the subjects every minute. At the twelfth minute a whistle was blown and the subjects stopped instantly and stood on the spot. The distance covered by each in twelve minutes was recorded to the nearest tenth meter. The distance covered by each subjects were recorded with the help of the lap scores.

Results

Computation of 't' test. The primary objective of the paired 't' ratio was to describe the differences between the pre-test and post-test means of hockey players. Thus the obtained results were interpreted with earlier studies and presented in this chapter well along with graphical presentations.

Table 1: Significance of mean gains & losses between pre and post test scores on selected variables of low altitude training group

S. NO	VARIABLE	Pre-test mean	Post test mean	Mean diff.	Std. dev.	DM	T RATIO
1	SPEED	7.35	7.15	0.20	0.12	0.03	6.12
2	Strength end	35.45	41.20	5.66	2.94	0.76	7.45
3	Agility	12.48	11.73	o.74	0.17	0.04	16.89
4	Cardio respiratory Edn.	1719.40	2142.06	422.66	96.82	25.00	16.90

An examination of table-1 indicates that the Obtained't' ratios were6.12, 7.45, 16.89, for speed, strength endurance, agility, cardio respiratory endurance. The obtained't' ratios on the selected variables were found to be greater than the required table value of 2.14 at 0.05level of significance for 14 degrees of freedom. So it was found to be significant. The results of this study showed that statistically significant and explained its effects positively.

Table 2: Significance of mean gains & losses between pre and post test Scoreson selected variables of post test

S. no	Variables	Pre test Mean	Post test Mean	Mean Diff.	Std. Dev	DM	't' ratio
1.	Speed	7.36	7.35	0.01	0.13	0.03	0.51
2.	Strength Endurence	34.53	34.66	0.13	1.30	0.33	0.39
3.	Agility	12.49	12.56	0.06	0.17	0.04	1.41
4.	Cardio Respiratory Endurence	1730.26	1733.33	3.06	81.93	21.15	0.14

An examination of table-V indicates that the obtained't' ratios were0.51, 0.39, 1.41, 0.14, for speed, strength endurance, agility, cardio respiratory endurance respectively. The obtained't' ratios on the selected variables were found to be

greater than the required table value of 2.14 at 0.05level of significance for 14 degrees of freedom. So it was found to be significant. The results of this study showed that statistically significant and explained its effects positively.

Computation of analysis of covariance

The following tables illustrate the statistical results of the low altitudetraining on selected physical and physiological variables among football players.

Table 3: Computation of analysis of covariance of mean of low altitude training and post test on speed

	LATG	CG	Source of varience	Sum of Squares	df	Means squares	F Ratio
Pre-test Mean	7.35	7.36	BG	0.001	1	0.001	0.13
			WG	0.227	28	0.008	
Post test Mean	7.15	7.35	BG	0.290	1	0.290	33.06
			WG	0.246	28	0.009	
Adjusted Post test Mean	7.15	7.35	BG	0.290	1	0.290	31.90
			WG	0.245	28	0.009	

B- Between Group Means * - Significant
W- Within Group Means (Table Value for 0.05 Level for df 1 & 28 = 4.19)
df- Degrees of Freedom (Table Value for 0.05 Level for df 1 & 27 = 4.21)

The results presented in table3 showed that obtained adjusted means on speed among low altitude training group was 7.15 followed by post test with mean value of 7.35. The differences among pretest scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and the obtained F values were 0.13, 33.06 and 31.90 respectively. It was found that obtained F value on pre test scores were not significant and the obtained F values on post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 4.19 and 4.23. Result showed that there was significant differences exist between the two groups, clearly indicating that low altitude training was significantly better than post test in improving speed of the hockey players. similar results were shown by Paul *et al*. (2015) [2], Sethu (2014), Suresh Kumar (2015).

Table 4: Computation of analysis of covariance of mean of low altitude trainingand post test on strength endurance

	LATG	CG	Sources of variance	Sum of Squares	df	Mean Squares	F-ratio
Pre test Mean	35.53	34.53	BG	7.5	1	7.5	3.53
			WG	59.46	28	2.1	
Post test Mean	41.20	34.66	BG	320.1	1	320.1	69.09
			WG	129.7	28	4.6	
Adjusted post test mean	41.01	34.85	BG	252.9	1	252.9	56.18
			WG	121.5	27	4.5	

B- Between Group Means * - Significant
W- Within Group Means (Table Value for 0.05 Level for df 1 & 28 = 4.19)
df- Degrees of Freedom (Table Value for 0.05 Level for df 1 & 27 = 4.21)

The results presented in table 4 showed that obtained adjusted meanson strength endurance among low altitude training group was 41.01 followed by post test with mean value of 34.85. The differences among pretest scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and the obtained F values were 3.53, 69.09 and 56.18 respectively. It was found that obtained F value on pre test scores were not significant and the obtained F values on post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 4.19 and 4.23.

Result showed that there was significant differences exist between the two groups, clearly indicating that low altitude training was significantly better than post test in improving strength endurance of the hockey players. The study conducted by Zahoor & Karthikeyan (2017), Senthilkumar & Gokulakrishnan (2015) [4], proved that there was an improvement in strength endurance.

Table 5: Computation of analysis of covariance of mean of low altitude trainingand post test on agility.

	LATG	CG	Sources of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre test Mean	35.53	12.49	BG	0.001	1	0.001	0.03
			WG	0.675	28	0.024	
Post Test Mean	41.20	12.56	BG	5.05	1	5.05	292.52
			WG	0.48	28	0.01	
Adjusted Post test Mean	41.01	12.55	BG	5.01	1	5.01	305.3
			WG	0.443	27	0.01	

B- Between Group Means * - Significant
W- Within Group Means (Table Value for 0.05 Level for df 1 & 28 = 4.19)
df- Degrees of Freedom (Table Value for 0.05 Level for df 1 & 27 = 4.21)

The results presented in table 5 showed that obtained adjusted means on agility among low altitude training group was 11.74 followed by post test with mean value of 12.55. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and the obtained F values were 0.03, 292.52 and 305.28 respectively. It was found that obtained F value on pre test scores were not significant and the obtained F valueson post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 4.19 and 4.23. Result showed thatthere was significant differences exist between the two groups, clearly

indicating that low altitude training was significantly better than post test in improving agility of the hockey players. The study conducted by Sethu (2014) [3], Gobikrishnan *et al*. (2014), Thomas (2009) proved that there was an improvement in agility.

Table 6: Computation of analysis of covariance of mean of low altitude trainingand post test on cardio respiratory endurance

	LATG	CG	Sources of Variance	Sum of Squares	df	Means Squares	F-ratio
Pre test Mean	1719.40	1730.2	BG	885.6	1	885.6	0.43
			WG	57400.5	28	2050.01	
Post test Mean	2142.06	1733.3	BG	1242971.03	1	1252972.03	256.55
			WG	*131616.2*	28	4700.5	
Adjusted post Mean	2140.35	1735.04	BG	*12113313.46*	1	12131313.49	260.20
			WG	*125898.90*	27	4662.9	

B- Between Group Means * - Significant
W- Within Group Means (Table Value for 0.05 Level for df 1 & 28 = 4.19)
df- Degrees of Freedom (Table Value for 0.05 Level for df 1 & 27 = 4.21)

The results presented in table 6 showed that obtained adjusted means on cardio respiratory endurance among low altitude training group was 2140.35followed by post test with mean value of 1735.04. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and the obtained F values were 0.43, 266.55and 260.20 respectively. It was found that obtained F value on pre test scores were not significant and the obtained F values on post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 4.19 and 4.23. Result showed that there was significant differences exist between the two groups, clearly indicating that low altitude training was significantly better than post test in improving cardio respiratory endurance of the hockey players. The study conducted by Blake (2013), Ferrari et al. (2008) proved that there was an improvement in cardio respiratory endurance.

Discussion on Findings

The results of the study indicate that the experimental group had shown significant improvement in all selected physical variables among hockey players. Hockey is a most popular and vigorous as well as strenuous game in all over the world. On the coaching point of view the coaches wish to train their players on the basis of scientific principles for better performance. The hockey players were needs a very good physical fitness to play the game without any physical hurdle Every individual player can maintain his fitness level to with stand in the field during the full time play. Hockey players must execute skilled movements under generalized conditions of restricted space, limited time, physical and mental fatigue, and opposing players. One must be able to run many miles during a game, mostly at sprint like speed and respond quickly to a variety of rapidly changing situations during play. Fitness is a very important component of the game. Concentration lapses and skill levels tend to decline when a player is tired. The more soccer endurance the player has, the less chance the player has of making an error due to fatigue. The physical aspects of the game include speed, including acceleration and explosiveness; agility and balance; body control, particularly in jumping and heading the ball; leg strength; and endurance. The development of each of these physical capabilities must be incorporated into the training required to build the individual technical components of play (Luxbacher, 1996). Levine *et al*. (2008) altitude will impact football performance through two separate and parallel pathways related to the hypobaric (physical) and hypoxic (physiological) components of terrestrial altitude Giridharan & Saikumar (2015) examined the effects of high intensity aerobic interval training, concurrent low intensity aerobic and resistance interval training on physiological variables of college level football players.

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