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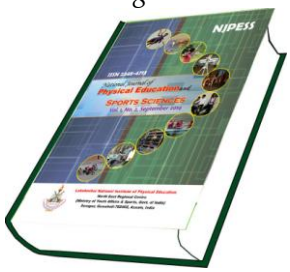

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Editorial

Epicenter Voyage of a Myth Institute-Lakshmibai National Institute of Physical Education
North East Regional Center

Lakshmibai National Institute of Physical Education, NERCis amongst the most admired centers of world-class education to foster academic excellence, physical fitness and research in sports committed to helping scholars, researchers and sports scientist leap into the 21st century. The present endeavor is a tribute to the holy symbol of Lakshmibai National Institute of Physical Education, NERC as the same was long precious aspiration. The journal shall symbolically signify the essence of quality research thereby appropriate in the ambition of the institute. The journal shall offer a much desired platform to publish quality research being undertaken in the whole world on the area in question. The journal shall bring the academicians and researchers from all over the globe to share their accumulated experiences and perceptions in order to realize new scientific and original innovation focused on aspects of the sports sciences and sports performance.

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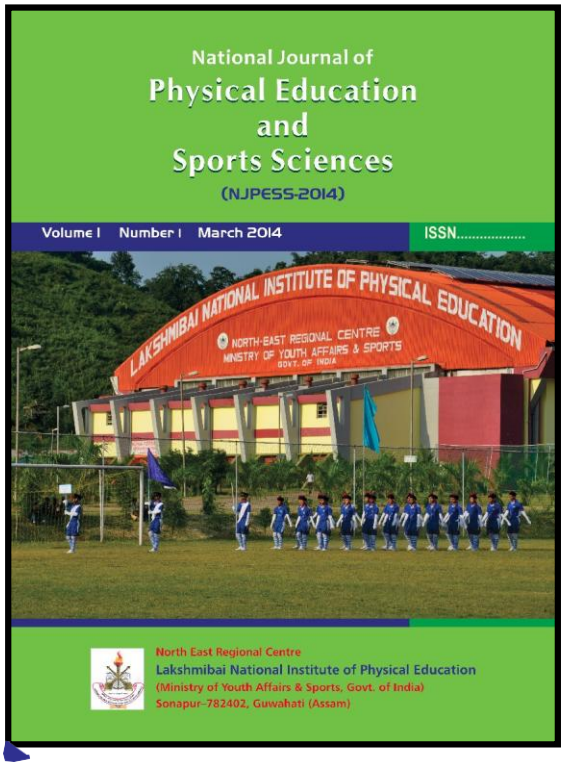

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N J P E S S

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Contents

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A Comparison between Sprinters and Long Distance Runner with in Circulatory Indices

Prof. L.N. Sarkar[1], Prof. Biswajit Basumatry[2] and Satpal Yadav[3]

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ABSTRACT

The purpose of the study was to compare the circulatory indices between sprinters and long distance runners. The subjects were selected from the Lakshmibai National Institute of Physical Education and training centers, who had participated last 3 years at All India Athletic Championship for this study. Twenty (20) sprinters and long distance runners were selected as the subject for the study. Selected circulatory indices such as resting pulse rate, blood pressure (Systolic), blood pressure (Diastolic) and pulse pressure. To see the significant difference of selected circulatory indices variables among the sprinters and long distance runners the analysis of "mean, standard deviation and t test" was applied at.05 level of significance. As per the finding Long distance runners were better than Sprinters on resting pulse rate, blood pressure (Systolic), blood pressure (Diastolic).No significant changes were found in pulse pressure of the Sprinters and Long distance runners. Hence, it can be concluded that the physical activity may help the athletes by involving the adaptation power of their cardio-vascular.

Keywords: *Circulatory Indices, Sprinters, Long Distance Runners*

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INTRODUCTION

By nature human beings are competitive and aspires from excellence in every field. Sport is not an exception, changes are the order of the day. Changes are taking place every day in every walk of life. Life of people, their philosophy, ways of living etc. are undergoing changes due to basic and applied research in various fields. New techniques are developed in laboratories and scientific methods are applied to obtain the level of performance. Sports by their very nature are enjoyable, challenging, absorbing and require a certain amount of skill and physical condition (Seaton *et al*., 1956)

With all round advancement in the science of sports the new disciplines are emerging with micro-specialization. The elements, of scientific basis of selection are being inducted in the procedure of selection of athletes at various levels in some of the advanced countries. The knowledge from many scientific disciplines is being used for improving criteria for the selection of talents. The physical educationists have designed test procedures for evaluating the fitness of young children.

Among all the factors, the physiological characteristics play an important role for the attainment of high level sports performance. Among the various physiological parameters, cardiovascular efficiency forms the basis to undertake sports efforts successfully.

Cardio-vascular efficiency reflects the capacity of an individual to undertake and continues physical efforts of sub-maximal nature for a relatively longer period of time. To measure cardio-vascular efficiency, tests of physical works capacity and VO_2 max have been developed to use in laboratory and field situations to assists the scientist, physical educators and coaches (Daniel, 1985).

MATERIALS AND METHODS

Participants

A group of forty (N = 40) male All India Athletic Inter university level in the Sprinting and long distance running event were in this study. The subjects were divided into two groups. i.e., sprinters and long distance runners. Each group comprised of 20 subjects. The average age of the students ranged from 21 to 24 years. For measuring the breath holding time, resting respiratory rate and pulse rate, the stop watches were used. The suppliers, Krishna Watch Company, Mumbai, assured the accurate calibration of there watches. Blood pressure of the subjects was measured using Stethoscope and Sphygmomanometer. The equipments were manufactured by a competent form, Biological concern, Kalkota. Thus the instrument reliability was assumed.

The subjects were clearly informed and well acquainted with the requirement of the study and the testing procedure. The testing on variables was conducted at the human performance Laboratory of Lakshmibai National Institute of Physical Education, NERC, Guwahati. The entire testing procedure took about 4 days.

The collected data were statistically analyzed using Medcalc software. Student's t-test was used to assess the between group differences. The level of $p \leq 0.05$ was considered significant.

RESULTS

The mean value of circulatory indices of sprinters and long distance runners is presented in Table 1.

It is seen from the table 1 that the mean values of resting pulse rate and pulse pressure were lower for sprinters and higher in Long distance runners. Blood pressure (Systolic), blood pressure (Diastolic) is lower for sprinters and higher in Long distance runners. So it is understood that the resting pulse rate and pulse pressure is better in Long distance runners than sprinters and blood pressure (Systolic) and blood pressure (Diastolic) is better in sprinters than Long distance runners.

It is clear from the table value that resting pulse rate, blood pressure (Systolic), blood pressure (Diastolic) has been significant difference between Sprinters and Long distance runners. Pulse pressure has been found insignificant difference between Sprinters and Long distance runners, since the computed value of t for all the dimensions were greater than the tabulated t.05 (19) =2.02 except pulse pressure (t=0.75). Thus it may be concluded that the all the circulatory indices except pulse pressure among Sprinters and Long distance runners sportsmen found to be statistically significant.

Figure 1 Indicate the Mean values (±SD), standard error of the mean and test statistic t of pulse rate, blood pressure (Systolic), blood pressure (Diastolic) and pulse pressure of Sprinters and Long distance runners (N = 20).

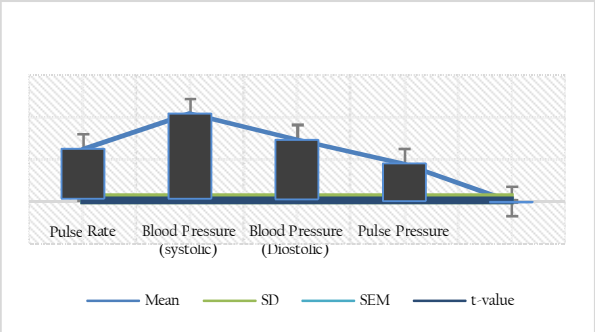

Fig. 1: Circulatory Indices of Sprinters and Long Distance Runners

DISCUSSION

The calculation of circulatory indices has shown that there was a significant difference on resting pulse rate, blood pressure (Systolic), blood pressure (Diastolic) between Sprinters and Long distance runners. Pulse pressure has been found insignificant difference between Sprinters and Long distance runners, since the computed value of t for all the indices were greater than the tabulated t.05 (19) =2.02 except pulse pressure (t=0.75). Thus it may be concluded that all the circulatory indices except pulse pressure among Sprintersand Long distance runners found to be statistically significant.

As per the finding Long distance runners were better than Sprinters on resting pulse rate, blood pressure (Systolic), blood pressure (Diastolic), the finding of this study is supported by the finding of Oring and Jamison.

The finding of Moutis are in disagreement with the Finding of this investigation that of having insignificant difference on pulse pressure. These reasons could be attributed to not getting significant differences on the indices as mentioned above.

Table 1: The Significant of Mean Difference, Standard Error of the Mean and Test Statistic t of on Circulatory Indices of Sprinters and Long Distance Runners

Group Variable	Mean		SD		SEM		T-value	P-value
	Sprinters	Long Runners	Sprinters	Long Runners	Sprinters	Long Runners		
Resting Pulse Rate(RPR)	62.7	58	4.46	6.40	1.32	1.10	3.18*	0.05
Blood Pressure (Systolic)	105.1	108.7	6.45	5.68	1.85	1.74	3.45*	0.02
Blood Pressure (Diastolic)	74	74.15	7.23	7.42	1.79	1.55	2.72*	0.008
Pulse Pressure (PP)	45.2	44.95	7.22	6.18	1.49	1.23	0.75	0.40

CONCLUSION

In the light of conclusion drawn and within the limitations of the study, it can be revealed that our bodily system have been gifted by nature to accommodate themselves and change the functions accordingly within the physiological limits. This has been responded by cardio- vascular system by increasing the pulse pressure which increases the amount of blood flow through lungs. Minutes to compensate the deficient oxygenation of blood.

No significant changes were found in pulse pressure of the Sprinters and Long distance runners. Hence, it can be concluded that the physical activity may help the athletes by involving the adaptation power of their cardio-vascular.

After giving a deep view of all the tables, it can be observed that there is not much of difference in the blood pressure for Sprinters, which indicates that due to the physical activity. The individuals maintain certain physical values to the optimum level.

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Classification of Volleyballers According to their Specialized Position—Development of a Discriminant Model

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ABSTRACT

This study has been conducted with a purpose to develop a discriminant model to classify the spiker and libero players in volleyball. For the purpose of the study, a total of 36 volleyball players have been selected from the sixteen teams at All India Inter-University Championship. The players were tested on the selected variables just after the finish of the tournament. The variables which were selected for the purpose of the study are standing height, body weight, arm length, forearm length, trunk length, upper arm girth, hand length, leg length, thigh girth, calf girth, thigh length, positive breath holding capacity, negative breath holding capacity, resting respiratory rate, resting heart rate, lean body weight, fat percentage and vital capacity. A robust and significant discriminant model has been constructed to classify the spikers and liberos. Among all the selected variables, standing height and upper arm girth were found to have significant discriminating power.

Keywords: *Discriminant Model, Physical, Physiological, Volleyball, Spiker, Libero*

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INTRODUCTION

Volleyball is a difficult sport of uncomplicated skills. Volleyball is a sport played by two teams on a playing court divided by a net. The object of the game is to send the ball over the net in order to ground it on the opponent's court, and to prevent the same effort by the opponent. The ball is spiked from up to 60 cm above the height of a basketball hoop (about 3.65 metres) and takes fractions of a second to travel from the spiker to the receiver. That means the receiver must assess incoming angle, decide where to pass the ball and then control their pass in the blink of an eye. The basic pattern of movement in making an attack includes a dig (an underarm pass), a set (an overhead pass made with the hands), and a spike (the overhead attacking shot). Teams can also try to block the opponent's spike as the ball crosses the net (International Volleyball Federation, 2008).

There are 5 positions filled on every volleyball team at the elite level. Setter, Outside Hitter/ Left Side Hitter, Middle Hitter, Opposite Hitter/ Right Side Hitter and Libero/ Defensive Specialist. Each of these positions plays a specific, key role in winning a volleyball match (Benson Siyawareva, UTC Volleyball, 2015). Most favorable physique is apparently an help to volleyball performance. Only while a volleyball team is jointly equipped with the whole ideal anthropometric characteristics can win the supremacy in a game (Chen, 2005). Among all the physical performance indicators, speed and power are of the most importance. Mainly, jumping height is important for the implementation of techniques and tactics (Jin *et al*., 2007). Japan Volleyball Association demonstrated a significant correlation between the vertical jumping index and the competitive ability of the volleyball players. It was found that the jumping capacity had a positive correlation with the number of spiking, blocking and serving in a game and the total success rates of spiking (Tian, 2006).

Arm length had a significant correlation with the performance over the volleyball net, especially in attacking (You and Huang, 2000). Longer arm is also important in defence. The length of the arm span of elite volleyball players has been found to be approximately 5 cm longer than his/her height. The arm span and the standing reach height are found to be closely related (Zeng, 1992). To perform volleyball skills and tactics, players need high levels of physical performance particularly in muscle strength, speed of movement, arm spiking, jump with and without running up, stamina of movement, agility, and flexibility of shoulders, waist, knees, and wrist, etc. (Chen, 2005). Height has been reported to be a discriminating factor between successful and non-successful teams in a collegiate tournament (Morrow *et al*., 1979), correlating significantly with the final standings of an open national tournament (Gladden and Colacino, 1978). The height over the net is a important factor for volleyball games, determined by the athletes' stature and jumping height, and shown in

blocking height and spiking height. All these bring forward the demand for specific physique of volleyball athletes (Gao, 2006).

Yang (1996) had collected 106 testing items for physical performance (23 items from China, 26 items from Japan, 26 items from USA, 10 items from Canada, 14 items from former Soviet Union, and 7 items from Holland), and categorized 61 test items that were commonly used in these countries to six domains that were thought to be closely related to volleyball performance, including: explosive force, stamina, agility, muscle strength, flexibility, coordination and balance. Furthermore, 10 testing items were selected, including 20-metre sprint starting from a prone position, spiking jump, 3-step frog-leap, medicine ball throwing, sit-ups, 12-minute race, 3-metre shuttle run, 36-metre shuttle run, deep squat with barbell, standing forward body flexion (Yang, 1996).

Gabbett *et al*. (2006) selected the following items to measure physical performance of volleyball players: lower-body muscular power (vertical jump, spike jump), upper-body muscular power (over-head medicine ball throwing), speed (5-m and 10-m sprint), agility (T-test), and maximal aerobic power (multistage fitness test). The anthropometry of a volleyball athlete combined with their natural mechanical abilities, are the most important factors, which can limit the technical and tactical level of an opponent during a game (Papadopoulou, 2001). However, there have been few reports on the relationship between the anthropometric characteristics and physical performance of elite volleyball players, particularly at different playing positions. With this purpose, the researcher has tried to make a discriminant model to classify the spikers and liberos. The discriminant model will help us in knowing the variables which are helpful in discriminating these players.

PURPOSE OF THE STUDY

- The purpose of the study was to classify the subjects (libero and spikers) into groups using a discriminant function.
- To test the theory by observing whether cases are classified as predicted.
- To determine the percentage of variance in the dependent variable explained by the independents.
- To assess the relative importance of the independent variables in classifying the dependent variable.
- To discard those independent variables which do not have discriminating power in classification.

OBJECTIVES

- To identify independent variables having significant discriminating power in classifying a volleyballer into libero or spiker.
- To develop a discriminant model for classifying a player into libero and spiker position.
- To test the validity of the model.
- To find the percentage of correct classification of the subjects in the selected groups.

METHODOLOGY

This section includes the selection of subjects, selection of variables, assumptions and statistical techniques employed in the study.

Selection of Subjects

The present study is based on randomly selected 36 inter-university male Indian volleyball players (18 liberos and 18 spikers) aged 18–25 years (mean 19.15±1.38 years) from the sixteen Indian universities which has reached to the All-India Inter-University Championship and the competition was held in Kolhapur University, Kolhapur. The age of the subjects were recorded from the date of birth registered in their respective institutes. A written consent was obtained from the subjects. The data were collected under natural environmental conditions in morning (between 8 AM. to 12 noon).

Selection of Variables

For the purpose of the study standing height (SH), body weight (BW), arm length (AL), forearm length (FL), trunk length (TRL), upper arm girth (UAG), hand length (HL), leg length (LL), thigh girth (THL), calf girth (CG), thigh length (TGL), positive breath holding capacity (PBH), negative breath holding capacity (NBH), resting respiratory rate (RRR), resting heart rate (RHR), lean body weight (LBW), fat percentage (FP) and vital capacity (VC) has been undertaken in the study to construct a discriminant model.

Assumptions of Discriminant Analysis

- Data must be normally distributed.
- Outliers should not be there.
- All cases must be independent.
- Sample size of both the groups should not differ to a great extent
- No dependent variables should have zero variability.

Statistical Techniques

The following selected statistics techniques have been employed in the study:

- Descriptive statistics has been calculated for the data of selected variables.
- Normality of data has been checked with the Shapiro-Wilk test.
- Outliers have been checked with the Box Plots.
- Discriminant Analysis has been done to classify the selected specialized position players.

RESULTS

The data collected was analyzed statistically with the help of software package IBM SPSS Statistics 20.0 and the outcomes generated have been presented in the tables below.

The descriptive statistics for the scores on selected variables have been presented in the table 1.

Table 1: Descriptive Statistics for the Data on Selected Variables from Both the Groups

Variables	Spikers		Liberos	
	Mean	S.D.	Mean	S.D.
Standing Height	190.02	2.186	174.61	2.64
Body Weight	82.05	3.733	67.83	3.76
Arm Lengh	80.36	1.65	72.27	1.55
Forearm Length	35.11	1.74	32.27	1.48
Trunk Length	77.47	2.41	72.11	1.83
Upper Arm Girth	28.94	1.58	19.83	1.61
Hand Length	23.16	1.33	21.27	1.90
Leg Length	111.50	2.47	102.05	2.75
Thigh Girth	58.72	6.37	49.66	3.92
Calf Girth	42.83	1.68	36.50	6.45
Thigh Length	59.94	5.82	56.05	2.73
Pos. Breath Hold. Cap.	48.55	6.74	39.50	3.74
Neg. Breath Hold. Cap.	27.72	2.46	23.50	3.51
Resting Respiratory Rate	14.55	1.82	14.27	1.44
Resting Heart Rate	60.38	2.30	60.94	2.64
Lean Body Weight	68.94	4.08	54.83	3.77
Fat Percentage	13.52	1.11	13.50	1.15
Vital Capacity	3.93	.211	4.11	.41

Table 1 shows the descriptive statistics (i.e. means and standard deviations) of the scores of the selected variables.

Table 2: Unstandardized Canonical Discriminant Function Coefficients

	Function
	1
Standing Height	.280
Upper Arm Girth	.272
(Constant)	-57.639

The unstandardized canonical discriminant function coefficients have been presented in the Table 2.

Table 2 shows the unstandardized canonical discriminant function coefficients which were used for constructing discriminant function. As it was an explorative study, the stepwise method was used in the analyses and only two variables namely standing height and upper arm girth could be retained in the model due to their discriminating power. Remaining variables did not get selected in the model as they were not found to have sufficient discriminating power.

Thus, discriminant function can be constructed by using the values of constant and coefficients of these two variables as shown in Table 2.

$$Z = (\text{Standing Height} \times 0.280) \times (\text{Upper Arm Girth} \times 0.272) - 57.639$$

The table for the values of Wilks' Lambda and Chi-Square test has been presented in Table 3.

Table 3: Wilks' Lambda and Chi-square Test

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-Square	DF	Sig.
1	.076	85.192	2	.000

The value of Wilks' Lambda shown in the Table 3 is the sign of robustness of the discriminant model. The value of Wilks' Lambda lies in between 0 to 1. If its value is less than 0.5, the discriminant model is considered to be good and, therefore, the discriminant model developed in this studycan be considered to be robust enough as the value of Wilks' Lambda is 0.076. Since, the value of Chi-Square shown in the table 3 is significant as its p-value is equal to 0.000 which is less than 0.05, it may be inferred that the discriminant model is highly significant.

The classification matrix which shows the correct and wrong classification of subjects in both the groups on the basis of the developed discriminant model has been presented in the Table 4.

Table 4: Classification Matrix[a]

		Position	Predicted Group Membership		Total
			Spiker	Libero	
Original	Count	Spiker	18	0	18
		Libero	0	18	18
	Percentage	Spiker	100.0	.0	100.0
		Libero	.0	100.0	100.0
a. 100.0% of original grouped cases correctly classified.					

Table 4 shows that out of 18 subjects in both the categories all were correctly classified in their corresponding category. Thus, out of thirty six subjects

all subjects (100%) were correctly classified by the model which is very high, hence, the model can be considered as valid. Since, this model was developed on the basis of a small sample, therefore, the level of accuracy shown in the classification matrix may not be true for all future classification of new cases.

The standardized canonical discriminant function coefficients have been presented in the Table 5.

Table 5: Standardized Canonical Discriminant Function Coefficients

Variables Selected	Function
	1
Standing Height	.678
Upper Arm Girth	.437

Table 5 shows the discriminating power of the variables selected in the model. Since, absolute function of the standing height (0.678) is higher than that of upper arm girth (0.437), standing height is more powerful variable in this model in comparison to upper arm girth in discriminating the libero and spiker players.

The means of the transformed group centroids are presented in the Table 6.

Table 6: Functions at Group Centroid

Position	Function
	1
Spiker	3.397
Libero	-3.397
Unstandardized canonical discriminant functions evaluated at group means	

Table 6 shows the means for the transformed group centroids. Thus, the new mean for spikers is 3.397 and for libero players is -3.397. This indicates that the midpoint of these two is 0.

The graphical representation of the means for the transformed group centroids have been presented in the Figure 1 below.

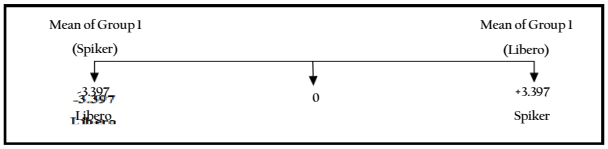

Fig. 1: Graphical Representation of the Means of the Transformed Group Centroids

The above table gives the decision rule for classifying any new subject into any of the two categories. If the discriminant score of any volleyball player falls to the right of the midpoint ($Z>0$), he will be classified into spiker category and if it falls to the left of the midpoint ($Z<0$), he will be classified into libero category.

DISCUSSION OF FINDINGS

It is well established that anthropometric analysis of different sports has shown optimum performance appears to have definite physical requirements (Tanner, 1964; Alexander, 1976; Slater *et al.* 2005; Stretch, 1987). In the present study apart from conventional anthropometric variables, some important physiological variables also have taken into consideration eg. positive breath holding capacity (PBH), negative breath holding capacity (NBH), resting respiratory rate (RRR), resting heart rate (RHR) and vital capacity (VC). For the purpose of the study the selected variables have been analyzed and putted into the exploratory method (step-wise method) for the formulation of a discriminant model. Standing height and upper arm girth of the spiker and libero players was found to have a discriminating power. Other variables which have not found to have a significant discriminating power were dropped after getting the output. The unstandardized canonical discriminant function coefficients were 0.280 (for Standing Height), 0.272 (for Upper Arm Girth) and -57.639 (Constant). With these unstandardized canonical discriminant function coefficients the discriminant function was constructed i.e. $Z = (\text{Standing Height} \times 0.280) + (\text{Upper Arm Girth} \times 0.272) - 57.639$. The robustness of the model was calculated through Wilks' Lambda and the model was found to be robust enough. Chi-Square for the model was also found significant which again shows that the discriminating model is highly significant. It was found through classification matrix that 100.0% of original grouped cases were correctly classified. Through standardized canonical discriminant function coefficients, it was found that standing height is more powerful variable in this model in comparison to upper arm girth in discriminating the libero and spiker players.

In Volleyball, two groups of player types can be differentiated. On one side there are middle blockers, outside hitters, and opposites, who mainly blocks and spikes. These are usually taller, heavier and have a higher jump reach in comparison to the other players. On the other side there are setters and liberos, who contribute less or do not contribute in blocking and spiking. They are usually shorter and lighter. Standing height and Upper arm girth was found to have a significant discrimination power in this study. Elaheh K *et al.* (2013) found that among the elite volleyball players, the tallest mean height is related to the spikers and the shortest mean height is related to the liberos. These results confirm previous studies in relation to the player's position and physical capacities among males (Gualdi-Russoand Zaccagni, 2001; Marques *et al.*, 2009; Sheppard *et al.*, 2009; Fattahi *et al.*, 2012). Marques *et al.* (2009) and Malousaris *et al.* (2008) has also suggested

in their research that the height of liberos used to be shorter than spikers. Palao J.M. (2014) conducted a study on Volleyball players and found the differences between body height, spike and block reaches by their position. These differences are related to the needs of the different positions with regard to the actions they execute. Middle-blockers, outside-hitters, and opposites have the characteristics that are most appropriate for blocking and spiking, and the setters and liberos appear to have characteristics advantageous to setting and receiving as well as digging, respectively. The upper arm girth of the spikers was more in comparison to the liberos may be because of their big stature. However, these findings are not in conformity with findings of Duncan *et al.* (2006), since, in his findings, Duncan showed that there is no significant difference between different game positions in regard with height.

CONCLUSION

The present study was conducted with an aim to construct a discriminant function to discriminate among spikers and liberos in volleyball. The discriminant function has been successfully constructed with only two variables as these variables has been found to have a high discriminating power.

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Effect of 6 Week Yogic Practices on Hematological Variables of University Level Girls

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ABSTRACT

The present study was conducted with the objective to determine the short term effect of 6 week yogic practices on hematological variables. Forty (N=40) female subjects between the age group of 18-25 years (Mean ± SD: height 5.57±0.24m, body mass 68.55±4.74kg, age 21.30±2.03years) were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (N1=20) and Group-B: Control (N2=20). Student's t-test for independent data was used to assess the between-group differences and for dependent data to assess the Pre-Post differences. Based on the analysis of the results obtained, we conclude that the insignificant differences were found in Haematological Variables (i.e., Hemoglobin, Total Cholesterol, HDL Cholesterol, Triglycerides and LDL Cholesterol) of University Level Girls.

Keywords: *Haematological Variables*

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INTRODUCTION

Yoga can be said to be a way of life which includes bodily and intellectual self-controls to improve fitness and energy. The word is Sanskrit and means Yoke, so we are harnessing ourselves to a particular way of life, but also by its very nature a yoke must be balanced. Yoga is a stability and amalgamation of physique, observance and essence; a symmetry as we study to regulate body, inhalation and senses. Yoga is individual and non- competitive. Your own stretch is good enough for you. Listen to your body, it will tell you what feels right at particular time.

Across all levels of the athletic continuum, from youth through professional sports, psychological preparation is as essential to success as physical conditioning, adequate hydration and proper nutrition (Creasy et al., 2009). Asanas are postures which are used for balance, sound health and to tone up every part of the body. The asanas remove physical and psychosomatic tensions, so we can sit in comfort, concentrate and meditate without bodily distraction. The endocrine system (certain ductless glands, thyroid and thymus) are stimulated, which helps maintain good health and a feeling of wellbeing. Energy is directed away from the body image and challenged to positive ends. The body is a temple of the self and the practice of the postures will keep it healthy and full of vitality. The effects of the postures will keep it healthy and full of vitality. The effects of the postures can be summed up as, "That which you nourish grows, that which you neglect dies". Yoga is a psycho-somatic-spiritual discipline for achieving union & harmony between our mind, body and soul and the ultimate union of our individual consciousness with the Universal consciousness (Madanmohan, 2008). The science of yoga that is holistic has been designed to have subtle effect on our whole being, body, mind as well as spirit. The all pervasive stress and stress-induced disorders like hypertension and angina are fast growing epidemics and bane of today's modern society (Patricia, 2008). The science of yoga is the best method for prevention as well as management of stress and stress-induced disorders. To improve your cardiovascular health, a complete yoga program should be a way of your life. This prompted us to undertake this study with the aim to assess the effect of 6 week yogic practices on hematological variables of university level girls.

MATERIAL AND METHODS

Subjects

Forty (N=40) female subjects between the age group of 18-25 years (Mean±SD: height 5.57±0.24m, body mass 68.55±4.74kg, age 21.30±2.03years) were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (N_1=20) and Group-B: Control (N_2=20).

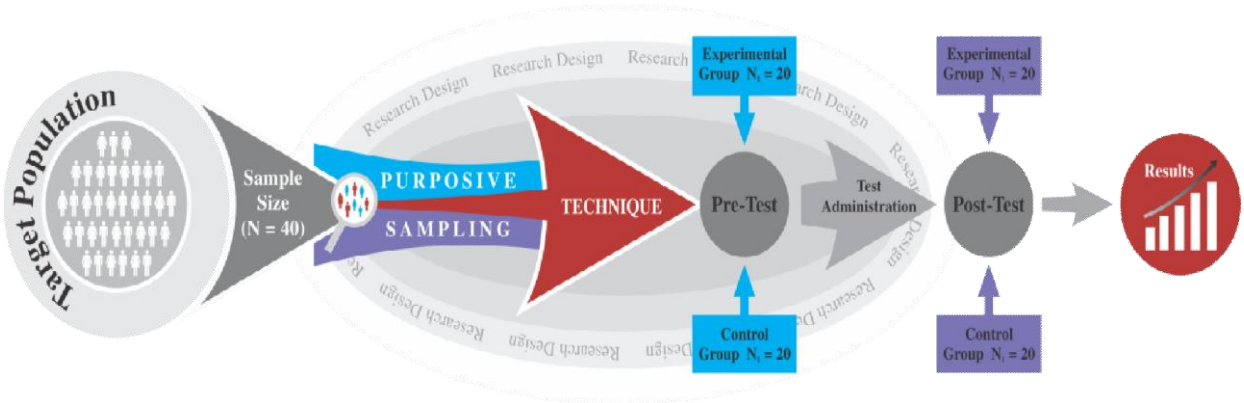

Fig. 1: Study Design

Table 1: Subject's Demographics of Experimental Group and the Control Group

Variables	Sample Size (N = 40)		
	Total (N=40)	Experimental Group (n_1=20)	Control Group (n_2=20)
Age	21.30±2.03	21.25±2.00	21.35±2.11
Body Height	5.57±0.24	5.85±0.23	5.55±0.26
Body Mass	68.55±4.74	68.71±4.71	68.42±4.83

METHODOLOGY

This is an exploratory study that has employed methods of data collection and analysis quantitatively. The purpose of this study was to assess the Effect of 6 Week Yogic Practices on Hematological Variables. This lasted 6-weeks and consisted of daily sessions.

STATISTICAL ANALYSES

Student's t-test for independent data was used to assess the between-group differences and for dependent data to assess the Pre-Post differences.

RESULTS

Table 2: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Haemoglobin

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	11.76	0.61	0.13	0.8736	0.3932
Experimental (Post-test)		11.94	0.73	0.16	0.0183	
Control (Pre-test)	20	12.26	0.81	0.18		0.9856
Control (Post-test)		12.25	0.82	0.18		

*Significant at 0.05 level

Table 2 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Haemoglobin. The Pre-Test Mean Score of Experimental Group was 11.76 whereas Post-Test Mean Score was recorded as 11.94. The Pre-Test and Post-Test SD values were 0.61 and 0.73 respectively. The t-value 0.8736 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 12.26. However, Post-Test mean score was recorded as 12.25. The Pre-Test and Post-Test SD values of control group were 0.81 and 0.82 respectively. The t-value 0.0183 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

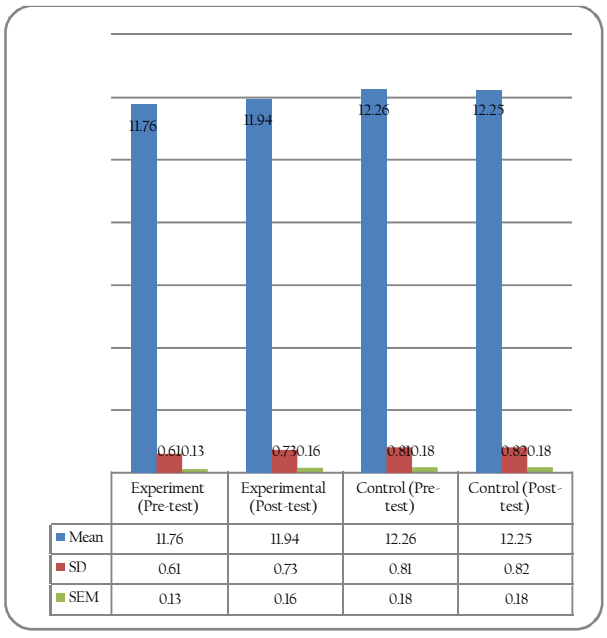

Fig. 2: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Haemoglobin of Experimental and Control Group

Table 3: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Total Cholesterol

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	155.77	2.04	0.45	0.7009	0.49
Experimental (Post-test)		155.32	2.15	0.48	0.6633	
Control (Pre-test)	20	140.97	14.30	3.19		0.5151
Control (Post-test)		144.37	15.18	3.39		

*Significant at 0.05 level

Table 3 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Total Cholesterol. The Pre-Test Mean Score of Experimental Group was 155.77 whereas Post-Test Mean Score was recorded as 155.32. The Pre-Test and Post-Test SD values were 2.04 and 2.15 respectively. The t-value 0.7009 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 140.97. However, Post-Test mean score was recorded as 144.37. The Pre-Test and Post-Test SD values of control group were 14.30 and 15.18 respectively. The t-value 0.6633 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

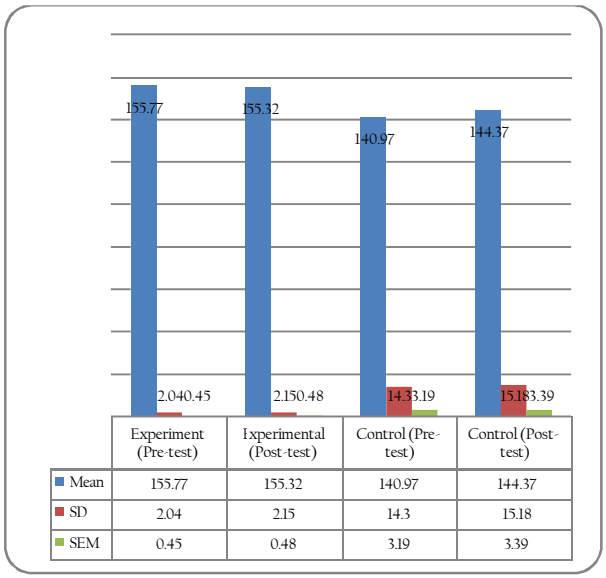

Fig. 3: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Total Cholesterol of Experimental and Control Group

Table 4: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of HDL Cholesterol

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	89.73	5.35	1.19	0.0164	0.9871
Experimental (Post-test)		89.76	4.41	0.98	0.8678	
Control (Pre-test)	20	88.99	4.86	1.08		0.3964
Control (Post-test)		90.28	4.05	0.90		

*Significant at 0.05 level

Table 4 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of HDL Cholesterol. The Pre-Test Mean Score of Experimental Group was 89.73 whereas Post-Test Mean Score was recorded as 89.76. The Pre-Test and Post-Test SD values were 5.35 and 4.41 respectively. The t-value 0.0164 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 88.99. However, Post-Test mean score was recorded as 90.28. The Pre-Test and Post-Test SD values of control group were 4.86 and 4.05 respectively. The t-value 0.8678 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

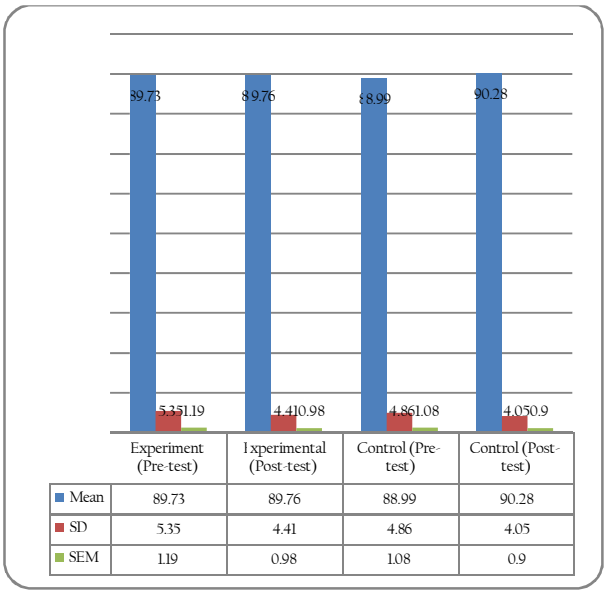

Fig. 4: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of HDL Cholesterol of Experimental and Control Group

Table 5: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Triglycerides

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	117.15	10.34	2.31	0.5295	0.6026
Experimental (Post-test)		119.04	11.00	2.46	1.0302	
Control (Pre-test)	20	115.95	9.38	2.09		0.3158
Control (Post-test)		118.85	11.12	2.48		

*Significant at 0.05 level

Table 5 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Triglycerides. The Pre-Test Mean Score of Experimental Group was 117.15 whereas Post-Test Mean Score was recorded as 119.04. The Pre-Test and Post-Test SD values were 10.34 and 11.00 respectively. The t-value 0.5295 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 115.95. However, Post-Test mean score was recorded as 118.85. The Pre-Test and Post-Test SD values of control group were 9.38 and 11.12 respectively. The t-value 1.0302 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

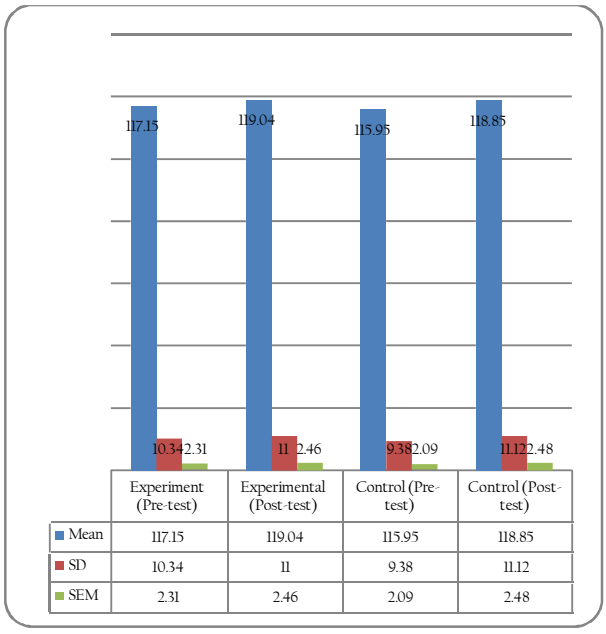

Fig. 5: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Triglycerides of Experimental and Control Group

Table 6: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of LDL Cholesterol

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	120.53	6.29	1.40	0.6585	0.5181
Experimental (Post-test)		118.59	11.33	2.53	2.203	
Control (Pre-test)	20	119.35	7.34	1.64		0.0401
Control (Post-test)		120.52	7.76	1.73		

*Significant at 0.05 level

Table 6 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of LDL Cholesterol. The Pre-Test Mean Score of Experimental Group was 120.53 whereas Post-Test Mean Score was recorded as 118.59. The Pre-Test and Post-Test SD values were 6.29 and 11.33 respectively. The t-value 0.6585 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 119.35. However, Post-Test mean score was recorded as 120.52. The Pre-Test and Post-Test SD values of control group were 7.34 and 7.76 respectively. The t-value 2.203 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

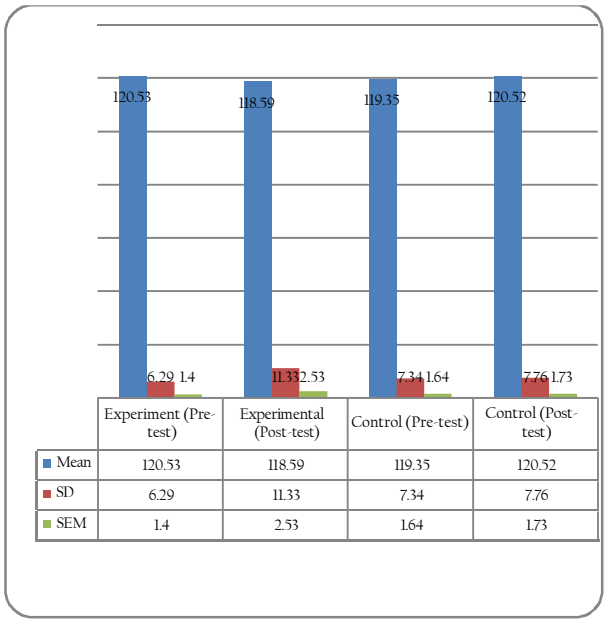

Fig. 6: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of LDL Cholesterol of Experimental and Control Group

CONCLUSION

Based on the analysis of the results obtained, we conclude that the insignificant differences were found in Haematological Variables (i.e., Hemoglobin, Total Cholesterol, HDL Cholesterol, Triglycerides and LDL Cholesterol) of University Level Girls.

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Analysis of Vital Capacity of Volleyball Players during Match Progression

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ABSTRACT

Modern competitive volleyball is very fast by its nature, and it demands a high level of special fitness. The spectators and the players enjoy the game of volleyball with a great amount of merriment. It is a game of constant action and requires continuous adaptation to the changing situation by the team as well as by the individual players. As the changes of rules takes place match become more intensive due to change in point system i.e. rally system. Cardio-vascular efficiency reflects the capacity of an individual to undertake and continues physical effort of sub-maximal nature for a relatively longer period of time. A Volleyball player requires a good vital capacity during the long rallies as well as to recover fast within the regular interval of match. As we know that volleyball is more anaerobic in nature then aerobic, but aerobic capacity helps the player to rejuvenate himself after the long rallies. The main aim of the researcher is to know the effect on vital capacity during volleyball match progression, is it decreases or increases. The study was delimited to 12 university level players were selected as the subjects in which purposively six players were taken for the study in the age ranging of the subjects were between 18 to 25 years. The firsttests of vital capacity were determined before starting the match and other five test of vital capacity were taken after the end of each set of volleyball matchupto 5th set. To determine the significant difference between vital capacity of each set Repetitive Measure of ANOVA was employed and level of significance was set at 0.05. After analysis of data it has been concluded that, there are significant difference in the vital capacity between pre-test and also within the sets of volleyball match may be due to the requirement of oxygen and warming of muscles leads to enhancement of vital capacity.

Keywords: *Vital Capacity, Match Progression*

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INTRODUCTION

By the nature of human being are competitive and aspire for excellent in every given field. Sports are not an exception. Not only individuals but nations also want to show their supremacy in the field of sports. This friendly rivalry has inspired and motivated all to sweat and strive, to run faster, jump higher, throw longer, and skills in the competition arena.

Every though physical performance is evaluated in terms of body composition, aerobic, anaerobic capacity and physiological suppleness. The capacity of prolong physiological functioning demanding cardio-vascular endurance depend upon aerobic capacity i.e. energy metabolism under continuous supply of oxygen to the organism. Intensive burst of activities i.e. executing high load work with explosive action and short duration of time, such as, kicking the football faster and for explosive take-off in jump, throwing and implement etc. depend upon the anaerobic capacity i.e. efficiency in energy production in the absence of oxygen supply, through the oxygen would be taken up later during the recovery period after the cessation of energy.

A volleyball player require a high level of vital capacity and endurance as the game involves continuous sets of player at a fart rate over a long duration. The game requires a combination of aerobic and anaerobic endurance. The continuous rallies and explosive jump for spiking and block jump for offense and defense over a long spell of time requires aerobic endurance. Apart from this, volleyball requires explosive jumps for the spiking for offence and 'fast movements in the court' requires anaerobic endurance.

In sports training must emphasis is laid on those components of physical fitness, which are most fundamental to those sports. For example training of long distance runner, cardio-vascular and muscular are prime importance, while for sprinting, development of endurance, speed is given greater importance. The

complex nature of physical fitness includes the muscular strength, muscular endurance, cardio-respiratory endurance and the most important of them is the cardio-respiratory endurance.

Among all the factors, the physiological characteristic plays the important role for attaining the high level of performance. Among the various physiological parameters, cardiovascular efficiency forms the basis to under-take sports efforts successfully.

Cardio-vascular efficiency reflects the capacity of an individual to undertake and continues physical effort of sub-maximal nature for a relatively longer period of time. To measure cardio-vascular efficiency, tests of physical work capacity and vo2 max. Have been developed to use in laboratory and field situation to assist the scientist, physical educators and coaches.

PURPOSE OF THE STUDY

The main purpose of the present study was to determine the vital capacity before and after the each sets of volleyball match, is it increase or decrease.

METHODOLOGY

For the present study the data was collected from the LNIPE (Gwalior) volleyball match practice group and the students was delimited to 12 university level players. Ages of the subjects were ranging from 18 to 25 years.

In the present study, the researcher selects the twelve university level players for the match, in which purposively sex players were taken for the study. Pre-test was conducted on the selected subjects before staring the match. After the match six selected subjects were taken for the five progressive post-test. Each post-test was administered immediately after the end of each set. To measure the vital capacity of the players dry spiormeter were used. Same procedure was used to measure the vital capacity in all the five set.

STATISTICAL TECHNIQUE

To find out the differences of vial capacity before and after each set of volleyball match repetitive measurer of ANOVA was used at 0.05 level of significance.

STATISTICAL ANALYSIS OF DATA

Descriptive statistics of vital capacity of the volleyball players during match progression are presented in Table 1.

Table 1 revealed that the mean value of vital capacity of volleyball players before match was (4.1833 ±.17224 L) and after 1st set (4.3667 ±.23381), after 2nd set (4.7000 ±.14142), after 3rd set (4.7667 ±.10328), after 4th set (4.9167 ±.17224) and after 5th set the mean value of vital capacity of the volleyball players was (4.8667 ±.23381).

Table 1

Sl. No.	Timing	Mean (in Liters)	Standard Deviation
1	Pre	4.1833	.17224
2	Set-1	4.3667	.23381
3	Set-2	4.7000	.14142
4	Set-3	4.7667	.10328
5	Set-4	4.9167	.17224
6	Set-5	4.8667	.23381

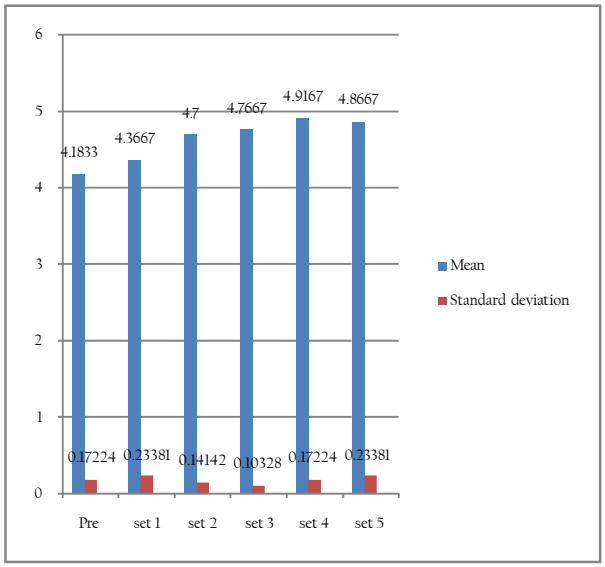

Fig. 1: Graphical Representation of Vital Capacity of Starting Six Players during Match Progression

Table 2: Mauchly's Test of Sphericity

With Subject Effect	Mauchly's W	Approx. Chi-square	Df	Sig.
Time.	.054	9.039	14.	.895

In the Table 2, Mauchly's test of sphericity reveals that the assumption of spherisity is retained as the test statistic is insignificant at 0.05 levels. Thus in within subject comparison the F-ratio of 'spherisity assumed' will be considered in Table 3.

Table 3: Test of within the- Subjects Effects for Vital Capacity

Source	Type III Sum of Square	DF	Mean Square	F	Sig.
Sphericityassumed	2.853	5	.517	25.327	.000
Greenhouse-geisser	2.853	3.246	.796	25.327	.000
Huynh-Feldt	2.853	5.000	.517	25.327	.000
Lower-bound	2.853	1.000	2.583	25.327	.004

Table three Reveals that F-ratio (25.327) significant at 0.05 levels as p-value (.000) is less than 0.05. Thus it is evident that there is significant difference in vital capacity among the successive sets of volleyball match.

Table 4: Pair wise Comparison of vital Capacity at Different Interval of Match Progression using Bonferroni Correction

(I)Time	(J) Time	Mean Difference (I-J)	P-value
	Set-1	.183	.182
	Set- 2	.517	.057
Berofe Match	Set-3	.583*	.004
	Set-4	.733*	.000
	Set-5	.683*	.012
	Set-2	.333	.375
Set-1	Set-3	.400	.082
	Set-4	.550*	.003
	Set-5	.500*	.038
	Set-3	.067	.1000
Set-2	Set-4	.217	.616
	Set-5	.167	.1000
	Set-4	.150	.1000
Set-3	Set-5	.100	.1000
Set-4	Set-5	.050	.1000

Table four reveal that there are significant differences in vital capacity between before match and 3rd set of match (p-value=0.04), before match and 4th set of match (p-value=.000), and before match to 5th set (p-value=.012), as it is less than 0.05.

Table four reveal that there are no significant differences in vital capacity between before match and 1st set of match (p-value=.182), before match and 2nd set (p-value=.057), as it greater than 0.05.

Table four reveals that there are significant differences in vital capacity between 1st set and 4th set (p-value=.003), 1st set and 5th set (p-value=.038), as it less than 0.05.

It reveals that there are no significant differences in vital capacity between 1st set and 2nd set (p-value=.375), 1st set and 3rd set (p-value=.082), as greater than 0.05.

DISCUSSION AND FINDINGS

There are significant in the vital capacity between pre-test and also within the sets of volleyball match. As we know that during exercise there is more extension in the lungs due to the requirement of more oxygen as the situation demand. Due to this the oxygen carrying capacity increases in the lungs which are resulted in increases of vital capacity.

One more cause may be that as the muscles of lungs get warmed then there may be more flexibility in the muscles for stretching which increase the volume of lungs at the time of inspiration during exercise or playing of volleyball match lead in the enhancement of vital capacity.

As the volleyball match progress the intensity of match also increases which requires greater effort by the players during the volleyball match lead to further enhancement of vital capacity than the preceding sets. We all know that volleyball is the game which is requires more anaerobic capacity than aerobic capacity. It means volleyball player have to work hard during match result the more possible intake of oxygen during rally and again lead to increases of vital capacity.

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Study of Selected Respiratory Functions among Individual, Dual and Team Sport Players

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ABSTRACT

The purpose of this study was to study and compare the selected respiratory functions among inter-college level male individual, dual and team sport players. A sample of Ninety (N=90) male players, which includes thirty each individual, dual and team sport players of age ranging from 18 to 25 years, who actually participated in inter–college competitions of Guru Nanak Dev University, Amritsar, Punjab, India, was selected. All the participants were informed about aim and methodology of the study and they agreed to participate in this study. The study was conducted on selected respiratory function's variables i.e. vital capacity, expiratory reserve volume and inspiratory reserve volume. One way Analysis of Variance (ANOVA) was applied to find out the significance of differences with regard to selected respiratory functions among individual, dual and team sport players. Scheffe's post-hoc test (SPHT) was applied to see the direction and significance of differences where 'F' value found statistically significant. The level of significance was set at 0.05. Results revealed significant differences among inter-college level male individual, dual and team sport players with regard to vital capacity ($p < 0.05$), expiratory reserve volume ($p < 0.05$) and inspiratory reserve volume ($p < 0.05$) respectively. While comparing the means, it revealed that team sport players had better vital capacity, expiratory reserve volume and inspiratory reserve volume than their counterparts; individual and dual sport players. However, Individual sport players exhibited better vital capacity and inspiratory reserve volume than dual sport players.

Keywords: *Respiratory Functions, Vital Capacity, Expiratory Reserve Volume, Inspiratory Reserve Volume*

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INTRODUCTION

The performance of players is influenced by many factors such as physical, physiological and psychological variables. The physiological variables play an important role for the attainment of high level performance in sports. Respiratory functions values are influenced by race, age, sex, height, weight, physical activity, as well as environmental, genetic, socioeconomic and technical parameters (Woolcock *et al*., 1972; Budhiraja *et al*., 2010). Among the various physiological parameters, lungs functions form the basis to undertake sports efforts successfully. The respiratory function tests, like other physiological tests must be of the utmost importance for measuring the fitness of an individual from physiological point of view (Astrand and Rodahl, 1970). Singh *et al*.,(2012) suggested that athletes had better respiratory functions then non-athletes. Adaptations of respiratory parameters achieved by players vary with the type of sports training involved in each discipline of games i.e. individual, dual and team. Respiratory functions increases by training depend upon the specific playing abilities. The individual, dual and team game players requires different types of physical and physiological demands. Respiratory function tests provide qualitative and quantitative evaluation of respiratory functions (Belman & Mittman, 1980; Robinson & Kjeldqard, 1982). Therefore, the purpose of this study was to compare the selected respiratory function variable between individual sports and team sports athletes. Therefore, the purpose of the study was to compare the respiratory functions among inter-college level male individual, dual and team sport players.

MATERIALS AND METHODS

Subjects

A sample of Ninety (N=90) male players, which includes thirty each individual, dual and team sport players of age ranging from 18 to 25 years, who actually participated in inter–college competitions of Guru

Nanak Dev University, Amritsar, Punjab, India, was selected. All the participants were informed about aim and methodology of the study and they agreed to participate in this study. The purposive sampling technique was used to select the subjects.

METHODOLOGY

Height and Weight

Height measurements were taken by using the standard anthropometric rod to the nearest 0.5 cm. Full attention was given to make sure that players' body was fully upright and their mandible was parallel to the ground. Taken values recorded in 'cm'. The subject's weight was measured with portable weighing machine to the nearest 0.5 kg. During measurements players were on bare feet and wearing underwear only. Measurements recorded in 'kg'.

Body Mass Index (BMI)

BMI was calculated by the formula of; Body Mass Index = Weight/Height^2.

Measurements of Respiratory Functions

Respiratory functions were measured with a computerized spirometer. Before recording the respiratory function tests, subjects were shown a demonstration of the tests. It was made sure that subject's vital capacity was measured when the subject was exhaling with maximal speed and effort. Consequently, a minimum of three readings were recorded of each test for every subject and the best of the three was considered for having reproducibility and validity of the recorded test. The Respiratory functions like, vital capacity (VC), expiratory reserve volume (ERV) and inspiratory reserve volume (IRV) were taken into consideration for this study.

Statistical Analysis

Values are presented as mean values and SD. One-way analysis of variance (ANOVA) was employed. Following the detection of a significant mean effect, Scheffe's post-hoc analysis was performed to locate where specific mean differences were laid. Data was analyzed using SPSS Version 16.0 (Statistical Package for the Social Sciences, version 16.0, SPSS Inc, Chicago, IL, USA.

RESULTS

Table 1 shows the demographic characteristics of inter-college level male individual, dual and team sport players. Table 2 exhibited the Mean and SD values of selected respiratory functions of inter-college level male individual, dual and team sport players. While comparing the means, it revealed that team sport players had better vital capacity, expiratory reserve volume and inspiratory reserve volume than their counterparts; individual and dual sport players. Individual sport players exhibited better vital capacity and inspiratory reserve volume than dual sport players.

Table 1: Demographic Characteristics of Inter-College Level Male Individual, Dual and Team Sport Players

Sport Group	Age (yrs)		Height (m)		Weight (Kg)		BMI	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Individual Sport	20.97	1.13	177.27	4.92	68.53	8.73	21.79	2.53
Dual Sport	20.90	1.27	176.20	5.43	67.00	9.96	21.53	2.81
Team Sport	20.70	2.25	175.63	8.40	66.07	9.94	21.34	2.17
Total	20.86	1.55	176.37	6.25	67.20	9.54	21.55	2.50

Table 2: Mean and SD Values of Variables of Respiratory Functions of Inter-College Level Male Individual, Dual and Team Sport Players

Variables	Sports Groups					
	Individual Sports		Dual Sports		Team Sports	
	Mean	SD	Mean	SD	Mean	SD
Vital Capacity (VC)	4.44	0.44	4.05	0.34	4.96	0.17
Expiratory Reserve Volume (ERV)	1.45	0.29	1.49	0.28	1.97	0.35
Inspiratory Reserve Volume (IRV)	2.00	0.24	1.66	0.31	2.41	0.35

Table 3: Analysis of Variance (ANOVA) among Inter-College Level Male Individual, Dual and Team Sport Players with Regards to Selected Respiratory Functions

Variables	Source of Variance	Sum of Squares	DF	Mean Square	F-value	Sig.
Vital Capacity	Between Groups	12.691	2	6.345	56.63*	0.00
	Within Groups	9.748	87	0.112		
	Total	22.439	89			
Expiratory Reserve Volume	Between Groups	5.068	2	2.534	26.17*	0.00
	Within Groups	8.425	87	0.097		
	Total	13.492	89			
Inspiratory Reserve Volume	Between Groups	8.570	2	4.285	45.85*	0.00
	Within Groups	8.130	87	0.093		
	Total	16.701	89			

*Significant at.05 level of Confidence $F_{.05}(2,87) = 3.10$

In Table 3 analysis of variance (ANOVA) results revealed significant differences among inter-college level male individual, dual and team sport players with regard to vital capacity ($p < 0.05$), expiratory reserve volume ($p < 0.05$) and inspiratory reserve volume ($p<0.05$) respectively.

Since the obtained F-values were found significant, therefore, the Post-hoc test (Scheffe's) was applied to see the direction and significance of difference between paired means of inter-college level male individual, dual and team sport players with regards to selected respiratory functions. The results of Post-hoc test (Scheffe's) have been presented in Table 4 below.

Table 4: Comparison of Mean Values of Post-hoc Test (Scheffe's) among Inter-College Level Male Individual, Dual and Team Sport Players with Regards to Selected Respiratory Functions

Variables	Sports Groups			Mean Difference	Sig.
	Individual Sports	Dual Sports	Team Sports		
Vital Capacity	4.44	4.05		0.39*	0.00
	4.44		4.96	0.52*	0.00
		4.05	4.96	0.91*	0.00
Expiratory Reserve Volume	1.45	1.49		0.04	0.88
	1.45		1.97	0.52*	0.00
		1.49	1.97	0.48*	0.00
Inspiratory Reserve Volume	2.00	1.66		0.34*	0.00
	2.00		2.41	0.41*	0.00
		1.66	2.41	0.75*	0.00

*Significant at.05 level of Confidence

A glance at table-4 showed that team sport players have exhibited statistically significant ($p < 0.05$) differences with individual and dual sport players on all the selected respiratory functions i.e. vital capacity, expiratory reserve volume and inspiratory reserve volume. However, individual and dual sport players have also shown statistically significant ($p < 0.05$) differences on vital capacity and inspiratory reserve volume, but statistically insignificant ($p > 0.05$) difference on expiratory reserve volume.

DISCUSSION

Respiratory system is an important system of human body where gaseous exchange takes place with diffusion of enormous amounts of oxygen into the blood during physical activity (Khurana, 2005). The current study was designed to compare the respiratory parameters, including vital capacity (VC), expiratory reserve volume (ERV) and inspiratory reserve volume (IRV) among inter-college level male individual, dual and team sport players. The respiratory parameters tests are very important in assessing a player's level of physiological fitness. Results of the present study indicated that significant differences among inter-college level male individual, dual and team sport players with regard to vital capacity, expiratory reserve volume and inspiratory reserve volume were found respectively. These differences may be the result of differences in the sporting activity and levels of training. Due to regular exercise, athletes tend to have an increase in respiratory capacity (Adegoke & Arogundade, 2002). While comparing the means, it revealed that team sport players had better vital capacity, expiratory reserve volume and inspiratory reserve volume than their counterparts; individual and dual sport players. This difference may be due to lower level of physical fitness in individual and dual athletes as compare to team game athletes. It is suggested that physically fit athletes possess superior respiratory functions relative to less fit subjects (Johnson *et al*., 1981; Johnson *et al*., 1991). The findings of the present study supported by the study of Holmen *et al*. (2002).They performed a study on non-smokers in athletes who were 13-19 years old, and they determined that athletes engaged with team sports like football, volleyball, basketball and handball had higher respiratory values in compare to individual sports i.e. swimmers, long-distance runners and skiers.

CONCLUSION

It is concluded that, significant differences were found among inter-college level male individual, dual and team sport players with regard to selected respiratory functions i.e. vital capacity, expiratory reserve volume and inspiratory reserve volume respectively. Team sport players had better vital capacity, expiratory reserve volume and inspiratory reserve volume than their counterparts; individual and dual sport players.

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A Kinematic Analysis of Technique of Sprinters at National Level

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INTRODUCTION

Biomechanical analysis is the evaluation of technique, whether in sports, industry or everyday life. Method of analysis used in biomechanics vary from those requiring expensive and complex equipment to technique utilizing little else than in acute eye and an understanding of the mechanics of the movement. Analysis method in biomechanics may be classified under three general areas, namely subjective, objective and predictive techniques). Objective technique in biomechanics refer to the collection, measurement and evaluation of data from the activity of interest.

It appears that social participation in an activity has an effect on world records. However, there remains anatomical and physiological differences between the sexes which may account for performance discrepancies. A measurement of the exact contribution of inherent and social factors to performance is not possible, but little research has examined the performance of the sexes matching the same activity.

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The purpose of the study was to compare the selected kinematics variables of the technique of national male and female sprinters. The subjects of this study were three males and three females Inter-university athletes of Lakshmibai National Institute of Physical Education, Gwalior (M.P.). The age the subjects were between 18-25 years.

The sequence photographic technique was employed to register the sprinters technique. A motor driven, Nikon Model EM Camera was used. The subjects were photographed at 40-55 meters marks in sagittal plane. The filming Zone was 15 meters in width only moment take-off was analyzed. From the photographs, the stick figures were prepared by using joint point method and various kinematics variables were obtained. Segmentation methods were employed in order to assess the center of gravity of the body during the moment of take-off. Selected kinematics variables were Angle at Ankle Joint (Supporting Leg), Angle at knee Joint (Supporting Leg), Angle at Ankle Joint (Swinging Leg), Angle at knee Joint (Swinging Leg), Angle at Trunk Inclination (with vertical), Push-up Angle, Height of Center of Gravity at Moment Take-off, Take-off Distance and stride length.

The data were analyzed by 't' test to as certain the comparison of male and female sprinters. The results have shown the insignificant values of 't' ratio for all the selected kinematics variables of the study at the significance level of 0.05.

OBJECTIVE OF THE STUDY

The purpose of this study is to compare the technique of male and female sprinters from kinematics point of view.

Methodology

Subjects

Five male and five female sprinters of track and field athlete of national level were selected. The age of the subjects were between 18-25 years. Purposive sampling were used for the collection of sample. Static group design were used for the study.

Variables

The following selected kinematics variables for analyzing the technique of sprinters:

- Angle at Ankle Joint (Supporting Leg)
- Angle at knee Joint (Supporting Leg)
- Angle at Ankle Joint (Swinging Leg)
- Angle at knee Joint (Swinging Leg)
- Angle at Trunk Inclination (with vertical)
- Push-up Angle
- Height of Center of Gravity at Moment Take-off,
- Take-off Distance
- Stride length.

COLLECTION OF DATA

The sequential photography was used as a technique of kinematics comparison of male and female sprinters. A standard motor driven camera i.e. Nikon Model EM, was used to obtain photo sequences of selected movements during the movement take-off.

The subjects were photographed between 40-55 meters in sagittal plane filming zone was 15 meters for obtaining individual photographic sequence the subjects were photographed in controlled condition. The distance of the concern from the subjects was 11.20 meters and fixed 1.20 meters high. The moment take-off was measured manually for each subject. The scholar-developed stick figure utilizes joint-point methods on which the body projections at the joints facing the camera were considered. The inclination of torso was measured by deviation of torso from the vertical axis. The center of gravity of each subject at the moment take-off was located by using segmentation method as suggested by JAMES G. HAY.

STATISTICAL ANALYSIS

The data were analyzed by 't' test to as certain the comparison of male and female sprinters. Data were analyzed by using S.P.S.S. (Statically package of Social Science)

FINDING

Table 1: Comparison of the Performance of Male and Female Sprinters in Ankle Joint (Supporting Leg)

Means		T-ratio
Male	Female	
128.9	107.3	0.158

Significant at 0.05 level t-value=2.306

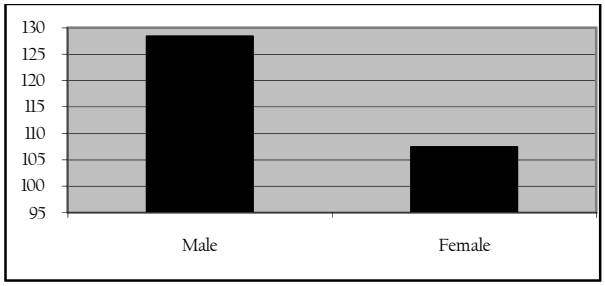

Fig. 1: Comparison of Performance of Male and Female Sprinters in Ankle Joint (Supporting Leg)

Table 1 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.158, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 2: Comparison of the Performance of Male and Female Sprinters in Ankle Joint (Swinging Leg)

Means		T-ratio
Male	Female	
106.8	90.1	0.151

Significant at 0.05 level t-value=2.306

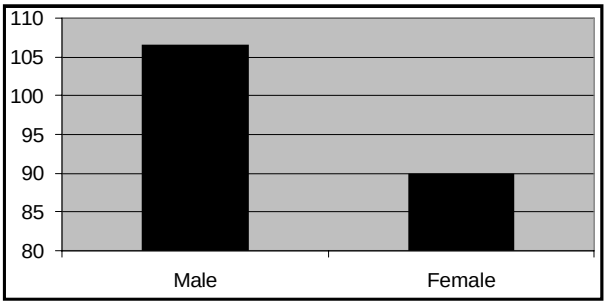

Fig. 2: Comparison of Male and Female Sprinters Ankle Joint (Swinging Leg)

Table 2 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.151, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 3: Comparison of the Performance of Male and Female Sprinters in Knee Joint (Supporting Leg)

Means		T-ratio
Male	Female	
166.6	166	0.02

Significant at 0.05 level t-value=2.306

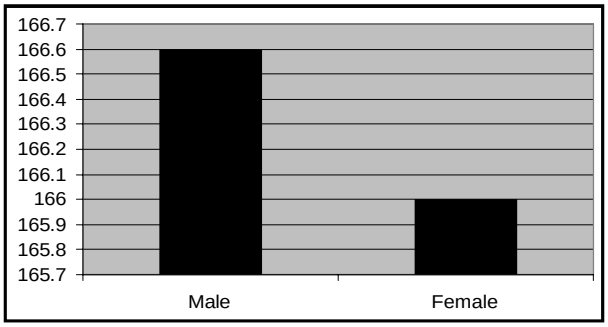

Fig. 3: Comparison of Male and Female Sprinters in Knee Joint (Supporting Leg)

Table 3 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.02, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 4: Comparison of the Performance of Male and Female Sprinters in Knee Joint (Swinging Leg)

Means		T-ratio
Male	Female	
81.6	93.3	-0.115

Significant at 0.05 level t-value=2.306

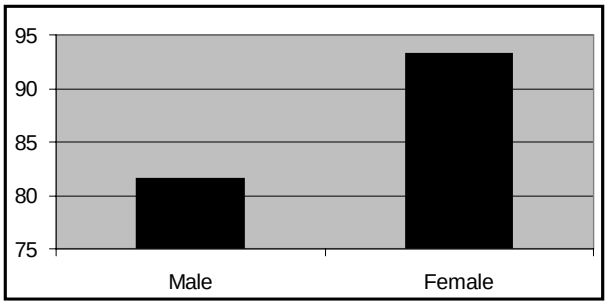

Fig. 4: Comparison of Male and Female Sprinters in Knee Joint (Swinging Leg)

Table 4 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was -0.115, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 5: Comparison of the Performance of Male and Female Sprinters in Push-up Angle

Means		T-ratio
Male	Female	
62.3	64	-0.023

Significant at 0.05 level t-value=2.306

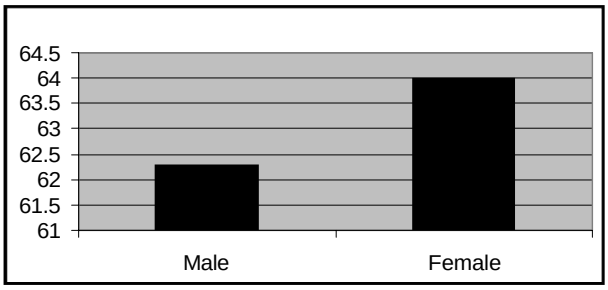

Fig. 5: Comparison of Male and Female Sprinte5rs in Push-up Angle

Table-5 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was –0.023, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 6: Comparison of the Performance of Male and Female Sprinters in Trunk Inclination

Means		T-ratio
Male	Female	
89	86.3	0.153

Significant at 0.05 level t-value=2.306

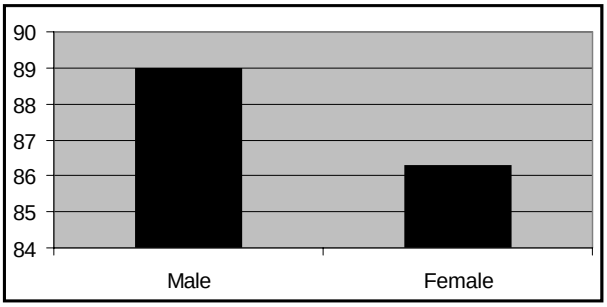

Fig. 6: Comparison of Male and Female Sprinters in Trunk Inclination

Table 6 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.153, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 7: Comparison of the Performance of Male and Female Sprinters in Height of C.G. at moment of Take-off

Means		T-ratio
Male	Female	
66.4	61.2	0.072

Significant at 0.05 level t-value=2.306

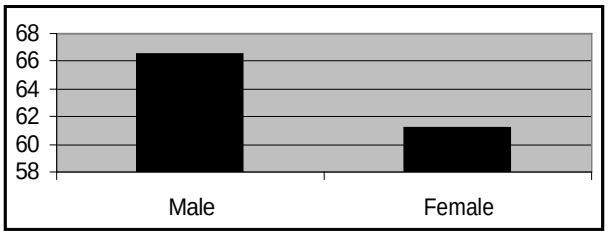

Fig. 7: Comparison of Male and Female Sprinters in Height of C.G. at Moment of Take-off

Table 7 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.071, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 8: Comparison of the Performance of Male and Female Sprinters in Take-off Distance

Means		T-Ratio
Male	**Female**	
48	36.3	0.248

Significant at 0.05 level t-value=2.306

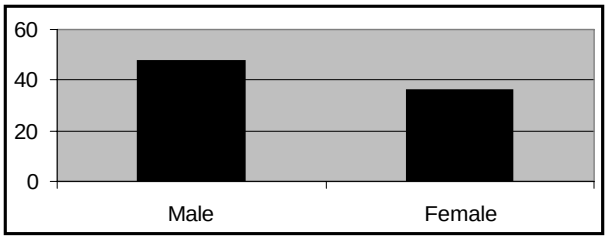

Fig. 8: Comparison of Male and Female Sprinters in Take-off Distance

Table-8 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.248, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

Table 9: Comparison of the Performance of Male and Female Sprinters in Stride Length

Means		T-ratio
Male	**Female**	
2.09	1.76	0.486

Significant at 0.05 level t-value=2.306

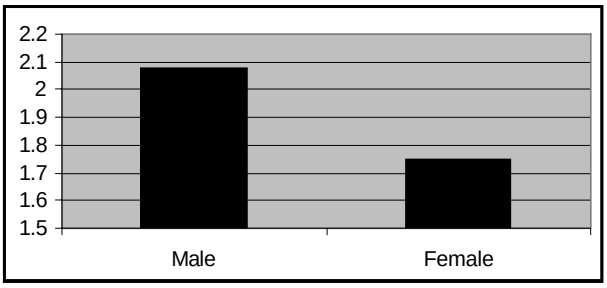

Fig. 9: Comparison of Male and Female Sprinters in Stride Length

Table 9 clearly indicates that insignificant difference was found between the means of male and female students as the observed T-ratio was 0.487, which was lower value than the required value (2.306) to be significant at 0.05 level of significance.

FINDINGS AND CONCLUSIONS

With the limitations and findings of the study the following conclusion may be drawn. None of the Kinematics variables such as Angles at ankle joint, Angle at knee joint of supporting leg and Angles at ankle joint, Knee joint of swinging leg, Trunk Inclination, Height of the Center of gravity at moment of take-off, Take–off distance and Stride length did not differ significant in case of technique of male and female sprinters. It was concluded that linear and angular kinematics show exhibited the insignificant difference of the technique of male and female sprinters .The angular kinematics variable which importance of greater planter flexion at moment of take-off in a sprinting stride. It may due to the small size of the sample or the Kinematics variables between male and female sprinter at the selected level of significance 0.05 therefore, the hypothesis as stated that these may not be significant difference in selected kinematics variables of male and female sprinters in accepted.

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A Study on Respiratory Modulation in Response to Yogic ASANS

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ABSTRACT

The primary aim of this research was to determine the impact of short-term effects of yogic asanas on respiratory modulation. The research was carried out on a sample of 40 university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21-26 years (Mean ± SD: age 22.95 ± 1.796 years, height 5.552 ± 1.974 feet's, body mass 61.265 ± 4.080 kg). The subjects from experimentalgroup were subjected to a 6-weeks yogic asanas. Student's t-test for independent data was used to assess the between-group differences and for dependent data to assess the Pre-Post differences. Significant differences were found in Respiratory variables (i.e., Tidal Volume (Vt), Expiratory Reserve Volume (ERV), Vital Capacity (VC), Inspiratory Reserve Volume (IRV) and Inspiratory Capacity (IC)) of university level girls. The result further indicates that no significant changes over that 6-week period were noted in the control group.

Keywords: *Respiratory Modulation, Yogic Asanas.*

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INTRODUCTION

Research of the last two decades has made considerable progress and contributes to our understanding of the psychological and biological/physiological components important to individual and team game athletes. The specialized field of sports psychology has developed rapidly in recent years. The importance of a sports psychologist as an integral member of the coaching and health care teams is widely recognised. Across all levels of the athletic continuum, from youth through professional sports, psychological preparation is as essential to success as physical conditioning, adequate hydration and proper nutrition (Creasy *et al*., 2009). Now-a-days yoga, the ancient practice of postures, breathing and meditation is gaining a lot of attention from healthcare professionals. With increasing scientific research in yoga, its therapeutic aspects are also being explored. The word "yoga" has come to describe a means of uniting or a method of discipline: to join the body to the mind and together join to the self (soul), or the union between the individual self and the transcendental self.

The literature abounds in studies that have discussed the effects of practicing different yoga styles. Practicing yoga systems has been shown to improve muscle and joint elasticity, to strengthen muscle strength (with particular focus on static strength) to cause body mass reduction and to change body composition.Yoga training has also been shown to increase aerobic power and to decrease anaerobic power. Yoga for Physical Education allows children to express energy in a positive way. Share a professionally guided yoga class designed to specifically for your students, one that every child can follow at their own pace, on their own journey to building self-esteem and self-confidence. Use Yoga for Physical Education again and again for fitness, fun, and feeling great. The science of yoga that is holistic has been designed to have subtle effect on our whole being, body, mind as well as spirit. The all pervasive stress and stress-induced disorders like hypertension and angina are fast growing epidemics and bane of today's modern society (Patricia, 2008). To improve your cardiovascular health, a complete yoga program should be a way of your life. This prompted us to undertake this study with the aim to assess the effect of 6 week yogic practices on respiratory modulation in response to yogic asanas of university level girls.

MATERIAL AND METHODS

Subjects

Forty, university level girls of Department of Physical Education (T), Guru Nanak Dev University, Amritsar between the age group of 21-26 years (Mean ± SD: age 22.95 ± 1.796 years, height 5.552 ± 1.974 feet's, body mass 61.265 ± 4.080 kg) volunteered to participate in the study. The subjects were purposively assigned into two groups: Group-A: Experimental (n_1=20); Group-B:

Control (n_2=20). Distribution and demographics of subjects are brought forth in Table-1.

Table 1: Distribution and Demographics of Subjects

Sample Size (N=40)			
Variables	**Total (N=40)**	**Experimental Group (n1=20)**	**Control Group (n2=20)**
Age	22.95±1.796	22.85±1.565	23.05±2.038
Body Height	5.552±1.974	5.595±1.932	5.51±1.970
Body Mass	61.265±4.080	62.29±3.609	60.24±4.351

METHODOLOGY

This is an exploratory study that has employed methods of data collection and analysis quantitatively. The purpose of this study was to assess the Effect of 6 Week Yogic Practices on Hematological Variables. This lasted 6-weeks and consisted of daily sessions.

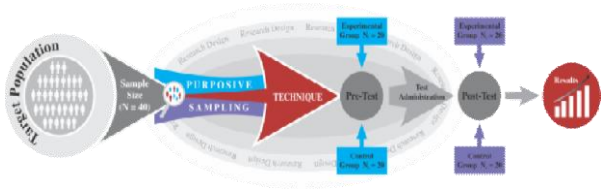

Fig. 1: Study Design

STATISTICAL ANALYSES

Student's t-test for independent data was used to assess the between-group differences and for dependent data to assess the Pre-Post differences.

RESULTS

Table-2 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Tidal Volume (Vt). The Pre-Test Mean Score of Experimental Group was 389.25 whereas Post-Test Mean Score was recorded as 403.05. The Pre-Test and Post-Test SD values were 10.16 and 24.80 respectively. The t-value 2.638* was found to be statistically significant as obtained t-value was found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 354.95. However, Post-Test mean score was recorded as 355.35. The Pre-Test and Post-Test SD values of control group were 8.50 and 8.13 respectively. The t-value 0.968 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

Table 2: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Tidal Volume (Vt)

Group	Number	Mean	S.D.	SEM	T-Value	P-Value
Experiment (Pre-test)	20	389.25	10.16	2.27	2.638*	0.016
Experimental (Post-test)		403.05	24.80	5.55		
Control (Pre-test)	20	354.95	8.50	1.90	0.968	0.344
Control (Post-test)		355.35	8.13	1.82		

*Significant at 0.05 level

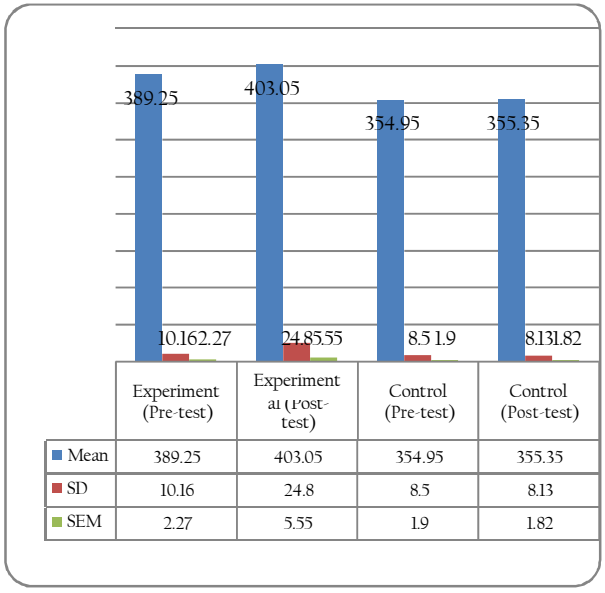

Fig. 2: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Tidal Volume (Vt) of Experimental and Control Group

Table 3 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Expiratory Reserve Volume (ERV). The Pre-Test Mean Score of Experimental Group was 0.76 whereas Post-Test Mean Score was recorded as 0.92. The Pre-Test and Post-Test SD values were 0.22 and 0.19 respectively. The t-value 3.143* was found to be statistically significant as obtained t-value was found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 0.53. However, Post-Test mean score was recorded as 0.55. The Pre-Test and Post-Test SD values of control group were 0.04 and 0.05 respectively. The t-value 1.359 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

Table 3: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Expiratory Reserve Volume (ERV)

Group	Number	Mean	S.D.	SEM	T-Value	P-Value
Experiment (Pre-test)	20	0.76	0.22	0.05	3.143*	0.005
Experimental (Post-test)		0.92	0.19	0.04		
Control (Pre-test)	20	0.53	0.04	0.01	1.359	0.190
Control (Post-test)		0.55	0.05	0.01		

*Significant at 0.05 level

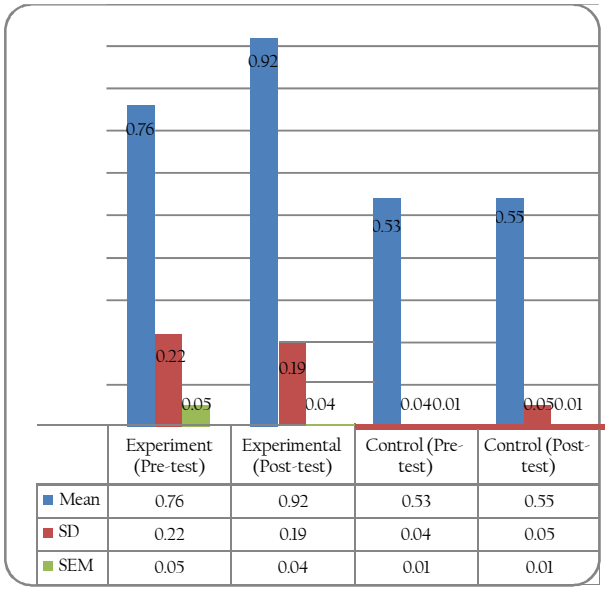

Fig. 3: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Expiratory Reserve Volume (ERV) of Experimental and Control Group

Table 4 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Vital Capacity (VC). The Pre-Test Mean Score of Experimental Group was 3.31 whereas Post-Test Mean Score was recorded as 3.72. The Pre-Test and Post-Test SD values were 0.24 and 0.29 respectively. The t-value 9.770* was found to be statistically significant as obtained t-value was found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 2.45. However, Post-Test mean score was recorded as 2.50. The Pre-Test and Post-Test SD values of control group were 0.24 and 0.25 respectively. The t-value 0.7285 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

Table 4: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Vital Capacity (VC)

Group	Number	Mean	S.D.	SEM	T-Value	P-Value
Experiment (Pre-test)	20	3.31	0.24	0.05	9.770*	0.001
Experimental (Post-test)		3.72	0.29	0.06		
Control (Pre-test)	20	2.45	0.24	0.05	0.7285	0.475
Control (Post-test)		2.50	0.25	0.06		

*Significant at 0.05 level

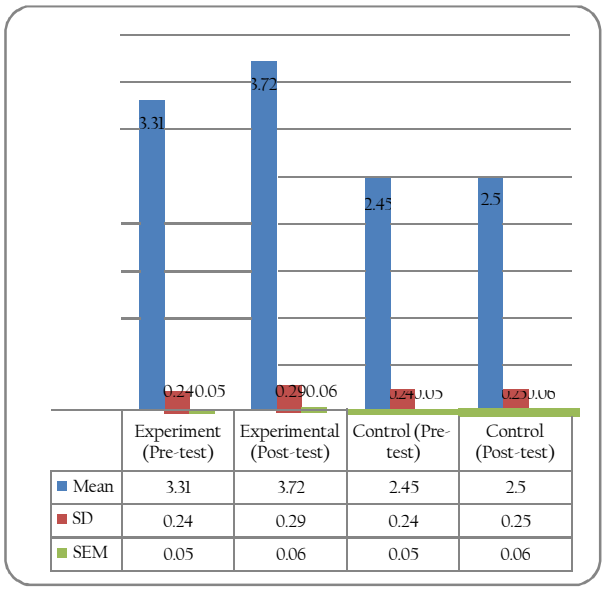

Fig. 4: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Vital Capacity (VC) of Experimental and Control Group

Table 5 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Inspiratory Reserve Volume (IRV). The Pre-Test Mean Score of Experimental Group was 2.28 whereas Post-Test Mean Score was recorded as 2.55. The Pre-Test and Post-Test SD values were 0.33 and 0.37 respectively. The t-value 4.968* was found to be statistically significant as obtained t-value was found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 1.62. However, Post-Test mean score was recorded as 1.65. The Pre-Test and Post-Test SD values of control group were 0.24 and 0.28 respectively. The t-value 0.4995 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

Table 5: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Inspiratory Reserve Volume (IRV)

Group	Number	Mean	S.D.	SEM	T-value	P-value
Experiment (Pre-test)	20	2.28	0.33	0.07	4.9689*	0.001
Experimental (Post-test)		2.55	0.37	0.08		
Control (Pre-test)	20	1.62	0.24	0.05	0.4995	0.623
Control (Post-test)		1.65	0.28	0.06		

*Significant at 0.05 level

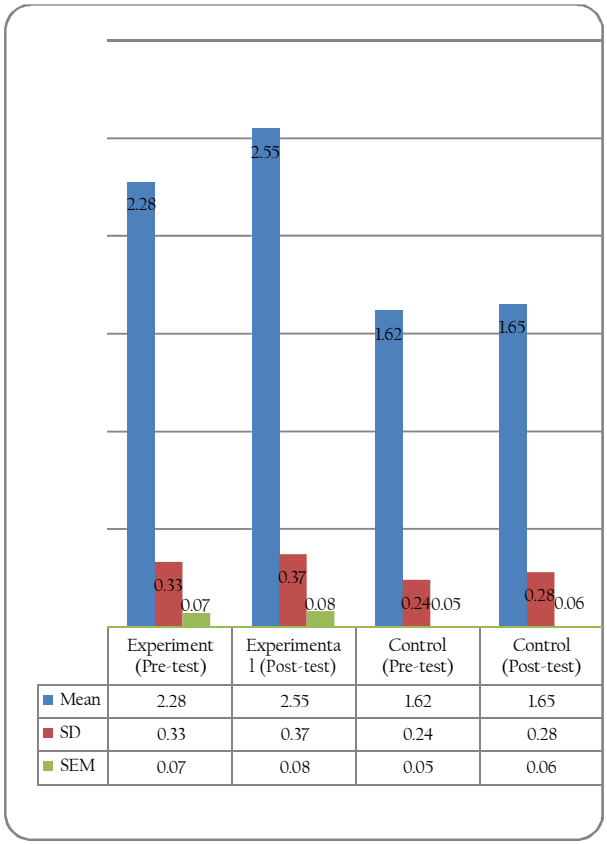

Fig. 5: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Inspiratory Reserve Volume (IRV) of Experimental and Control Group

Table 6 Presents Results Regarding Pre-Test and Post-Test Mean Scores of Experimental Group and Control Group on the Variable of Inspiratory Capacity (IC). The Pre-Test Mean Score of Experimental Group was 2.67 whereas Post-Test Mean Score was recorded as 2.90. The Pre-Test and Post-Test SD values were 0.46 and 0.33 respectively. The t-value 3.268* was found to be statistically significant as obtained t-value was found greater than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19. The Pre-Test mean score of control group was 1.53. However, Post-Test mean score was recorded as 1.54. The Pre-Test and Post-Test SD values of control group were 0.24 and 0.30 respectively. The t-value 0.1721 was found to be statistically insignificant as obtained t-value was found smaller than the tabulated value 2.09 required to be significant at 0.05 level of confidence with degree of freedom=19.

Table 6: Significance of Difference between Pre-Test and Post-Test Mean Scores of Experimental Groups and Control Group on the Variable of Inspiratory Capacity (IC)

Group	Number	Mean	S.D.	SEM	T-Value	P-Value
Experiment (Pre-test)	20	2.67	0.46	0.10	3.268*	0.004
Experimental (Post-test)		2.90	0.33	0.07		
Control (Pre-test)	20	1.53	0.24	0.05	0.1721	0.8652
Control (Post-test)		1.54	0.30	0.06		

*Significant at 0.05 level

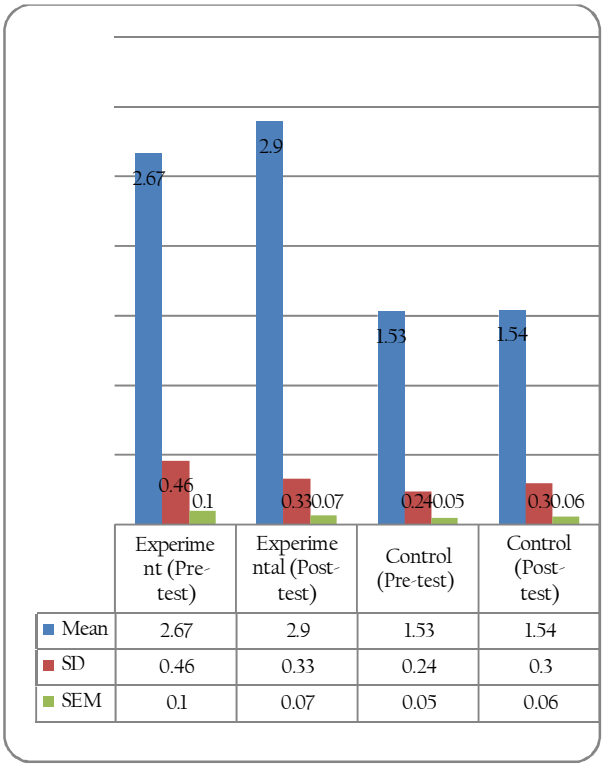

Fig. 6: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Inspiratory Capacity (IC) of Experimental and Control Group

CONCLUSION

Significant differences were found in Respiratory variables (i.e., Tidal Volume (Vt), Expiratory Reserve Volume (ERV), Vital Capacity (VC), Inspiratory

Reserve Volume (IRV) and Inspiratory Capacity (IC)) of university level girls. The result further indicates that no significant changes over that 6-week period were noted in the control group.

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Effect of Selected Yoga Asanas on Minimum Muscular Fitness among High School Boys

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PHYSICAL EXERCISES

A part of active and dynamic exercises, which are repetitive in nature. The physical exercises used in the present investigation resemble those of yogic asanas and are generally used in physical education programmes.

Yoga Asanas

Yogic asanas are Indians unique contribution to physical education. Yoga and physical education may be compared to two bullocks hitched to a shaft as they are for the judicious blending of the education of the body and the mind. There is no denial of the fact that yoga and physical education attach importance by gaining the benefits of physical health, mental health and peace of mind through their regular practices.

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In modern competitive world, people are always afflicted by physical, physiological and psychological problems which lead to several complications. It is a known fact that a regular practice of physical exercise yogasanas relaxes the body and the mind considerably and brings down the physical and mental strain.

Statement of the Problem

The purpose of the study was to investigate the effect of selected yoga asanas on a minimum muscular fitness among the high school boys.

Hypothesis

It was hypothesized that there would be significant improvement on minimum muscular fitness among the high school boys, due to influence of yoga asana exercise programme.

Delimitations

1. The study was confined to 30 boy students of high school and 15 boys under each group.
2. The age group of the subjects ranged from 12 to 14 years.

3. The duration of the yoga asanas exercise programme was fixed fro a period of 6 weeks only.
4. This study was confined to Kraus-weber minimum muscular fitness test.

Limitations

1. Heredity and environmental factors which might have influences the results of this study could not be controlled.
2. Motivational and emotional level of the subjects at the time of testing was not controlled.
3. Socio-economic back ground was not taken into consideration.
4. Certain factors like habits, life style, daily routine work, diet etc., might have influence the result which was not considered in this study.
5. Previous training and experience were not taken into consideration.

METHODOLOGY

The purpose of the study was designed to assess the effect of selected yoga asanas on minimum muscular fitness among the high school boys.

Selection of Subjects

The objective of this study was to find out the arm and shoulder girdle muscular strength and endurance and hip and abdominal muscular strength and endurance. For this purpose thirty boy students were selected at random from the government and private primary school, from Pondicherry. Their age ranged thirteen and fourteen years.

The number of subjects in each group was fixed as fifteen. Thus the total number of subjects, on whom the present experimental study was conducted, was thirty and they were divided into two equal groups. All the subjects were healthy and normal.

Table 1

Sl. No.	Test Items	Variables
a.	Abdominals plus psoas or A^+	To measure the abdominal muscular strength and endurance
b.	Abdominals psoas or A^-	To measure abdominals muscular strength.
c.	psoas and Lower Abdominal	To measure the lower abdominal muscular strength and endurance.
d.	Upper Back position	To measure the back muscle endurance and flexibility.
e.	Lower Back	To measure the endurance of the lower muscles.
f.	Back and Hamstring	To measure the endurance of the hamstring muscle group.

Name of Asanas: Selabhasana, Dhanu Rasana, Bhujangasana, Navasana, Patchimothasana, Halasana and Threkonasana–Each Asanas has 3 Minutes

Experimental Treatment and Design

The adolescent boys selected for this study were grouped randomly in two equal groups i.e., Group A as experimental groups (No=15) and Group B as control group (No=15) the experimental group A was subjected to the experimental training, that is yoga asanas exercises where as control group B was not allowed to participate in the experimental training however both the group A and B were permitted to attend their routine physical education classes as per the school curriculum. The study was formulated as the random group design.

The subjects were tested minimum muscular fitness test that is Kraus Weber test at the beginning (pre-test) and at the end of the experimental training period (post-test) of six weeks, but the purposes of statistical analysis post test was taken for both the groups that is control group and experimental group.

Table 2

Sl. No.	Test Items	Co-efficient of Correlation
a.	Abdominals plus psoas or A^+	0.92*
b.	Abdominals psoas or A	0.90*
c.	Psoas and Lower Abdominal	0.95*
d.	Upper Back position	0.90*
e.	Lower Back	0.92*
f.	Back and Hamstring	0.89*

*Significant at 0.05 level of confidence.

Reliability was established by the test and retest method for ten subjects. Care was taken that each test item was administrated by the same tester to ensure consistency of result which was obtained in each test item is correlated by Pearson product moment correlation.

The correlation obtained between the test and retest data are significant at 0.05 level confidences as shown in table.

Test Administration

Kraus–Weber Tests

The Kraus-Weber tests of minimum muscular fitness consist of six items.

Test 1–Abdominals plus psoas or A^+

Test 2–Abdominals psoas or A^-

Test 3–Psoas and Lower Abdominal

Test 4–Upper Back position

Test 5–Lower Back

Test 6–Strength of Back and Hamstring muscles

Statistical Techniques

The data collected from the experimental group A and control group B on minimum muscular fitness variables. "t" ratio was used fir each and every variables. The level significance was fixed at 0.05 level of confidence.

ANALYSIS OF DATA AND THEIR RESULTS OF THE STUDY

The analysis of data pertaining to this study has been presented in this chapter. Thirty subjects aged 13 and 14 years from Pondicherry were taken. They were randomly divided into two equal groups. The data was collected before and after the treatment period. (Control and experimental group) for the purpose of analysis the pre and post test has been carried out for the minimum muscular fitness (Kraus Weber test). The collected data on abdominal muscular strength and endurance, lower back, upper back and hamstring muscle strength and endurance were analyzed by using the't' test.

The level of significance was fixed at 0.05 levels as it's considered adequate for the purpose of this study.

Table 3: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Abdominal Plus (A+) Psoas Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	5.33	3.85	1.06	3.67	3.46*
Experimental group	9.00	2.00			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008

It can be seen from the above table that there exists a significant difference in abdominal plus Psoas muscles between control group and experimental group.

Table 4: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Abdominal Minus (A-) Psoas Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	5.33	3.85	1.06	3.67	3.46*
Experimental group	9.00	2.00			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008

It can be seen from the above table that there exists a significant difference in abdominal Minus Psoas muscles between control group and experimental group.

Table 5: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Psoas and Lower Abdominal Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	4.53	2.07	0.58	4.00	6.89*
Experimental group	8.53	0.884			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008

It can be seen from the above table that there exists a significant difference in Psoas and lower abdominal muscles between control group and experimental group.

Table 6: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Upper Back Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	4.6	1.985	0.571	5.06	8.86*
Experimental group	9.66	0.979			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008

It can be seen from the above table that there exists a significant difference in Upper Back muscles between control group and experimental group.

Table 7: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Lower Back Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	4.80	1.514	0.4881	3.86	7.908*
Experimental group	8.66	1.13			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008

It can be seen from the above table that there exists a significant difference in Lower Back muscles between control group and experimental group.

Table 8: Comparison of Control Group and Experimental Groups of Yoga Exercise Programme on Strength of Back and Hamstring Muscles

Group	Mean	SD	SEM	M.D	'T' Value
Control group	4.66	3.85	1.045	5.00	4.78*
Experimental group	9.66	1.247			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008.

It can be seen from the above table that there exists a significant difference in Strength of Back and Hamstring muscles between control group and experimental group.

Table 9: Comparison of Minimum Muscular Fitness between Control Group and Experimental Group

Group	Mean	SD	SEM	M.D	'T' Value
Control group	29.33	15.52	13.78	45.0	3.26*
Experimental group	74.37	51.20			

*Significant at 0.05 level of confidence.

Table value required for 28 degrees of freedom is 2.008.

It can be seen from the above table that there exists a significant difference in muscles strength between control group and experimental group.

DISCUSSION ON FINDINGS

The results of the study indicates that there is a significant improvement abdominal muscles, upper back, lower back and hamstring muscles strength and endurance as a results of practice of asanas, is significantly higher as compared to the improvement of abdominal muscles, upper back, lower back and hamstring muscles strength and endurance of the control group. This may be due to the nature and effect of asanas on improvement in abdominal muscles, upper back, lower back and hamstring muscles.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS SUMMARY

The purpose of the study was to analyze the effect of yoga asanas training programme on abdominal muscular strength and endurance, lower back, upper back and hamstring muscles strength and fitness among school boys.

To achieve this purpose 30 school boys were selected as subjected and their age was thirteen and fourteen years only. The randomly selectd subjected were put into two equal groups namely experimental group A and control group B. Pre test and post test were administered to both group A and B on abdominal muscular strength, lower back, upper back and hamstring muscles.

The data collected from the subjects were statistically analyzed by using "t" ratio to find out the significant difference between experimental and control group on (minimum muscular fitness) abdominal muscular upper back, lower back and hamstring muscles. "t" ratio was calculated and tested at 0.05 level of confidence. Statistical analysis revealed that there was significant difference on abdominal muscular Psoas (A+) and abdominal Minus (A^-) Psoas and lower abdominal, upper back muscles, lower back muscles and hamstring muscles strength fitness and the null hypothesis was rejected.

CONCLUSION

On the basis of the interpretation of data, the following conclusions were drawn from this study

Practicing asanas had significantly increased the abdominal muscular Psoas (A+) and abdominal Minus (A^-) Psoas and lower abdominal, upper back muscles, lower back muscles and hamstring muscles.

RECOMMENDATIONS

The following recommendations have been made as follows:

1. The same study may be conducted in different level of student of both sexes.
2. The same study may be conducted in different variables such as physical, physiological.
3. Similar study may be under taken physical fitness test.

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Assessment of Stress and Self Concept between UG & PG Level Students

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ABSTRACT

The purpose of the study was to assessing the stress and self concept of under graduate and post graduate level students of Guwahati University. For the purpose of the study one hundred (100) male students (age ranging 19-25 years) of which 50 UG & 50 PG students were selected from various colleges of Guwahati University, Assam. The variables under taken for the present study were Personal Stress Source Inventory Questionnaire by Arun kumar Singh, Ashish kumar Singh and Aparna Singh and the Self-concept Questionnaire by Raj kumar Saraswat was used to measure the stress level and Self-concept of the students. Assessing the Stress level and Self concept between under graduate & Post graduate level students the descriptive statistic and students 't' test was applied. It was found that the under graduate students were found in a more stressful condition than the post graduate students. It was also found that the post graduate were found better in self concept than the under graduate students.

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INTRODUCTION

Stress is the sum of physical and emotional reaction to any stimulus that disturbs the organism's homeostasis. It is a factor that is without a question apart of daily living. Stress comes in many forms. Things like our environment, physiological well being, thoughts and social stresses can have an effect on our learning. The knowledge of stress's impact on learning has resulted in a cottage industry dedicated to teaching methods of managing it. The ability to identify sources of stress and then ways to manage them are key to resolving and overcoming stress and opening our learning channels. (http://writing4students.blogspot.com)

Self concept is one of the most popular ideas of psychological literature. Self concept is inherently phenomenological that is, it refers to the person's own view of him/herself. Adjustment, academic achievement and general behaviors are among the development features of an individual which are subject to the influence of an individual's self concept. Mostly present day educators and psychologists consider that in individual's self concept is a critical facet of his personality (Bag-2010). In fact, leading scholar in the field (Wylie, 1974) has argued that comparisons to external events are not particularly relevant in the assessment of Self concept.

In the field of sports the importance of stress and self concept is vary relevant. In physical education curriculum the students have to adjust themselves the physically and psychologically stressed condition rather than any other area of education system. The physical education curriculum is prepared to establish the foundation of self esteem and confidence. However, it was observed that the present students of the colleges have to adjust themselves with the atmosphere of the colleges along with the rules and regulations. On the other hand, the passed out students have some better experiences than the present students. That's why the study was undertaken to investigate the Stress and Self concept on the basis of the students' profiles.

SIGNIFICANCE OF THE STUDY

It is expected that this study would supply valuable information about the psychological setup of the students and can be determined the degree of stress and self concept. It may also be helpful to the professionals to understand the psychological standard of the students for implication of theoretical as well as practical load on them. This study will keep its impact in the field of physical education & coaching also.

METHODS & MATERIALS

In order to asses stress and self concept between under graduate & post graduate level students one hundred

(100) male students (age ranging 19-25 years) of which 50 UG & 50 PG students were selected from various colleges of Guwahati University, Assam. The variables under taken for the present study were Personal Stress Source Inventory Questionnaire by Arun kumar Singh, Ashish kumar Singh and Aparna Singh and the Self-concept Questionnaire by Raj kumar Saraswat was used to measure the stress level and Self-concept of the students.

STATISTICAL PROCEDURE

For the purpose of assessing the Stress level and Self concept between Under graduate & Post graduate level students the descriptive statistic and students 't' test was applied.

ANNALYSIS OF DATA

Table 1: Significance Difference of Means and Standard Deviations of Stress between UG and PG Level Students

Variables	Mean	S.D.	Mean Diff.	't' Ratio
Under Graduate students	63.48	6.55	4.02	3.02*
Post graduate students	59.46	6.76		

*Significant at 0.05 level.

*'t' value required to be significant at 0.05 level of confidence with 98 degree of freedom was 1.98

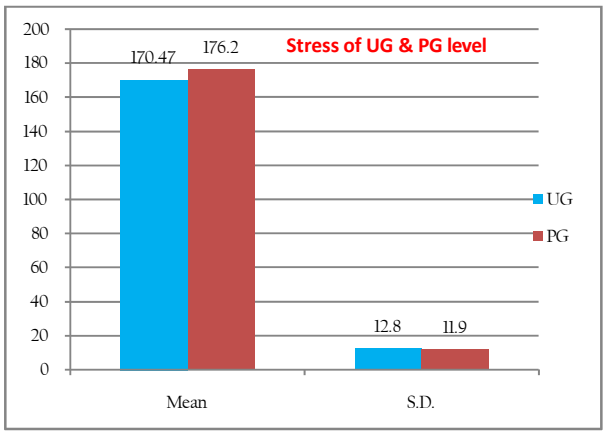

Fig. 1: Comparison of Means of Stress between UG and PG Level Students

Table 2: Significance of Difference of Means and Standard Deviations of Self-Concept between UG and PG Level Students

Variables	Mean	S.D.	Mean Diff.	'T' Ratio
Under Graduate students	170.47	12.80	5.73	2.21*
Post graduate students	176.20	11.90		

*Significant at 0.05 level

*'t' value required to be significant at 0.05 level of confidence with 98 degree of freedom was 1.98.

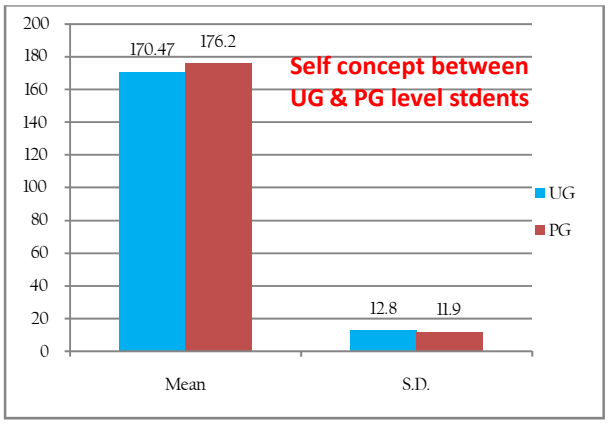

Fig. 2: Comparison of Means of Self-Concept between UG and PG Level Students

DISCUSSION OF THE FINDINGS

The results as obtained while conducting the study and after analyzing the gathered data can be expressed by the following ways.

The comparative results of the study on stress & self concept between under graduate & post graduate level students showed significant difference. The data represented that under graduate level students were in a psychologically more stressed condition than the post graduate students because they had to adopt themselves in the scientifically vigorous college curriculum to build the root of their future. The present college students were found less experienced about the college curriculum and always in a thoughtful state about which kind of burden is about to come. The post graduate students were found better in self concept than the under graduate students as after completing their degree, they felt a little bit relaxed as they had the required eligible criteria to get a job to be a physical education teacher or many other more jobs. In general the post graduate students need not to do physically and psychologically tough deed as the present students do except the exceptional. This result of the present student may be due to the pressure of the college's rules bounded curriculum of study and the relaxation from pressure of study and physical labor contributed for this result in favor of passed out students of the college.

CONCLUSION

From the above study the conclusion can be described as below:

1. It was found that the under graduate students were found in a more stressful condition than the post graduate students.
2. It was also found that the post graduate were found better in self concept than the under graduate students.

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Impact of Ujjayi Pranayama on Components of Health-Related Fitness

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ABSTRACT

The present study was conducted with the objective to determine the short term practice of Ujjayi-Nadi pranayama on components of health-related fitness. For the purpose of present study 32 university level girls between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n1=16); Group-B: Control (n2=16). The subjects from Group-A: Experimental were subjected to a 6-weeks Ujjayi pranayama. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. Based on the analysis of the results obtained, we conclude that the significant differences were found in Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance) of University Level Girls. Insignificant between-group differences were noted in Muscular Strength, Muscular Endurance, Flexibility, % Body Fat, Fat Weight and Lean Body Weight of University Level Girls.

Keywords: *Ujjayi Pranayama, Components of Health-Related Fitness.*

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INTRODUCTION

Breath, life and energy are rooted together and yogis have a single word for all three-prana. Yogis considers death to occur when prana, the vital force, leaves the body.

Yogic techniques produce remarkable physiological changes and have sound scientific basis (Madanmohan *et al.* 1983 & Madanmohan *et al.* 1992 & Wallace *et al.* 1971). Yoga is a conventional long-established and time-tested art and therapeutic science that has positive contribution to make in maintenance of general wellbeing and happiness. It is now almost a proved fact based on various investigations that a prolonged continuous yogic practice and Chandra nadi Pranayam, relieve respiratory ailments like Bronchial Asthma, chronic Bronchitis, Bronchiectasis, and Ventilatory functions are much improved in them (Yadav & Das, 2001). The effect of different pranayamas on healthy (Subbalakshmi *et al.* 2005) and diseased people (Cooper *et al.* 2003, Dhungel *et al.* 2008) has been well studied and they are known to affect the cardiopulmonary activities and autonomic functions. When completed through the left nostril alone the practice is called "Chandra nadi Pranayam" which means a heat dissipating or cooling liberating practice. (Backon, 1988, Bhargava, 1988). Breath is a dynamic bridge between the body and mind (Bjlani, 2004). Breathing is not only an instinctive reflex to satisfy the need of the body for oxygen but it has been considered that consciously controlled breathing can be used as a technique for enhancing mental and physical powers (Gharote, 2003). Pranayama produce different physiological responses in healthy young volunteers (Madanmohan *et al*, 2005, Shivraj *et al*, 2001). The practice of pranayama has been known to modulate cardiac autonomic status with an improvement in Cardio respiratory functions (Subalakshmi *et al*, 2005). Pranayama has immense therapeutic potential in a wide range of psychosomatic disorders, but there is currently lack of an adequate meta-analysis in relation to anuloma viloma pranayama to assess its efficacy with respect to components of health-related fitness and as a result the present study was conducted to find out therapeutic effects of Chandra nadi Pranayam on components of health-related fitness.

MATERIAL AND METHODS

Subjects

Thirty two, university level girls between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n_1=16); Group-B: Control (n_2=16).

Table 1: Distribution and Demographics of Subjects

Sample Size (N=32)			
Variables	**Total (N=32)**	**Experimental Group (n1=16)**	**Control Group (n2=16)**
Age	21.37±2.18	21.18±2.16	21.56±2.25
Body Height	5.64±2.09	5.64±2.15	5.64±2.09
Body Mass	69.91±4.19	69.88±4.39	69.94±4.12

METHODOLOGY

This study is designed as a retrospective cross-sectional study. The subjects from Group-A: Experimental were subjected to a 6-week training of Ujjayi Pranayama. This lasted 4 weeks and consisted of daily sessions.

STATISTICAL ANALYSES

Data is expressed as the mean ± SD. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test.

RESULT

Table 3 Mean values (±SD) and Paired Sample t-test of Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance, Flexibility, % Body Fat, Fat Weight and Lean Body Weight) in Experimental and Control group (n=16 each) before (Pre) and after (Post) 6-weeks Ujjayi Pranayama Training Programme (Experimental group only).

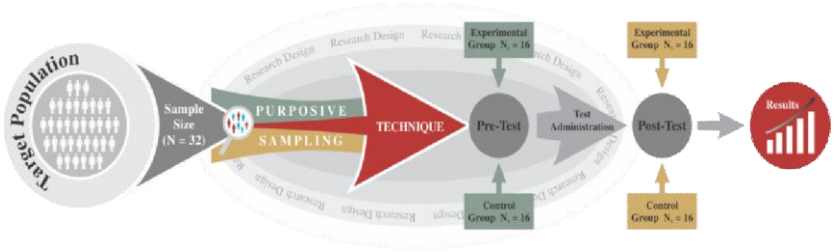


Fig. 1: Study Design

Table 2: Experimental Treatment

6-Weeks Ujjayi Pranayama Training			
Weeks	**Schedule**	**Time**	**Duration**
I[st] Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Ujjayi Pranayama (9 Rounds X 1 Set)	10 Minute	
	Relaxation Posture	5 Minute	
2[nd] Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Ujjayi Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3[rd] Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Ujjayi Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	
4[rd] Week	Preliminary Yogic Exercises	5 Minute	35 Minute
	Practice of Ujjayi Pranayama (9 Rounds X 4 Set)	25 Minute	
	Relaxation Posture	5 Minute	

Table 3

Parameters	Group	Pre-Test	Post-Test	T-value	P-value
Cardiorespiratory Endurance	Experimental	1897.19±460.58	1905.00±460.13	9.496*	0.0001
	Control	1987.81±408.60	1989.44±410.47	1.521	0.1489
Muscular Strength	Experimental	36.00±6.25	35.44±6.07	1.648	0.1200
	Control	35.25±5.97	34.88±5.86	1.102	0.2875
Muscular Endurance	Experimental	28.75±4.19	29.13±4.21	1.463	0.1639
	Control	28.13±3.93	28.31±3.50	0.764	0.4564
Flexibility	Experimental	23.13±4.16	23.50±3.63	1.694	0.1108
	Control	23.13±4.16	23.13±3.40	0.000	1.0000
% Body Fat	Experimental	30.41±5.40	30.39±5.39	1.954	0.0696
	Control	26.34±7.53	26.34±7.52	0.234	0.8176
Fat Weight	Experimental	16.54±1.32	16.54±1.32	1.463	0.1639
	Control	16.59±1.58	16.58±1.58	1.232	0.2369
Lean Body Weight	Experimental	48.98±5.10	49.01±5.11	1.588	0.1331
	Control	47.81±5.90	47.81±5.90	1.000	0.3332

Cardiorespiratory Endurance

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Cardiorespiratory Endurance of pre-test and post-test of experimental group were 1897.19±460.58 & 1905.00±460.13 respectively. However, the Mean and Standard Deviation (±SD) values of Cardio respiratory Endurance of pre-test and post-test of control group were 1987.81±408.60 & 1989.44±410.47. The t-value in case of experimental group was 9.496* and for control group it was 1.521.

Significant between-group differences were noted in Cardiorespiratory Endurance in the experimental group before (Pre) and after (Post) subjected to 4-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=9.496*) is greater than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

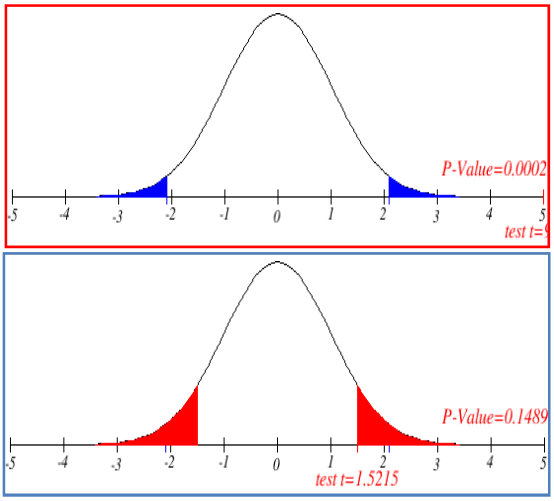


Fig. 2: t-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Cardiorespiratory Endurance) of University Level Girls

Muscular Strength

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Muscular Strength of pre-test and post-test of experimental group were 36.00±6.25 & 35.44±6.07 respectively. However, the Mean and Standard Deviation (±SD) values of Muscular Strength of pre-test and post-test of control group were 35.25±5.97 & 34.88±5.86. The t-value in case of experimental group was 1.648 and for control group it was 1.102.

Insignificant between-group differences were noted in Muscular Strength in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.648) is less than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

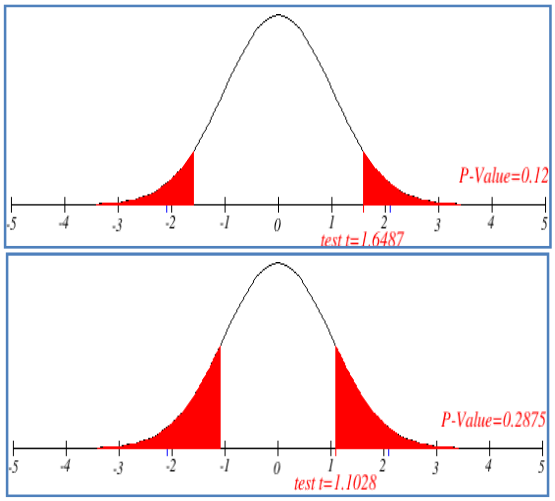


Fig. 3: t-Test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Muscular Strength) of University Level Girls

Muscular Endurance

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Muscular Endurance of pre-test and post-test of experimental group were 28.75±4.19 & 29.13±4.21 respectively. However, the Mean and Standard Deviation (±SD) values of Muscular Endurance of pre-test and post-test of control group were 28.13±3.93 & 28.31±3.50. The t-value in case of experimental group was 1.463 and for control group it was 0.764.

Insignificant between-group differences were noted in Muscular Endurance in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.463) is less than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

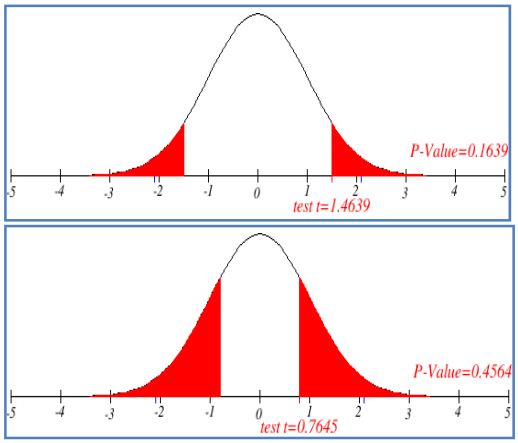


Fig. 4: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Muscular Endurance) of University Level Girls

Flexibility

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Flexibility of pre-test and post-test of experimental group were 23.13±4.16 & 23.50±3.63 respectively. However, the Mean and Standard Deviation (±SD) values of Flexibility of pre-test and post-test of control group were 23.13±4.16 & 23.13±3.40. The t-value in case of experimental group was 1.694 and for control group it was 0.000.

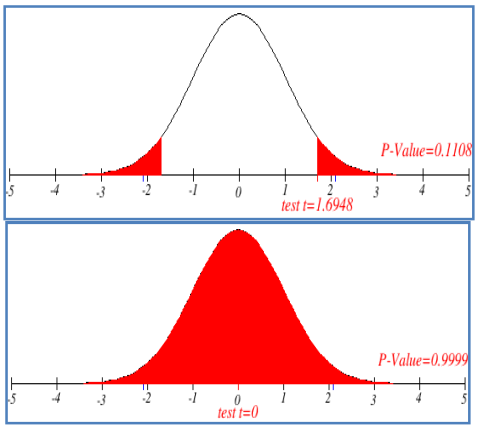


Fig. 5: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Flexibility) of University Level Girls

Insignificant between-group differences were noted in Flexibility in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.694) is greater than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

% Body Fat

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of experimental group were 30.41±5.40 & 30.39±5.39 respectively. However, the Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of control group were 26.34±7.53 & 26.34±7.52. The t-value in case of experimental group was 1.954 and for control group it was 0.234.

Insignificant between-group differences were noted in% Body Fat in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.954) is less than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

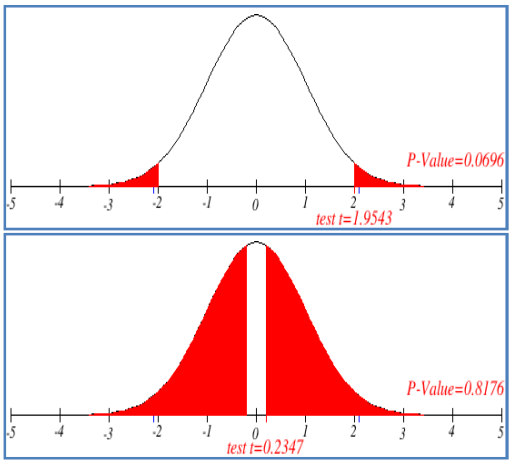


Fig. 6: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., % Body Fat) of University Level Girls

Fat Weight

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Fat Weight of pre-test and post-test of experimental group were 16.54±1.32 & 16.54±1.32 respectively. However, the Mean and Standard Deviation (±SD) values of Fat Weight of pre-test and post-test of control group were 16.59±1.58 & 16.58±1.58. The t-value in case of experimental group was 1.463 and for control group it was 1.232.

Insignificant between-group differences were noted in Fat Weight in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.463) is less than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

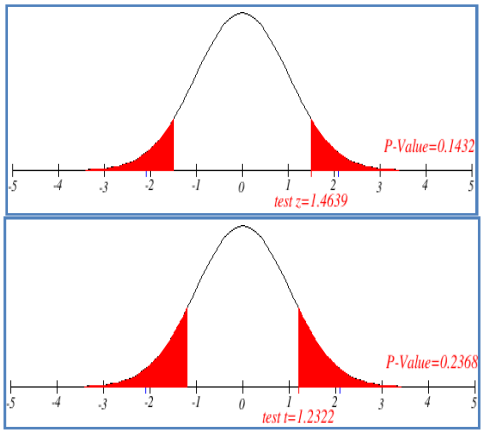


Fig. 7: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Fat Weight) of University Level Girls

Lean Body Weight

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table 3. The Mean and Standard Deviation (±SD) values of Lean Body Weight of pre-test and post-test of experimental group were 48.98±5.10 & 49.01±5.11 respectively. However, the Mean and Standard Deviation (±SD) values of Lean Body Weight of pre-test and post-test of control group were 47.81±5.90 & 47.81±5.90. The t-value in case of experimental group was 1.588 and for control group it was 1.000.

Insignificant between-group differences were noted in Lean Body Weight in the experimental group before (Pre) and after (Post) subjected to 8-weeks Ujjayi Pranayama Training Programme since, the calculated value of (t=1.588) is less than tabulated value of $t_{.05}$ (15) = 2.13 for the selected degree of freedom and level of significance. However, no significant changes over that 8-weeks period were noted in the control group.

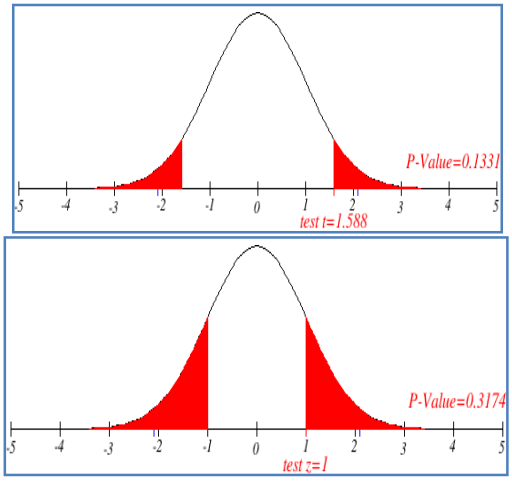
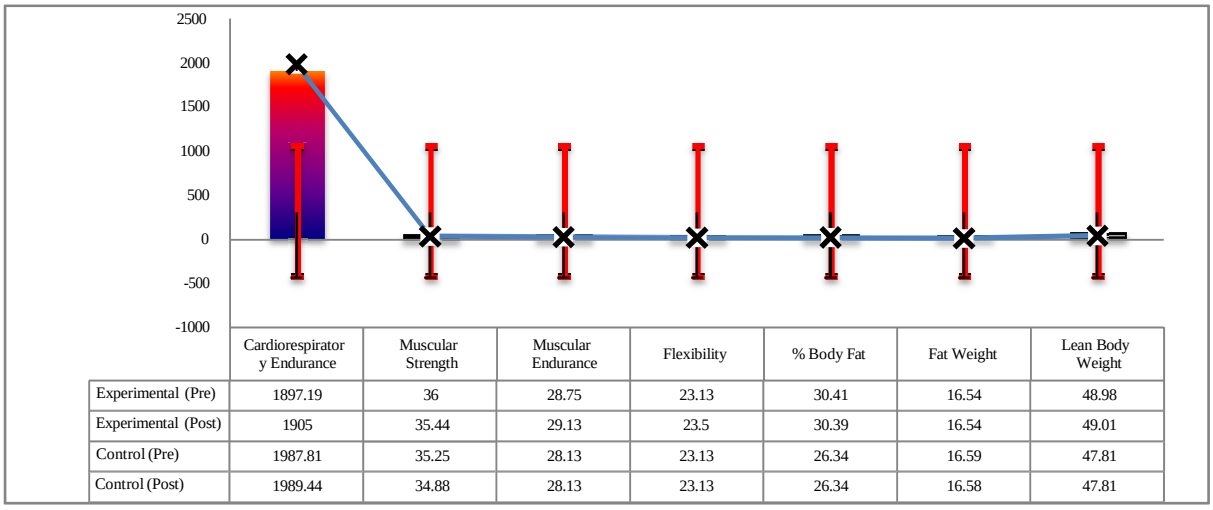


Fig. 8: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Lean Body Weight) of University Level Girls



	Cardiorespiratory Endurance	Muscular Strength	Muscular Endurance	Flexibility	% Body Fat	Fat Weight	Lean Body Weight
Experimental (Pre)	1897.19	36	28.75	23.13	30.41	16.54	48.98
Experimental (Post)	1905	35.44	29.13	23.5	30.39	16.54	49.01
Control (Pre)	1987.81	35.25	28.13	23.13	26.34	16.59	47.81
Control (Post)	1989.44	34.88	28.13	23.13	26.34	16.58	47.81

Fig. 9: Mean Values of Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance, Flexibility, % Body Fat, Fat Weight and Lean Body Weight) in Experimental and Control group (n=16 Each) before (Pre) and After (Post) 6-Weeks Ujjayi Pranayama Training Programme (Experimental Group Only)

CONCLUSION

Based on the analysis of the results obtained, we conclude that the significant differences were found in Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance) of University Level Girls. Insignificant between-group differences were noted in Muscular Strength, Muscular Endurance, and Flexibility, % Body Fat, Fat Weight and Lean Body Weight of University Level Girls.

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Comparison of the Effect of Diurnal Variation on VO_2 Max & Cardiovascular Efficiency among Individual and Team Game Players

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ABSTRACT

Introduction

Variation in the daily rhythm of the functional capacity of the different systems which are synchronized to a 24- hour day, observe two peculiar aspects. One of them is the time dependent alteration in the levels of physiological process expressed as circadian range or circadian amplitude. Athletic performances that occur several hours before or after the circadian peak "window" be potentially subjected to less than optimal performance.

The other aspect of the fluctuation of performance efficiency is in the internal mechanism called biological clock. The qualitative study of this biological phenomenon reveals that biological clock has division of hours, minutes, and seconds as a regular clock..

The purpose of the study was to compare the effect of diurnal variation on selected physiological variables among individual and team game players.

Methods

Sixty male subjects of university level in the age group of 17 to 25 years from L.N.I.P.E., Gwalior (M.P.) were selected randomly as the sample of the study. The following Equipments were used to measure selected physiological variables, Maximal oxygen consumption (VO2 Max) was measured by using Astrand-Astrand Nomogram and To assess the cardio vascular efficiency of the subjects following equipments were used wet Spirometer for Vital Capacity, Sphygmomanometer for measuring Blood Pressure and Maximum Expiratory Pressure, Stethoscope for Blood Pressure and nasal clips used for Breath Holding The data on the selected physiological variables were collected by administering respective tests, on separate days in the L.N.I.P.E. Research Laboratory. The data was collected only in the daytime between 6 a.m. to 7 p.m.

Results

In the present study no significant difference were exhibited by the sports group (individual and team game players) as well as no interaction was found in sports group (individual and team game players) and diurnal variation (different time of the day), however significant difference were exhibited by the participants in the mean performance of VO2 Max and Cardio Vascular Efficiency at the different selected time during the day of a 24 – hour cycle

Discussions/ Conclusion

Based upon the results of present study and of the previously reviewed investigations, a time of day effect on exercise is a factor that must be taken into account.. Optimal performance is the paramount objective of athletic endeavor, and adjusting for time of day differences appears to be an important factor in attaining that optimal performance. Endurance training should probably be conducted at the same time of day that performance is scheduled. This effect seems independent of gender. The question of whether morning or afternoon endurance training is more beneficial is still unresolved. The answer would have implications for designing training programs to enhance aerobic capacity.

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INTRODUCTION

Man's performance in sports or any other field depends on his movement-oriented behavior, all these actions which can be noted by other with or without the aid of instruments and which have their roots in the biological phenomenon. The sports performance of an individual is the result of integrated and harmonious functioning of the several dynamic process of the body, which are physiological, psychological, psycho-physiological and biochemical in nature operated in a specific environmental conditions. Further, there are some "performance variables" which are those conditions that supposedly affect performance i.e. they may temporarily depress or elevate performance and are quite transient in nature such as fatigue, warm-up, placebo effect, superstitious behavior, pain tolerance, genetics type of training and other interactions lead to the state of excellence in performance.

Out of the aforesaid factors, the biological phenomenon is the foremost which fluctuates periodically and is quite prone to the diurnal variation which may be interpreted as the circadian rhythms or biological clock or daily rhythm.

The daily rhythm is a major source of variability in performance and the range of amplitude increases with increasing task complexity. The circadian range of performance rhythm oscillations is 20-30% of the daily mean. Thus, the timing of the athletic performance seems to be an important factor, which needs careful investigation. Some research findings indicate that the daily rhythmical oscillation occurs in several physiological and behavioral functions that contribute to athletic performance. These functions include resting level of sensory, motor, psychomotor, and perceptual variables. Research also points out that daily rhythmicity in components of athletic performance can be modulated by work load, physiological stressors, motivation, arousal level, "morning and evening types" differences lighting, sleep disturbances, the post lunch dip phenomenon etc. diurnal rhythms in reflex time and tremor may be significant in athletic events requiring fine muscular control.

The purpose of the study was to compare the effect of diurnal variation on selected psychomotor variables among individual and team game players.

METHODS

Participants

Sixty male subjects of university level in the age group of 17 to 25 years from L.N.I.P.E., Gwalior (M.P.) were selected randomly as the sample of the study. The subjects were selected according to following sports groups given in Table 1.

Selection of Variables

- Maximal Oxygèn Consumption (VO_2 Max)
- Cardio Vascular Efficiency

Criterion Measures

Maximal Oxygen Consumption (VO_2 Max)

Maximal oxygen consumption (VO_2 Max) was measured by using Astrand-Astrand Nomogram. A wooden bench, 40 cm high was used for this test subjects was asked to perform 8 minutes bench stepping. The frequency of the stepping was 30 steps per minute. Exercise heart rate was taken for one minute immediately after the exercise. The heart rate and the Total body weight were then applied to the nomogram.

Total Body Weight

The weights of the subjects were taken by the weighing machine, the subject bare footed and wearing.

Hyman's Cardio Pulmonary Index

Objective: To assess the cardio vascular efficiency of the subjects.

Equipments: Spirometer for Vital Capacity, Sphygmomanometer for measuring Blood Pressure and Maximum Expiratory Pressure, Stethoscope for Blood Pressure and nasal clips used for Breath Holding.

Procedure: Hyman's index was used to compute the score of cardio pulmonary index. Following variables were used for testing the cardio pulmonary index namely Vital Capacity, Maximum Expiratory Pressure, Maximum Inspiratory Breath Holding Capacity, Age, Systolic Pressure, Diastolic Pressure and Resting Pulse Rate. For computation of score following formula was used :-

$$CPI = \frac{VC+MEP+MBH+AGE}{SP+DP+PR}$$

Table 1: Division of Students in Different Category of Sports

Sports	Individual			Team		
Events	Badminton	Athletics	Swimming	Football	Volleyball	Hockey
Numbers	10	10	10	10	10	10

PROCEDURE

Reliability of Data

The reliability of data was ensured by establishing the Instrument Reliability, Tester Competency, and Reliability of Tests and Subject Reliability.

Time Schedule for Collection of Data

The data on the selected psychomotor variables were collected by administering respective tests, on separate days in the L.N.I.P.E. Research Laboratory.

The data was collected only in the daytime between 6 a.m. to 7 p.m. equally interspersing timings are as follows:

Table 2: Timing of Data Collection

Sl. No.	Timing	Referred Time
1	Between 6.00 a.m. to 7.00 a.m.	6.00 a.m.
2	Between 10.00 a.m. to 11.00 a.m.	10.00 a.m.
3	Between 2.00 p.m. to 3.00 p.m.	2.00 p.m.
4	Between 6.00 p.m. to 7.00 p.m.	6.00 p.m.

Collection of Data

The required data on the selected physiological and psychomotor components was collected d at the Research Laboratory of Lakhsmibai National Institute of Physical Education, Gwalior (M.P.). The daily activities of the subjects were not altered during the course of investigation; however the following restrictions were imposed upon them:

- No caloric intake of any kind two hours prior to and proceeding the test session.
- No strenuous exercise two hours prior to and preceding each testing bout.

Statistical Analysis: To compare the VO_2 Max and Cardio vascular efficiency between the two sports categories in relation to diurnal Variation the data collected was analyzed using the mean, standard deviation and two-way analysis of variance (Two-Way ANOVA). Further, in order to identify the specific groups in which significant differential expression occurs from others in respect to the mean, post-hoc comparison test (LSD-Least Significant Difference) was used. The level of significance was set at 0.05. The data were analyzed by using the SPSS-Version 11.5.

RESULTS

Firstly, the data obtained from the selected parameters were organized and subjected to descriptive analysis in order to find out the characteristics of all the test items as mean and standard deviation.

Secondly, to compare the parameter between the two categories in relation to diurnal the data collected was analyzed using the mean, standard deviation and two-way analysis of variance and presented in the form of tables and figures.

Table 3: Analysis of Variance of Different Diurnals in Relation to Cardio-vascular Endurance (VO_2 Max)

Source	Type III Sum of Squares	DF	Mean Square	F-Value
Sports	11.511	1	11.511	0.815
Diurnal	121.621	3	40.540	2.870*
Sports × diurnal	55.029	3	18.343	1.299
Error	3276.807	232	14.124	
Total	419705.077	240		

Sports (d.f. 1, 232) = 3.86
Diurnals (d.f. 3, 232) =2.62
Sports × Diurnal (d.f. 3, 232) =2.62

Table 4: Significance of Difference Between Ordered Paired Means of Cardio-Vascular Endurance (VO_2 Max) in Different Diurnals

6am	10 am	2 pm	6 pm	Mean Difference	CD at 5% Level
40.87	41.01			0.14	1.39
40.87		42.51		1.64*	
40.87			42.18	1.31	
	41.01	42.51		1.50*	
	41.01		42.18	1.17	
		42.51	42.18	0.33	

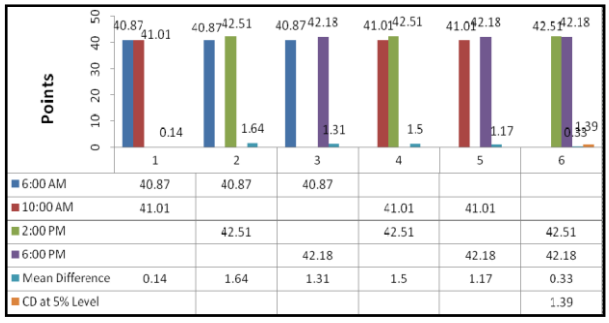

Fig. 1: LSD Comparison for the Mean Score of Cardio-Vascular Endurance (VO_2 Max) among Diurnals

Table 5: Analysis of Variance of Different Diurnals in Relation to Cardio Pulmonary Index

Source	Type III Sum of Squares	DF	Mean Square	F-Value
Sports	0.008	1	0.008	0.666
Diurnal	0.170	3	0.057	4.684*
Sports ×diurnal	0.001	3	0.000	0.031
Error	2.804	232	0.012	
Total	110.518	240		

Sports (d.f. 1, 232) = 3.86
Diurnals (d.f. 3, 232) =2.62
Sports × Diurnal (d.f. 3, 232) =2.62

Table 6: Significance of Difference Between Ordered Paired Means of Cardio Pulmonary Index in Different Diurnals

6am	10 am	2 pm	6 pm	Mean Difference	CD at 5% Level
0.6242	0.6845			0.0603*	0.0408
0.6242		0.6917		0.0675*	
0.6242			0.6772	0.0530*	
	0.6845	0.6917		0.0072	
	0.6845		0.6772	0.0073	
		0.6917	0.6772	0.0145	

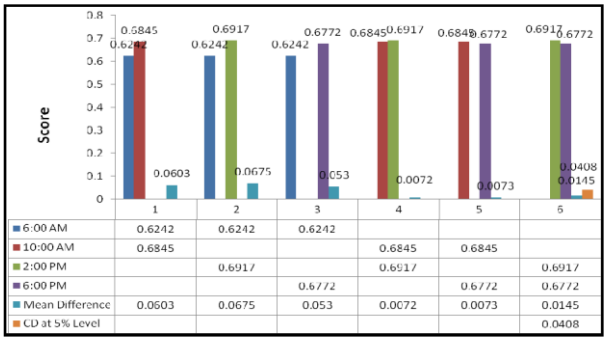

Fig. 2: LSD Comparison for the Mean Score of Cardio Pulmonary Index among Diurnals

DISCUSSION

In the present study no significant difference were exhibited by the sports group (individual and team game players) as well as no interaction was found in sports group (individual and team game players) and diurnal variation (different time of the day), however significant difference were exhibited by the participants in the mean performance of VO_2 Max and Cardio Vascular Efficiency at the different selected time during the day of a 24–hour cycle.

The results of this study are in agreement with results reported by Hill et al. (1988) conducted study in which they recruited 8 men with a mean age of 26 years and 24 women with a mean age of 24 years. The subjects were then classified as a "morning" type (*n* 5 14), an "evening" type (*n* 5 11), or neither (*n* 5 7) based upon responses to a questionnaire. The subjects then performed 2 maximal progressive cycle ergo meter tests: 1 test between 0600 and 0830 hours and 1 between 1530 and 1800 hours on the same day. No significant differences were found between the groups for heart rate, VO_2, or RPE at sub maximal levels. A Significant difference in RPE for the "morning" types showed that the sub maximal level appeared more difficult during the AM test. A significant time of day difference was present for all groups in VO_2 at sub maximal levels, a similar study by Burgoon et al. (1992) tested 26 men of college age who had been typed as morning (*n* 59), evening (*n* 5 6), or intermediate (*n* 5 11) people. These subjects performed a maximal graded treadmill test at 0730–0830 hours and 1930–2030 hours in a random order 48 hours apart. Significant differences were found for time of day and time to exhaustion, with higher values at the PM testing time. No interaction between time of day and VO_2 max was discovered. No between-group differences were found for VO_2 max or time to exhaustion in the present study Cardio pulmonary index, reveals a significant difference which is supprted by the findings of K.Venkareshwarlu (1972) who observed the diurnal changes in physiological performance. He took 25 male students undergoing training in National Institute of Sports, Patiala. Performance was evaluated by Harvard Step Test at different time. The results of his study showed significant difference in performance level produced at different times during a 24 hours period.

CONCLUSION

Practical Applications

Based upon the results of present study and of the previously reviewed investigations, a time of day effect on exercise is a factor that must be taken into account. This would have practical applications in planning training sessions, testing sessions, experimental investigations, and competitive events. Optimal performance is the paramount objective of athletic endeavor, and adjusting for time of day differences appears to be an important factor in attaining that optimal performance. Based on the results of the study the following recommendation can be set forth:

1. Endurance training should probably be conducted at the same time of day that performance is scheduled. This effect seems independent of gender. The question of whether morning or afternoon endurance training is more beneficial is still unresolved. The answer would have implications for designing training programs to enhance aerobic capacity.
2. Morning" and "evening" types may need to be considered when using maximal exercise or measuring V·O2max.
3. Training and competition should be scheduled at generally the same time of the day. If this is impractical, the athlete may be able to adjust the sleep/wake cycle so that the performance time will coincide with the adjusted peak times for a particular rhythm. This is in agreement with the recommendations of Winget et al. (1985) 'Circadian rhythms and athletic performance.

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Coordinative Abilities of Table-tennis in Different Age Groups: A Comparative Study

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ABSTRACT

The purpose of the study was to characterize elite Gujarat table-tennis players to standard human performance measures by their selected co-ordinative abilities. The purpose of the study was to compare sub junior, junior and senior players of table-tennis by their selected co-ordinative abilities. The subjects were tested on selected co-ordinative abilities i.e. Reaction ability, Orientation ability, Differentiation ability, Balance ability and Rhythm ability. To characterize elite state table-tennis players to their standard human performance measures by selected co-ordinative abilities, mean and standard deviation were used. To compare the selected co-ordinative abilities among sportsman belonging to three levels (Sub-Juniors, Juniors and Senior), one way analysis of variance (ANOVA) and post hoc (Least significant difference) test was used and the levels of significance was set at 0.05 levels. The analysis of variance showed that there was significant difference between sub juniors, juniors and seniors in relation to Reaction ability, Orientation ability, Balance ability and Rhythmic ability as "F" Values were found to be significant (99.65, 9.60, 9.39 and 176.44) where these were required to be 3.92 at 0.05 level of confidence. In relation to differentiation ability there was not any significant difference between sub juniors, juniors and seniors as 'F' value was not found to be significant (0.021), where this was required to be 3.92 at 0.05 level of confidence. After applying the post-hoc (least significant difference) test it was observed that in relation to Reaction ability mean differences of sub juniors and juniors; sub juniors and seniors; juniors and seniors was found to be significant at 0.05 level of significance. In relation to orientation ability mean differences of sub juniors and junior; sub juniors and seniors; juniors and seniors was found to be significant at 0.05 level of significance. In relation to Balance ability mean differences of sub juniors and juniors; sub juniors and seniors; juniors and seniors was found to be significant at 0.05 level of significance. In relation to Rhythmic ability mean differences of sub juniors and juniors; sub juniors and seniors; was found to be significant at 0.05 level of significance. Mean difference of juniors and seniors was found to be insignificant.

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OBJECTIVE OF STUDY

The purpose of the study was to compare the coordinative abilities of table-tennis players among different age groups.

METHODOLOGY

Subjects

For the purpose of this study 120 table-tennis players of school level girls from states of who participated in inter variety competitions, like state and national Championship and inter-university level in table-tennis. A total of 120 subjects were selected 40 from each level i.e. Sub-Junior, Junior and Senior:

1. For Sub-Juniors, the age of the subjects was 14 years and below (last day of the year) and upto Index 220.
2. For Juniors, the age of the subjects was 18 years and below (last day of the year) and upto Index 250.
3. For seniors the age of the subjects was above 18 years.

Index formula used in the study was:

Index point = age of years + Height in centimetres + weight in Kg.

Variables

Keeping the feasibility criterion in mind, especially in the case of availability of instruments, the following co-ordinative abilities were selected:

1. Orientation Ability
2. Differentiation Ability
3. Reaction Ability
4. Balance Ability
5. Rhythm Ability.

Administration of Tests

The necessary data was collected by administering co-ordinative abilities tests as suggested by Peter Hirtz (1985).

Statistical Analysis

To compare the coordinative abilities of taekwondo among different age categories, analysis of Variance (ANOVA) was employed at.05 level of significance.

FINDINGS AND CONCLUSION

To observe the difference between table-tennis players of all age categories on their selected coordinative abilities, the analysis of variance was adopted and data pertaining to these has been presented in table 1 to 9.

To observe the difference between three groups (Sub Juniors, Juniors and Seniors) of table-tennis Players on their Reaction Ability, the analysis of variance was adopted and data pertaining to them have been presented in Table 1.

Table 1: Analysis of Variance of the Means of Reaction Ability among Players of three Different Levels of Participation

Source of Variation	Df	Sum of Square	Mean Square	F-value
With in Group	2	28196.35	14098.17	99.65*
Between Groups	117	16552.98	141.47	

* Significant at 0.05 level
F.05 (2, 117) = 3.92

It is evident from Table 1 that significant difference was found among the table-tennis players of three different levels as the F-value of 99.65 is higher than the tabulted value of 3.92 with 2,117 df at.05 level of significance.

Since the one way analysis of variance was found significant in relation to Reaction Ability, the least significant difference (LSD) test was applied to find out which of the differences of the means amongst the different groups (Sub Juniors, Juniors and Seniors) were statistically significant (Table 2).

Table 2: Least Significant Difference Post-hoc Test for Means of the Sub-juniors, Juniors and Seniors in Relation to Reaction Ability

Groups (Means)			M.D.	C.D.
Sub Juniors	Juniors	Seniors		
186:1	164.4		21.7 *	5.26
186:1		155.42	30.68 *	5.26
	164.4	155.42	8.98 *	5.26

* Significant at.05 level
M.D. = Mean Difference
C.D. = Critical difference

It's evident from Table 2 that mean differences of Sub Juniors and Juniors, Sub Juniors and Seniors, Juniors and Seniors was found to be significant at 0.05 level of significance in relation to Reaction ability.

To observe the difference between three groups (Sub Junior, Junior and Seniors) of table-tennis players on their Orientation ability the analysis of variance was adopted and data pertaining to them have been presented in Table 3.

Table 3: Analysis of Variance of the Means of Orientation Ability among Players of three Different Levels of Participations

Source of Variation	Df	Sum of Squares	Means Squares	F-value
Within group	2	26.53	13.26	9.60*
Between Groups	117	162.60	1.38	

*Significant at 0.05 levels
F.05 (2, 117) = 3.07

It is evident from table 3 that significant difference was found among the table-tennis players of three different levels as the F-value of 9.60 is higher than the tabulted value of 3.07 with 2,117 df at.05 level of significance. Since the one way analysis of variance was found significant in relation to Orientation ability, the least significant (LSD) test was applied to find out which of the difference of the means amongst the different groups (Sub Junior, Juniors and Seniors) were statistically significant (Table 4).

Table 4: Least Significant Difference Post-hoc Test for Means of the Sub juniors, Juniors and Seniors in Relation to Orientation Ability

Groups			M.D.	C.D.
Sub Juniors	Juniors	Seniors		
7.27	8.54		1.27 *	.52
7.27		10.12	2.85 *	.52
	8.54	10.12	1.58*	.52

* Significant at.05 level
M.D. = Mean Difference
C.D. = Critical Difference

It is evident from Table 4 that mean differences of sub juniors and juniors; sub juniors and seniors; juniors and seniors was found to be significant at 0.05 levels of significance in relation to Orientation ability.

Table 5: Analysis of Variance of the Means of Differentiation Ability among Players of three Different Levels of Participation

Source of Variation	Df	Sum of Squares	Means Squares	F-value
With in group	2	0.32	0.16	0.021
Between Groups	117	886.4	7.57	

Insignificant at.05 level
F.05 (2, 117) = 3.07

Seniors of table-tennis players on their Differentiation Ability, the analysis of variance was adopted and data pertaining to them have been presented in Table 5.

To observe the difference between three groups (Sub Juniors, Juniors and Seniors) of table-tennis players on their Differentiation Ability, the analysis of

It is evident from table 5 that insignificant difference was found among the table-tennis players of three different levels as the F-value of 0.021 is lower than the tabulted value of 3.07 with 2,117 df at.05 level of significance. To observe the difference between three groups (Sub Juniors, Juniors and Seniors) of table-tennis players on their Balance Ability, the analysis of variance was adopted and data pertaining to them have been presented in Table 6.

Table 6: Analysis of Variance of the Means of Balance Ability among Players of three Different Levels of Participations

Source of Variation	Df	Sum of Squares	Means Squares	F-value
With in group	2	25.75	12.87	9.39*
Between Groups	117	160.75	1.37	

* Significant at.05 level
F.05 (2, 117) = 3.07

It is evident from table 6 that significant difference was found among the table-tennis players of three different levels as the F-value of 9.39 is higher than the tabulated value of 3.07 with 2,117 df at.05 level of significance.

Since the one way analysis of variance was found significant in relation to Balance Ability, the least significant (LSD) test was applied to find out which of the different of the means amongst the different groups (Sub Juniors, Juniors and Seniors) were statistically significant (Table 7).

Table 7: Least Significant Difference Post-hoc Test for Means of the Sub Juniors, Juniors and Seniors in Relation to Balance Ability

Groups			M.D.	C.D.
Sub Juniors	Juniors	Seniors		
10.075	8.635		1.44*	0.51
10.075		7.24	2.835*	0.51
	8.635	7.24	1.395*	0.51

* Significant at.05 level
M.D. = Mean Difference
C.D. = Critical Difference

It is evident from Table 7 that mean differences of Sub Juniors and Juniors; Sub Juniors and Seniors; Juniors and Seniors was found to be significant at 0.05 levels of significance in relation to Balance ability.

To observe the difference between three groups (Sub Junior, Junior and Seniors) of table-tennis players on their Rhythmic Ability the analysis of variance was adopted and data pertaining to them have been presented in Table 10.

Table 8: Analysis of Variance of the Means of Rhythmic ability among Players of three Different Levels of Participations

Source of Variation	Df	Sum of Squares	Means Squares	F-value
With in group	2	31.77	15.88	176.44*
Between Groups	117	11.08	0.09	

*Significant at 0.05 level
F.05 (2, 117) = 3.07

It is evident from Table 8 that significant difference was found among the table-tennis players of three different levels as the F-value of 176.44 is higher than the tabulted value of 3.07 with 2,117 df at.05 level of significance.

Since the one way analysis of variance was found significant in relation to Rhythmic Ability, the least significant (LSD) test was applied to find out which of the difference of the means amongst the different groups (Sub Juniors, Juniors and Seniors) were statistically significant (Table 9).

Table 9: Least Significant Difference Post-hoc Test for Means of the Sub Junior, Junior and Senior in Relation to Rhythmic Ability

Groups			M.D.	C.D.
Sub Juniors	Juniors	Seniors		
1.64	1.05		0.59 *	0.13
1.64		1.005	0.635*	0.13
	1.05	1.005	0.045	0.13

* Significant at.05 level
M.D. = Mean Difference
C.D. = Critical Difference

It is evident from Table 9 that mean differences of Sub Juniors and juniors, Sub Juniors and Seniors; was found to be significant at 0.05 level of significance in relation to Rhythmic ability.

On the other hand significant difference was not found among juniors and seniors in relation to Rhythmic ability.

DISCUSSION

Significant different was found between the table-tennis Players of three different levers in relation to Reaction Ability at.05 level, Orientation ability, Balance Ability and Rhythmic Ability. On the their hand insignificant different was found between the table-tennis players of three different levels in the relation to

Differentiation ability at.05 level. In all the four Co-ordinative i.e. Reaction ability, Orientation ability, Balance ability and Rhythmic ability, the sequence of performance in all the four co-ordinative abilities has Seniors› Juniors › Sub Juniors.

This might be due the reason that senior table-tennis Players development Co-ordinative abilities by the long duration of participation and by the help of general and specific exercises, Additional means for improving motor since organs, variation of exercises, variation of movement execution, variation in external conditions, combination of movement, change in information uptake, practice against time and due to practice a under fatigue.

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Effects of Six Weeks Training Programme on Playing Ability of Junior Badminton Players

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ABSTRACT

The purpose of this study was to determine the effect of six weeks training programme on playing ability of junior badminton players. For the purpose of the study 20 male and female badminton players were selected from Lakshmibai National Institute of Physical Education, Guwahati with age ranged 17 to 24 years. For determining the badminton playing ability, "Lockhart & McPherson Badminton Wall Volley Test" was used as criterion measure. Pre-test data were collected at the start of the six weeks training programme and also Post-test data were collected after the completion of the six weeks training programme. Descriptive statistics and Independent t-test were used as statistical techniques for the study. Result of the study revealed that the six weeks training had significantly improved the playing ability of junior badminton players.

Keywords: *Playing Ability, Badminton*

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INTRODUCTION

The affective phase of skill performance refers to "attitudinal changes". Opportunities for affective skill performance have to be provided when children are on the formative years. Where as effective learning pertains to the area, which consists of motor output of an individual. In other words, physical activities are the products of Skill Learning. The process by which an individual acquires motor skills is classified as effective learning.

Badminton is a game of graceful perfection, the stretch and bend of leg and back, the flick of wrist and sudden quick leap into the air. The shuttle, guided by delicate drop shots or deep tosses to the base line, just clears or shuttles precisely on the third line, out of reach in the backhand corner. There is an almost symmetrical beauty to the game for all its elegance and grace, hard and cruel, dart to the net, and then the scramble back; the constant, relentless effort of stretching left and right; the sudden smash coming hard at the body or the agony of being caught on the wrong foot and once again, lunging forward or leaping backwards. The legs ache and shoulders droop, breathing is short and gasping and there is no energy left for the finishing smash it is this combination, this need for absolute control and perfection, coupled with complete stamina and subtle strength that makes badminton such a wonderful game to play and to watch.

A beginning badminton player needs to learn the basic shots that are useful in singles and doubles, as well as the stroking techniques employed to produce these shots. In preparation acquire some associated skills that accompany a good stroking technique. Before attempting stroking techniques, one must learn prerequisite skills of effective stroke production.

In any game be it indoor or outdoor, to have complete command, perfection is needed game of badminton is no exception this perfection comes out through certain skills and techniques. It is apparently clear that if a sportsman wants to declare his mastery over any game, he will have to be well equipped with the skills and strategy of that particular game.

Evaluating the amount of knowledge achieved skills developed, and an attitude formed is an important function of teaching any subject and discipline. The extent of its importance can be visualized by the never ending schemes and reports on examination reforms in the academic education as the factors affecting in learning physical skills are too numerous such as physical fitness, motor fitness, motivation, intelligence, besides instruction got from well planned schemes of lessons further the criterion behavior in evaluating physical skills is not amenable to easily grading objectively especially in the skills of sports and games which are dependent equally on the circumstances of playing and the physical skills of the players.

METHODOLODY

For the purpose of the study 10 male and 10 female badminton players (N=20) of L.N.I.P.E, Guwahati were selected. The age of the subjects ranged between 17 to 24 years. For determining the badminton playing ability, "Lockhart & McPherson Badminton Wall

Volley Test" was used as criterion measure. Pre-test data were collected at the start of the six weeks training programme and also Post-test data were collected after the completion of the six weeks training programme. Descriptive statistics and Independent t-test was used as Statistical Technique for the study.

TRAINING PROTOCOL

The training schedule was divided into three parts, Physical Part, Skills Part and Game Part. The training programme lasted for six weeks; every day in the morning from 6:30 am to 8:00 am and 5 (five) days a week, Monday to Friday. Saturday and Sunday were observed as rest Day:

1. ***Physical Training Part***: At the beginning of the training physical training was made to perform for 20 minutes continuously.
2. ***Skills Training Part***: After performing the physical work out, following skills were made to perform for 30 minutes.
   - Service
   - Clear
   - Drop
   - Lift
   - Smash
   - Drive
   - Net Play etc.
3. ***Game Part***: After performing skills training subjects were made to play game for last 40 minutes.

STATISTICAL ANALYSIS

To find out the significant difference on playing ability between pre test score and post test score of junior badminton players, Statistical tool was used for accurate and systematic results. Descriptive statistics and Independent t-test was use as Statistical Technique. The level of significance was set at 0.05.

RESULTS AND FINDINGS

Table 1: Descriptive Analysis of Playing Ability between Pre Test Score and Post Test Score of Junior Badminton Players

	Group	N	Range of Scores		Mean	DM	SD
			Min	Max			
Playing Ability	Pre Test	20	37	61	46.85	32.40	7.45
	Post Test	20	65	94	78.25		9.31

Table 1 reveals that the playing ability of junior badminton players, range of pre test scores ranged from 37 to 61 whereas post test scores are from 65 to 94. Mean value of playing ability of pre test score (46.85) is less than the post test score (46.85). The standard deviation of post test scores (9.31) is more than the standard deviation of pre test scores (7.45) of junior badminton players.

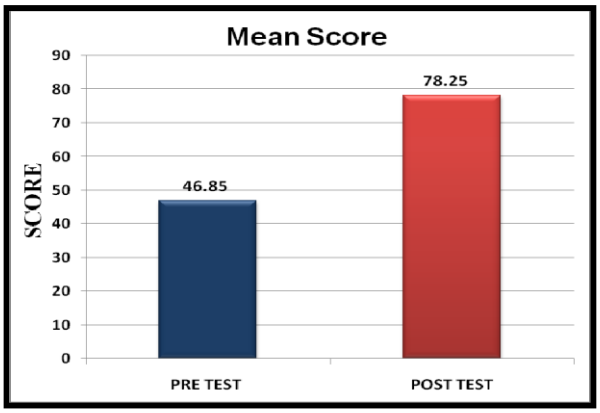

Fig. 1: Mean Graph of Pre Test & Post Test in Lockhart & McPherson Wall Volley Test

Table 2: Independent T-test on Playing ability between Pre Test Score and Post Test Score of Junior Badminton Players

Group	N	Mean	S.D	T–value	Table Value
Pre Test	20	46.85	7.45	11.76*	2.093
Post Test	20	78.25	9.31		

Significant at 0.05 levels

Table 2, reveals that t-value is 11.76 and critical value is 2.093. It shows that calculated t-value (11.76) is more than tabulated value (2.093), which is statistically significant at 0.05 levels. Hence from the above analysis it is known that there is difference on Playing Ability between Pre Test score and Post Test score of Junior Badminton Players.

DISCUSSION OF FINDING

Badminton is a highly competitive dynamic sport. At elite level, it is suggest that badminton is characterized by repetitive efforts of a lactic nature and great intensity which are continuously performed throughout the match. As an explosive sport, badminton performance can be enhanced from resistance training. Effective resistance training programme requires a systematic process of analysis, implementation and evaluation to ensure maximum adaptation and improvement. Badminton players are often required to perform speed, agility, flexibility, endurance, and strength capabilities at their limit. Basically there are four types of service and all these serve have its purpose in different situation against

different types of opponents. Some other skills like clear, drop, lift, smash, drive, net play required a lot of practice for the perfection and these skills were improved through day by day practice. For determining the performance, "Lockhart & McPherson Wall Volley Test" was administered to find out the skill performance.

It was revealed from the result that the six weeks training programme contributes significantly in the improvement of badminton playing ability among the subject as difference in the means exist between pre and post data shown in figure no. 1. Above finding of the study is also in partial consonant with the finding of "Shailendra Rasaniya", IJBSMS, Vol. @, Jan 2013, Issue- 1.

Therefore, the badminton playing ability can be improve upon different badminton skills by participating in the badminton training programme of at least six weeks, so that they can get them perfection on the fundamental skills and then work upon various tactics and strategy.

CONCLUSION

With above mention limitation and results of the study, it may be concluded that six weeks of training which included physical training, skills training and game have enough for the improvements of badminton playing ability as there was a significance difference found between the score of pre test and post test of six weeks training.

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Effects of 4-Week Surya Nadi Pranayama on Respiratory Indices

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ABSTRACT

The present study was conducted with the objective to determine the short term practice of Surya Nadi Pranayama on components of respiratory indices. For the purpose of present study 60 university level boys between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n1=30); Group-B: Control (n2=30). The subjects from Group-A: Experimental were subjected to a 4-weeks Bhujangasana. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. Based on the analysis of the results obtained, we conclude that the insignificant between-group differences were noted in Tidal Volume, Expiratory reserve Volume (ERV), Inspiratory Reserve Volume(IRV), Vital Capacity (VC), Inspiratory Capacity (IC) of University Level Boys.

Keywords: *Surya Nadi Pranayama, Components of Respiratory Indices*

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INTRODUCTION

Yoga was collated, coordinated and systematized by Patanjali in his classical work, the yoga sutras, which consists of 185 terse aphorisms. (Iyengar, 2008). It is also an important part of Hindu asceticism and a vital part of any yoga practice. Pranayama is derived from two Sanskrit words, namely, prana, which means vital force or life energy, ayama means to prolong (Tandon 2012). Versions of pranayama vary from single nostril breathing to belly breathing. Pranayama consists of three phases: "puraka" (inhalation); "kumbhaka" (retention) and "rechaka" (exhalation) that can be either fast or slow (Chodzinski, 2000). Thus pranayama and meditation as a natural way of cleansing breath has been suggested as a route to healthy body and mind (Nagarathna & Nagendra 2006). When completed through the left nostril alone the practice is called "Chandra Anuloma Viloma Pranayam" which means a heat dissipating or cooling liberating practice. (Bhargava, 1988, Stoksted, 1952, Keuning, 1968). Recent studies have reported differential physiological and psychological effects produced by exclusive right and left nostril breathing. (Shannahoff-Khalsa *et al*, 1993, Mohan, 1996, Raghuraj & Telles 2008, Telles *et al*, 1994). So many studies conducted to evaluate the effect of Pranayama and yoga, in normal volunteers, on cardio-respiratory efficiency (Raju *et al*. 1994 & Raju *et al*. 1997) and bone metabolism (Prasad *et al*. 2004) have resulted in a significant improvement in numerous physiological systems. Some reports show the benefits in both peripheral nerve function (Malhotra *et al*. 2002) as well as central neuronal processing (Malathi & Parulkar 1989; Telles *et al*. 1993). According to literature reveal that the very meaning of yoga is to achieve a balance within the internal and external environment, in this manner looking for to accomplish physical, spiritual and mental well-being. This is made possible through the practice of "Pranayama" or breathing exercises, "Asana" or specific postures, and Meditation (Taimni, 1961). It is a notion that regular practicing of yoga over a period of time guides to a decrease in muscular relaxation, physical and respiratory rate, along with calming of the mind, and decreased state of arousal (Maharishi, 1969 & Nagendra, 1977). Growing number of evidences have claimed that yoga practices increases longevity, (Bharshankar *et al*. 2003) has therapeutic (Khanam *et al*. 1996) and rehabilitative effects (Katiyar & Bihari, 2006). The beneficial effects of six weeks practice of different pranayamas are well reported and have sound scientific basis (Joshi *et al*. 1992).

MATERIAL AND METHODS

Subjects

Sixty, university level boys between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n_1=30); Group-B: Control (n_2=30).

METHODOLOGY

This study is designed as a retrospective cross-sectional study. The subjects from Group-A: Experimental were subjected to a 4-week training of Surya Nadi Pranayama. This lasted 4 weeks and consisted of daily sessions.

Table 1: Distribution and Demographics of Subjects

Sample Size (N=60)			
Variables	**Total (N=60)**	**Experimental Group (n1=30)**	**Control Group (n2=30)**
Age	22.35±1.91	22.26 ±1.91	22.43±1.94
Body Height	5.49±2.48	5.52± 2.49	5.47±2.49
Body Mass	66.7±12.26	67.56 ± 13.21	65.83 ± 11.38

Table 2: Experimental Treatment

4-Weeks Surya Nadi Pranayama Training			
Weeks	**Schedule**	**Time**	**Duration**
1st Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Surya Nadi Pranayama (9 Rounds X 1 Set)	10 Minute	
	Relaxation Posture	5 Minute	
2nd Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Surya Nadi Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3rd Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Surya Nadi Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	
4rd Week	Preliminary Yogic Exercises	5 Minute	35 Minute
	Practice of Surya Nadi Pranayama (9 Rounds X 4 Set)	25 Minute	
	Relaxation Posture	5 Minute	

STATISTICAL ANALYSES

Data is expressed as the mean ± SD. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test.

RESULTS

Table 3: Mean Values (±SD) and Paired Sample T-test of Components of Respiratory Indices (i.e., Tidal Volume, Expiratory Reserve Volume (ERV), Inspiratory Reserve Volume(IRV), Vital Capacity (VC), Inspiratory Capacity (IC)) in Experimental and Control Group (n=30 each) before (Pre) and after (Post) 4-Weeks Surya Nadi Pranayama Training Programme (Experimental Group Only)

Parameters	Group	Pre-Test	Post-Test	T-value	P-value
Tidal Volume (Vt)	Experimental	392.13±9.30	412.30±27.10	4.33	0.0002
	Control	352.43±7.50	351.93±8.22	0.79	0.434
Expiratory Reserve Volume (ERV)	Experimental	845.43±22.23	857.57±18.17	10.15	0.0001
	Control	756.57±30.51	76.50±20.14	1.49	0.146
Inspiratory reserve Volume (IRV)	Experimental	2344.67±24.45	2358.47±19.51	9.35	0.0001
	Control	2219.90±37.09	2230.30±12.03	1.34	0.1877
Vital Capacity	Experimental	3582.60±25.82	3624.80±42.42	9.32	0.0001
	Control	3330.53±43.71	3340.97±25.23	1.29	0.204
Inspiratory Capacity	Experimental	3973.17±29.91	4047.73±82.50	5.39	0.0001
	Control	3688.77±44.30	3690.40±29.22	0.21	0.829

TIDAL VOLUME (VT)

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table 3. The Mean and Standard Deviation (±SD) values of Cardiorespiratory Endurance of pre-test and post-test of experimental group were

392.13±9.30 & 412.30±27.10 respectively. However, the Mean and Standard Deviation (±SD) values of Tidal Volume of pre-test and post-test of control group were 352.43±7.50 & 351.93±8.22. The t-value in case of experimental group was 4.33 and for control group it was 0.79.

Significant between-group differences were noted in Tidal Volume in the experimental group before (Pre) and after (Post) subjected to 4-weeks Surya Nadi Pranayama Training Programme since, the calculated value of (t=4.33) is greater than tabulated value of $t_{.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. However, no significant changes over that 4- weeks period were noted in the control group.

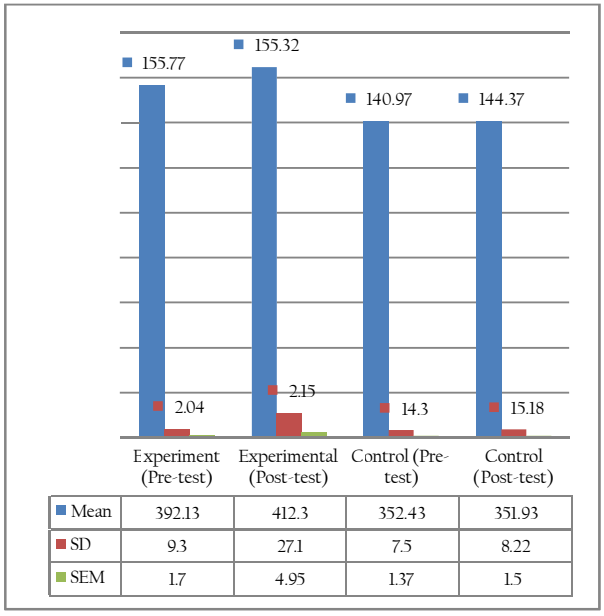


Fig. 1: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Tidal Volume (VT) of Experimental and Control Group

EXPIRATORY RESERVE VOLUME (ERV)

The results of Components of Expiratory Reserve Volume (ERV) in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Expiratory Reserve Volume (ERV) of pre-test and post-test of experimental group were 845.43±22.23 & 857.57±18.17 respectively. However, the Mean and Standard Deviation (±SD) values of Expiratory Reserve Volume (ERV) of pre-test and post-test of control group were 756.57±30.51 & 76.50±20.14. The t-value in case of experimental group was 10.15 and for control group it was 1.49.

Significant between-group differences were noted in Expiratory Reserve Volume (ERV) in the experimental group before (Pre) and after (Post) subjected to 4-weeks Surya Nadi Pranayama Training Programme since, the calculated value of (t=10.15) is greater than tabulated value of $t_{.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. However, no significant changes over that 4- weeks period were noted in the control group.

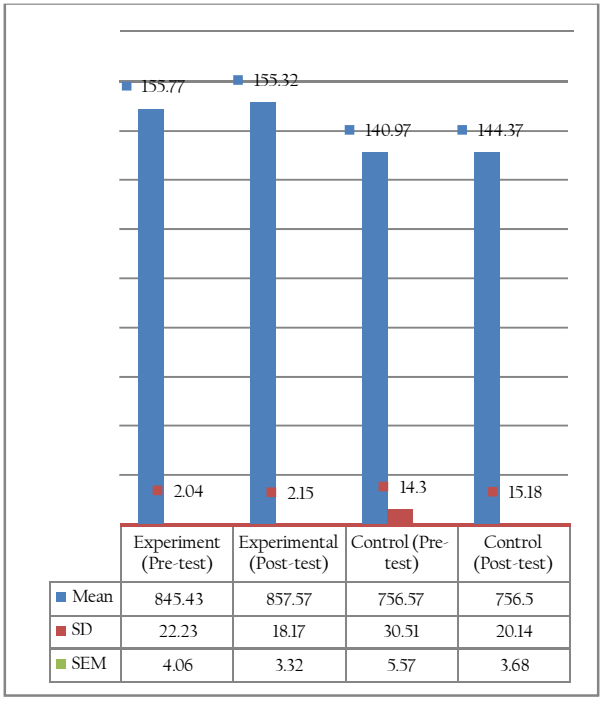
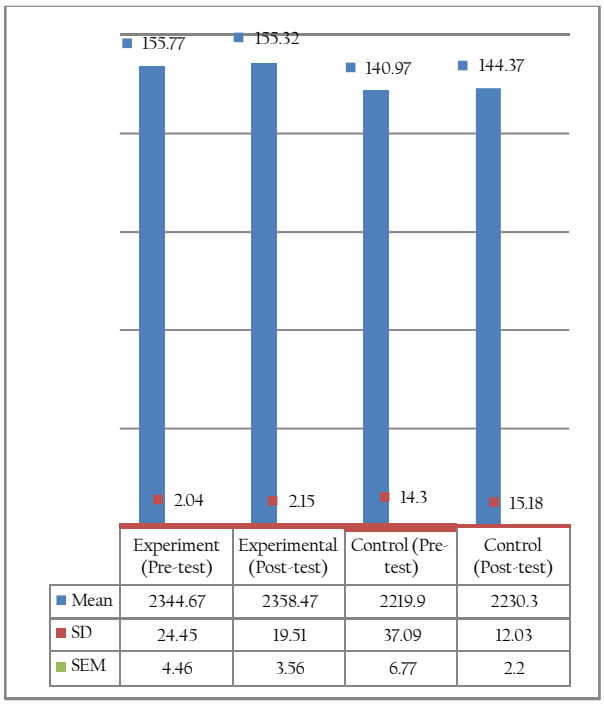


Fig. 2: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Expiratory Reserve Volume (ERV)) of Experimental and Control Group Inspiratory Reserve Volume (IRV)

INSPIRATORY RESERVE VOLUME (IRV)

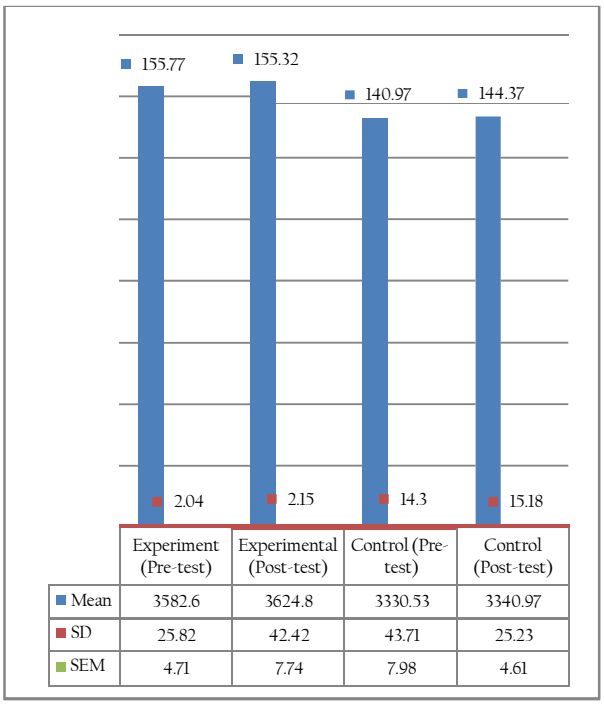
The results of Components of respiratory indices in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Inspiratory Reserve Volume (IRV) of pre-test and post-test of experimental group were 2344.67±24.45 & 2358.47±19.51 respectively. However, the Mean and Standard Deviation (±SD) values of Inspiratory Reserve Volume (IRV) of pre-test and post-test of control group were 2219.90±37.09 & 2230.30±12.03. The t-value in case of experimental group was 9.35 and for control group it was 1.34.

Significant between-group differences were noted in Muscular Endurance in the experimental group before (Pre) and after (Post) subjected to 4-weeks Surya Nadi Pranayama Training Programme since, the calculated value of (t=9.35) is greater than tabulated value of $t_{.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. However, no significant changes over that 4- weeks period were noted in the control group.



	Experiment (Pre-test)	Experimental (Post-test)	Control (Pre-test)	Control (Post-test)
Mean	2344.67	2358.47	2219.9	2230.3
SD	24.45	19.51	37.09	12.03
SEM	4.46	3.56	6.77	2.2

Fig. 3: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Inspiratory Reserve Volume (IRV) of Experimental and Control Group



	Experiment (Pre-test)	Experimental (Post-test)	Control (Pre-test)	Control (Post-test)
Mean	3582.6	3624.8	3330.53	3340.97
SD	25.82	42.42	43.71	25.23
SEM	4.71	7.74	7.98	4.61

Fig. 4: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Vital Capacity of Experimental and Control Group

VITAL CAPACITY

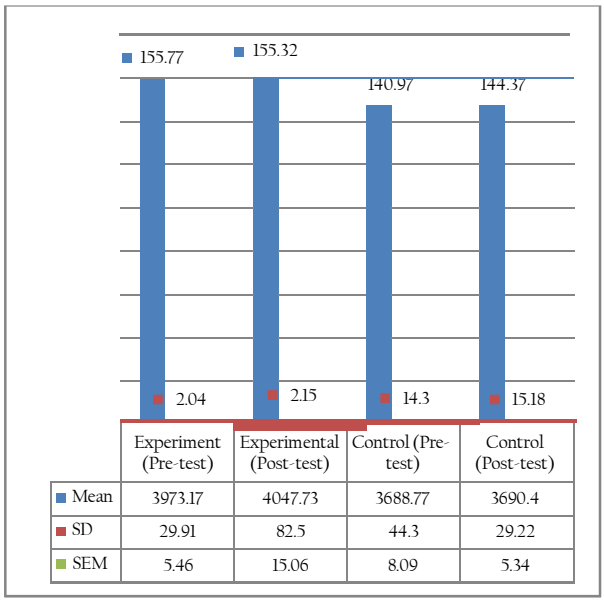
The results of Components of respiratory Indices in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Flexibility of pre-test and post-test of experimental group were 3582.60±25.82 & 3624.80±42.42 respectively. However, the Mean and Standard Deviation (±SD) values of Vital capacity of pre-test and post-test of control group were 3330.53±43.71 & 3340.97±25.23. The t-value In case of experimental group was 9.32 and for control group it was 1.29.

Significant between-group differences were noted in Vital Capacity in the experimental group before (Pre) and after (Post) subjected to 4-weeks Surya Nadi Pranayama Training Programme since, the calculated value of (t=9.32) is smaller than tabulated value of $t_{.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. However, no significant changes over that 4- weeks period were noted in the control group.

INSPIRATORY CAPACITY

The results of Components of respiratory indices in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of experimental group were 3973.17±29.91& 4047.73±82.50 respectively. However, the Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of control group were 3688.77±44.30 & 3690.40±29.22. The t-value in case of experimental group was 5.39 and for control group it was 0.21.

Significant between-group differences were noted in inspiratory capacity in the experimental group before (Pre) and after (Post) subjected to 4-weeks Surya Nadi Pranayama Training Programme since, the calculated value of (t=5.39) is greater than tabulated value of $t_{.05}$ (29) = 2.04 for the selected degree of freedom and level of significance. However, no significant changes over that 4- weeks period were noted in the control group.



	Experiment (Pre-test)	Experimental (Post-test)	Control (Pre-test)	Control (Post-test)
Mean	3973.17	4047.73	3688.77	3690.4
SD	29.91	82.5	44.3	29.22
SEM	5.46	15.06	8.09	5.34

Fig. 5: Mean, Standard Deviation (SD), Standard Error of Mean (SEM) of Inspiratory Capacity of Experimental and Control Group

CONCLUSION

Based on the analysis of the results obtained, we conclude that significant between-group differences were noted in Tidal Volume, Expiratory Reserve Volume (ERV), Inspiratory reserve volume (IRV), Vital Capacity, Inspiratory Capacity of University Level Boys.

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Relationship of Selected Physical Fitness Variables with Soccer Skill Performance

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ABSTRACT

The world of games and sports has crossed many milestones, as a result of different achievements in general and their application in the field of sports in particular. Scientific investigation into performance of sportsman has been playing an increasingly importance role to attain excellence of performance in different sports. Now the sportsman has been able to give outstanding performance because of involvement of new scientifically substantiated training methods and means of execution of sports exercise such as sports techniques and tactics. The purpose of the present study was to find out the relation of Physical Fitness Variables with Soccer Skill Performance of District level Male Soccer Players. In this study Physical Fitness Variables were considered as Speed, Explosive leg strength, Flexibility, and Cardiovascular Endurance and investigator used SAI Soccer skill test (dribbling, passing and shooting) of Soccer Skills to measure the playing ability. Twenty (20) District level Male Soccer Players of Burdwan District from Suchi Coaching camp were selected. The age of the subjects was 14-16 years. Product moment correlation coefficient was used to find out the relationship between the Physical Fitness Variables with Soccer Skill Performance of District level Male Soccer Players at0.05 level of Significance. The result showed that there was positive relationship between speeds, Explosive leg strength and Endurance with Soccer playing ability but not poses the significant relationship. In case of Flexibility with Soccer playing ability a negative relationship was observed.

Keywords: *Physical Fitness Variables, Soccer Skill Performance, District level Male Soccer Players*

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INTRODUCTION

Sports are as old as human society and it has achieved a universal following in the mordent times. It now enjoys a popularity which out strips any other form of social activity. It has become an integral part of educational process. Millions of fans fallow different sports event all over the world with an enthusiasm bordering and devotion many participate in sports activities for the fun of it or for health, strength and fitness. It has been the shape of a profession to some with high skills, with ample financial benefits linked with high degree of popularity.

There are numerous factors which are responsible for the performance of a sportsman. The physique and body composition, including the size shape and form are known to play a significant role in this regard. At present, sportsman for superior performance in any sports is selected on the basis of physical structure and body size.

For the top level performance it is very important to spot, select and nurture a budding sportsman as it is recognized by all that athlete must possess some inherent qualities which can be developed by means of systematized training for sporting and selecting a player one must consider physique and fitness as these qualities will go long way towards better performance.

With the development of science and technology the strategies and techniques in the Games and sports have undergone a lot of change, as each nation is competing with other to Produce top class athletes to win laurels in international competitions. The competitions are Essential and most important part of game and sports for satisfying the inner urge of fight, which is present in every player. The competitions provide an opportunity to exhibit skill, abilities and talent of the player. They help in the development of qualities such as cooperation, leadership and true sportsmanship etc., they also help for assessment and evaluation, in term help for advanced coaching and to develop new techniques.

Fitness especially physical fitness regarded as an essential component even if the team consists of highly skilled, technically sound and experienced player physical fitness is guarded by performance and this performance is based on outcome of many factors. The most commonly mentioned fitness factors are strength, endurance, power, speed and agility. Scientist's seas that the techniques and tactics of a player or a team, physical and physiological characteristics help him for better performance.

Soccer is one of the most popular games in the world in general. Soccer being most competitive sport, a player who is Physically fit does not only enjoy more but he is also capable of using all the skills attained and mastered by him throughout, right from beginning to end of the game. The twin combination of both skill and physical fitness is indispensible for a player without either of which he will not be able to achieve much, specifically in order to play any ball game competently (Nabhendra Singh, 2010).

Muscular power, often referred to as explosive power, is a combination of speed and strength an important in vigorous performance because it determines how hard a person can hit, jump and push etc. There are various means and method to increase power by increasing strength without sacrificing speed, by increasing speed of movement without sacrificing strength and by increasing both can be stressed by applying strong force through rapid motion. (Nabhendra Singh, 2010)

Running speed is not only an athletic event itself, but it is an important factor in almost all court and field games it can result the difference in whether a performer is able to gain an advantage over his/her opponent. It is determined by the length and frequency (speed) of strides and mostly dependent upon speed of muscular and neuromuscular coordination. (Nabhendra Singh, 2010)

The skillful soccer player produces high ball velocity by maximizing angular velocities of the thigh and shank. The accuracy of kicks depends mainly on the contact area of foot with the ball. The bigger the ball the better the accuracy. Accuracy in kicking has been the highest when the velocity of the ball has been 80 % of the maximal velocity (T. Asami,1983). The skilled players showed greater muscle relaxation of the antagonistic muscles in the swinging phase (E.C. Bollens, 1987).There was also greater peak muscle activity in the knee extensors during the swinging phase. Soccer kick is the main offensive action during the game and the team with more kicks on target has better chances to score and win a game. Dribbling is nothing more than moving with the ball across the field. It is a skill used to relocate a player into desirable positions where he can shoot or pass the ball. An efficient player knows what to do with the ball even before receiving it and can pass equally well with either foot. If controlling the ball is the most important technique, then the ability to pass the ball comes next in the technical hierarchy (M. Lyons, 2006). Motor fitness is actually broader and less definite in scope. It includes both physical fitness and motor ability and includes not only strength and endurance components but also factors of speed, power. The seven components used to measure motor fitness are muscular strength, muscular endurance, circulator and respiratory, muscular power, agility, speed and flexibility (Harrison,1983). Cureton (1979) states that motor fitness is significantly correlated with desirable psychological attributes.

STATEMENT OF THE PROBLEM

The purpose of the study was to analyze the relationship of selected physical fitness Variables with soccer skill Performance of male Soccer players.

METHODOLOGY

The purpose of the study was to find out the relationship between Physical fitness components with Soccer Playing ability.To achieve this purpose of the study 20 District level soccer player were selected from Suchi Coaching camp (Burdwan Town) of Burdwan District. The age of the subjects was 14-16 years.

The soccer playing ability was selected as dependent variable for this study was measure by SAI Soccer skill test which contained three separate set of test a) 30 meter running with the ball to assess the speed and ball control. B) Kicking accuracy to assess the kicking efficiency of potential football players. C) Juggling to assess the balancing ability, agility, reaction ability and sense of touch of the football.

- The player starts running with the ball as first as possible to reach the 30 meter finish line, time was recorded in 1/10 second.
- Ball is placed at the 11 meter mark from goal line the examinee is given ten attempts. In this ten attempts 4 to kick the ball in left part, 4 to right part and 2 to the middle part of the goal in the following sequence-first two kicks into the right part followed by one kick in the middle part of the goal to be followed by 2 kicks to the left part, and repeating the same pattern for the remaining five kicks. The ball is required to cross the goal line in the air to have the desired speed and strength in the kick. The number of correct kicks into the designated parts of the goal in a 10 attempt trial was recorded as score.

- To masers the balancing ability, agility, reaction ability and sense of touch of the ball researcher use juggling test. The number of the touches made by the subject continuously out of the best two attempts was recorded as score.

The following physical fitness components like speed, Explosive leg strength, Flexibility and cardio respiratory endurance were selected for the study to collect relevant data.

- For speed the students were asked to run as fast as they can up to 50 yards and the result were recorded to the nearest1/10th seconds.
- Standing Broad Jump was administered to measure explosive leg strength and the results were recorded in Meter.
- For Cardiovascular Endurance, Harvard Step Test was used and score was recorded with the help of long form of Physical Efficiency Index formula.
- Modified Sit and Reach Test was administered to measure flexibility and the result was recorded to cm.

Z-Scale was used to convert all the score in standard score and then Pearson Product Moment correlation was applied to calculate the collected data at0.05 level of significance. Soccer playing ability score were commutated in composite Score.

FINDING

Table 1: The Mean, Standard Deviation and 'r' Value in Selected Physical Fitness Components and Playing Ability of District level Men Soccer Players

Variables	Mean	S.D	"R" Value
Playing Ability	151.67	16.37	
Speed	50.0	10.11	.185 N.S
Playing Ability	151.67	16.37	
Explosive leg strength	50.09	10.23	.367 NS
Playing Ability	151.67	16.37	
Flexibility	50.05	10.25	-.272 NS
Playing Ability	151.67	16.37	
Endurance	51.50	9.91	.156 N.S

$Tab_{0.05}$ (r_{18}) =.444

DISCUSSION OF FINDING

The result showed positive relationship between speeds, Explosive leg strength and Endurance with Soccer playing ability but not poses the significant relationship and negative relationship between Flexibility and Soccer playing ability. The reasons behind the non significant relationship may be due to the fact that the training and coaching programs on District level players in West Bengal is yet not been structured systematically and scientifically for specific to a particular game. Most of the players practices under less qualified coaches and fitness experts and they have very little knowledge about the science of sports training and also the modern training methods. Some of the players also practices under self guidance.

Further the investigator is of the opinion that it may also happen due to sampling error as the sample size was not too large.

CONCLUSION

The following conclusions have been drawn after statistical calculation and analysis:

- Physical Fitness variables of Speed had poses positive but not significant relationship with Soccer playing ability.
- Explosive leg strength had poses positive but not significant relationship with Soccer playing ability.
- Positive but not significant relationship was found between Cardiovascular Endurance with Soccer playing ability
- No significant relationship was found between Flexibility and Soccer playing ability

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Effects of 4-Week Training of Bhastrika Pranayama on Components of Health-Related Fitness

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ABSTRACT

The present study was conducted with the objective to determine the short term practice of Bhastrika pranayama on components of health-related fitness. For the purpose of present study 34 university level boys between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n1=17); Group-B: Control (n2=17). The subjects from Group-A: Experimental were subjected to a 6-weeks Bhastrika pranayama. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test. Based on the analysis of the results obtained, we conclude that the insignificant between-group differences were noted in Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance and flexibility, % Body Fat, Fat Weight and Lean Body Weight of University Level Boys.

Keywords: *Bhastrika Pranayama, Components of Health-Related Fitness*

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INTRODUCTION

Yoga is a stability and amalgamation of physique, observance and essence; a symmetry as we study to regulate body, inhalation and senses. Yoga is individual and non-competitive. Your own stretch is good enough for you. Listen to your body, it will tell you what feels right at particular time. Yogic techniques produce remarkable physiological changes and have sound scientific basis (Madanmohan *et al.* 1983 & Madanmohan *et al.* 1992 & Wallace *et al.* 1971). The effect of different pranayamas on healthy (Subbalakshmi *et al.* 2005) and diseased people (Cooper *et al.* 2003, Dhungel *et al.* 2008) has been well studied and they are known to affect the cardiopulmonary activities and autonomic functions. When completed through the left nostril alone the practice is called "Surya nadi Pranayam" which means a heat dissipating or cooling liberating practice. (Backon, 1988, Bhargava, 1988). Breath is a dynamic bridge between the body and mind (Bjlani, 2004). Breathing is not only an instinctive reflex to satisfy the need of the body for oxygen but it has been considered that consciously controlled breathing can be used as a technique for enhancing mental and physical powers (Gharote, 2003). Pranayama produce different physiological responses in healthy young volunteers (Madanmohan *et al.*, 2005, Shivraj *et al.*, 2001). The practice of pranayama has been known to modulate cardiac autonomic status with an improvement in Cardio respiratory functions (Subalakshmi *et al.*, 2005). Pranayama has immense therapeutic potential in a wide range of psychosomatic disorders, but there is currently lack of an adequate meta-analysis in relation to anuloma viloma pranayama to assess its efficacy with respect to components of health-related fitness and as a result the present study was conducted to find out therapeutic effects of Bhastrika pranayama on components of health-related fitness.

MATERIAL AND METHODS

Subjects

Thirty Four, university level boys between the age group of 19-25 years were selected. The subjects were purposively assigned into two groups: Group-A: Experimental (n_1=17); Group-B: Control (n_2=17).

Table 1: Distribution and Demographics of Subjects

Sample Size (N=34)			
Variables	**Total (N=34)**	**Experimental Group (n1=17)**	**Control Group (n2=17)**
Age	22.204±1.947	16.772±2.022	22.636±1.813
Body Height	5.727±1.809	5.704±1.889	5.75±1.738
Body Mass	76.522±6.040	77.090±5.862	75.954±6.297

METHODOLOGY

This study is designed as a retrospective cross-sectional study. The subjects from Group-A: Experimental were subjected to a 6-week training of Bhastrika pranayama. This lasted 4 weeks and consisted of daily sessions.

STATISTICAL ANALYSES

Data is expressed as the mean ± SD. Student t test for paired samples was utilized to compare the means of the pre-test and the post-test.

Result

Table 3 Mean values (±SD) and Paired Sample t-test of Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance, Flexibility, % Body Fat, Fat Weight and Lean Body Weight) in Experimental and Control group (n=17 each) before (Pre) and after (Post) 6-weeks Bhastrika Pranayama Training Programme (Experimental group only).

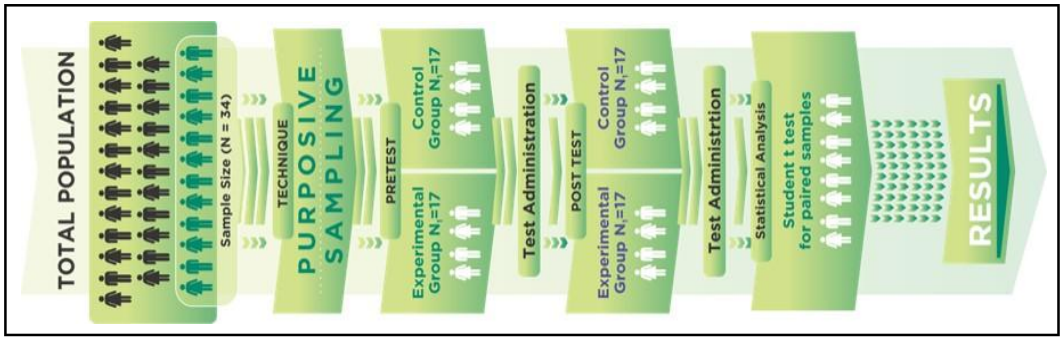


Fig. 1: Study Design

Table 2: Experimental Treatment

6-Weeks Bhastrika Pranayama Training			
Weeks	**Schedule**	**Time**	**Duration**
1st Week	Preliminary Yogic Exercises	5 Minute	20 Minute
	Practice of Sheetlai Pranayama (9 Rounds X 1 Set)	10 Minute	
	Relaxation Posture	5 Minute	
2nd Week	Preliminary Yogic Exercises	5 Minute	25 Minute
	Practice of Sheetlai Pranayama (9 Rounds X 2 Set)	15 Minute	
	Relaxation Posture	5 Minute	
3rd Week	Preliminary Yogic Exercises	5 Minute	30 Minute
	Practice of Sheetlai Pranayama (9 Rounds X 3 Set)	20 Minute	
	Relaxation Posture	5 Minute	
4rd Week	Preliminary Yogic Exercises	5 Minute	35 Minute
	Practice of Bhastrika Pranayama (9 Rounds X 4 Set)	25 Minute	
	Relaxation Posture	5 Minute	

Table 3

Parameters	Group	Pre-Test	Post-Test	T-Value	P-Value
Cardiorespiratory Endurance	Experimental	1328.71±143.11	1330.29±143.69	1.951	0.687
	Control	1262.35±160.31	1264.65±207.06	0.493	0.628
Muscular Strength	Experimental	38.12±4.27	38.59±4.03	1.141	0.270
	Control	37.76±2.28	37.35±1.77	0.940	0.360
Muscular Endurance	Experimental	28.47±4.11	29.29±4.25	1.950	0.068
	Control	28.53±4.16	28.65±3.66	0.488	0.631
Flexibility	Experimental	28.06±1.25	27.41±1.00	1.511	0.150
	Control	23.41±4.11	23.12±3.37	0.689	0.500
% Body Fat	Experimental	29.452±4.46	29.461±4.464	1.926	0.072
	Control	25.670±7.37	25.663±7.36	0.647	0.526
Fat Weight	Experimental	17.971±1.089	17.977±1.082	1.398	0.181
	Control	16.412±1.47	16.410±1.47	0.771	0.451
Lean Body Weight	Experimental	49.048±4.979	49.065±4.993	1.490	0.155
	Control	49.051±5.037	49.099±5.02	1.011	0.326

Cardiorespiratory Endurance

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Cardiorespiratory Endurance of pre-test and post-test of experimental group were 1328.71±143.11 & 1330.29±143.69 respectively. However, the Mean and Standard Deviation (±SD) values of Cardiorespiratory Endurance of pre-test and post-test of control group were 1262.35±160.31 & 1264.65±207.06. The t-value in case of experimental group was 1.951 and for control group it was 0.493.

Insignificant between-group differences were noted in Cardiorespiratory Endurance in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.951) is smaller than tabulated value of $t_{.05}$ (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

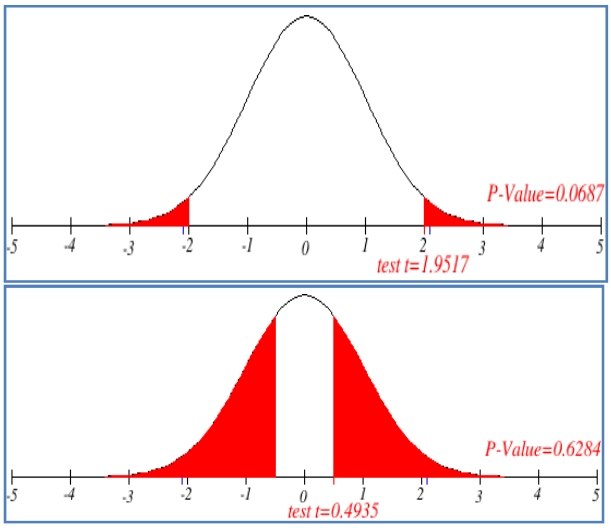


Fig. 2: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Cardiorespiratory Endurance) of University Level Boys

Muscular Strength

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Muscular Strength of pre-test and post-test of experimental group were 38.12±4.27 & 38.59±4.03 respectively. However, the Mean and Standard Deviation (±SD) values of Muscular Strength of pre-test and post-test of control group were 37.76±2.28 & 37.35±1.77. The t-value in case of experimental group was 1.141 and for control group it was 0.940.

Insignificant between-group differences were noted in Muscular Strength in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.141) is smaller than tabulated value of $t_{.05}$ (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

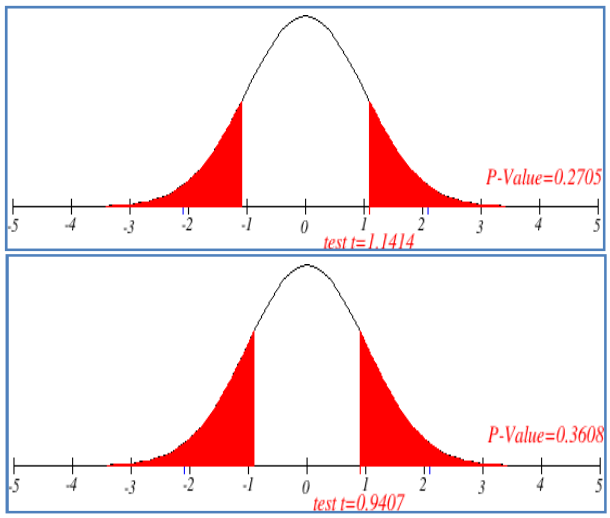


Fig. 3: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Muscular Strength) of University Level Boys

Muscular Endurance

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Muscular Endurance of pre-test and post-test of experimental group were 28.47±4.11 & 29.29±4.25 respectively. However, the Mean and Standard Deviation (±SD) values of Muscular Endurance of pre-test and post-test of control group were 28.53±4.16 & 28.65±3.66. The t-value in case of experimental group was 1.950 and for control group it was 0.488.

Insignificant between-group differences were noted in Muscular Endurance in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.950) is smaller than tabulated value of $t_{.05}$ (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

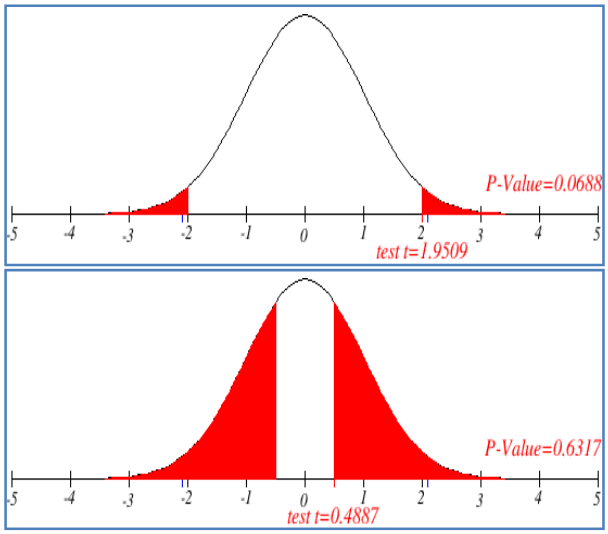


Fig. 4: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Muscular Endurance) of University Level Boys

Flexibility

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table-3. The Mean and Standard Deviation (±SD) values of Flexibility of pre-test and post-test of experimental group were 28.06±1.25 & 27.41±1.00 respectively. However, the Mean and Standard Deviation (±SD) values of Flexibility of pre-test and post-test of control group were 23.41±4.11 & 23.12±3.37. The t-value in case of experimental group was 1.511 and for control group it was 0.689.

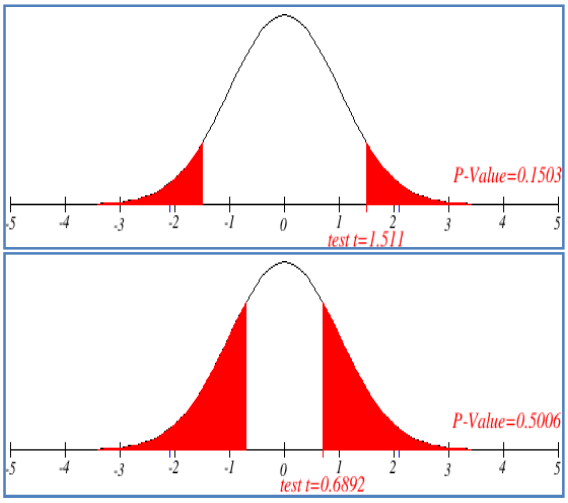


Fig. 5: T-test and p-value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Flexibility) of University Level Boys

Insignificant between-group differences were noted in Flexibility in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.511) is smaller than tabulated value of t_{05} (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

% Body Fat

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table 3. The Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of experimental group were 29.452±4.46 & 29.461±4.464 respectively. However, the Mean and Standard Deviation (±SD) values of % Body Fat of pre-test and post-test of control group were 25.670±7.37 & 25.663±7.36. The t-value in case of experimental group was 1.926 and for control group it was 0.647.

Insignificant between-group differences were noted in % Body Fat in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.926) is greater than tabulated value of t_{05} (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

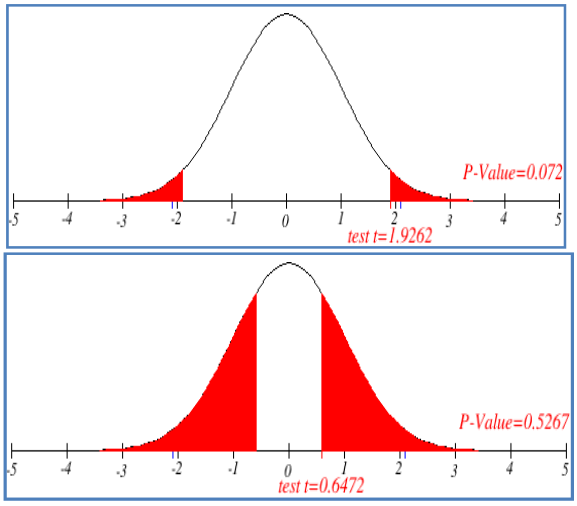


Fig. 6: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., % Body Fat) of University Level Boys

Fat Weight

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table 3. The Mean and Standard Deviation (±SD) values of Fat Weight of pre-test and post-test of

experimental group were 17.971±1.089 & 17.977±1.082 respectively. However, the Mean and Standard Deviation (±SD) values of Fat Weight of pre-test and post-test of control group were 49.051±5.037 & 16.410±1.47. The t-value in case of experimental group was 1.398 and for control group it was 0.771.

Insignificant between-group differences were noted in Fat Weight in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhastrika pranayama Training Programme since, the calculated value of (t=1.398) is greater than tabulated value of $t_{.05}$ (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

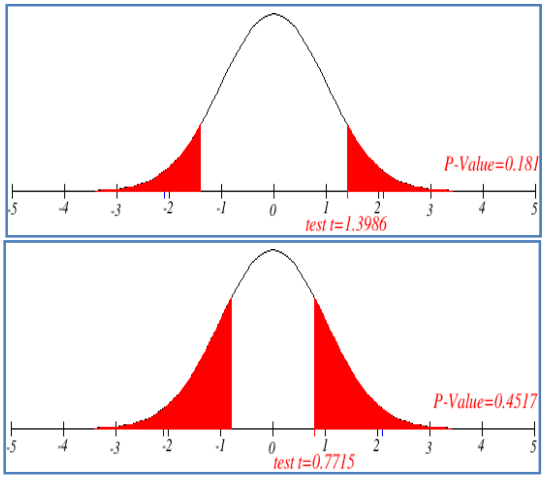


Fig. 7: T-test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Fat Weight) of University Level Boys

Lean Body Weight

The results of Components of Health-Related Fitness in group (Experimental) and group (Control) are shown in Table 3. The Mean and Standard Deviation (±SD) values of Lean Body Weight of pre-test and post-test of experimental group were 49.048±4.979 & 49.065±4.993 respectively. However, the Mean and Standard Deviation (±SD) values of Lean Body Weight of pre-test and post-test of control group were 49.569±6.157 & 49.099±5.02. The t-value in case of experimental group was 1.490 and for control group it was 1.011.

Insignificant between-group differences were noted in Lean Body Weight in the experimental group before (Pre) and after (Post) subjected to 6-weeks Bhujang Asana Training Programme since, the calculated value of (t=1.490) is smaller than tabulated value of $t_{.05}$ (16) = 2.14 for the selected degree of freedom and level of significance. However, no significant changes over that 6-weeks period were noted in the control group.

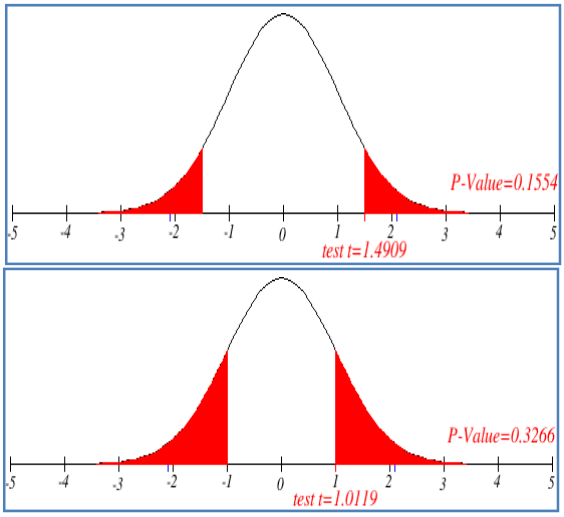
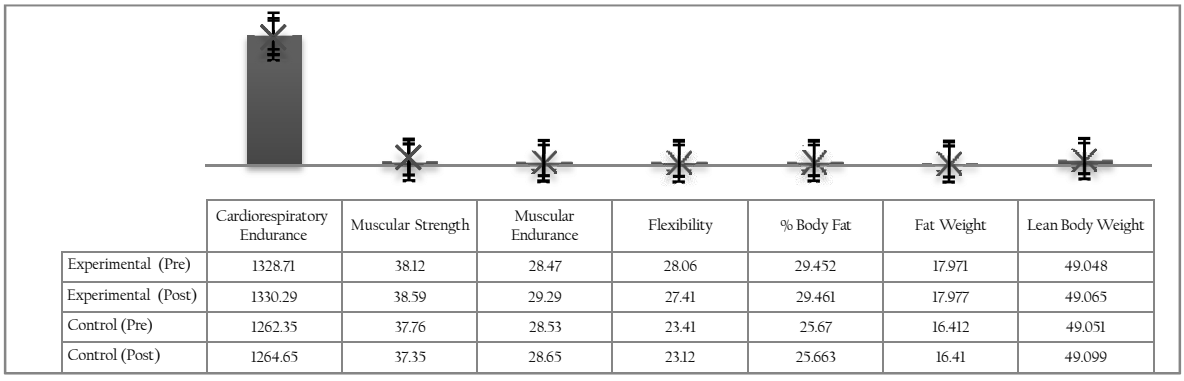


Fig. 8: t-Test and p-Value for the Experimental (Pre-Test & Post-Test) and Control (Pre-Test & Post-Test) Groups of Health-Related Fitness (i.e., Lean Body Weight) of University Level Boys



	Cardiorespiratory Endurance	Muscular Strength	Muscular Endurance	Flexibility	% Body Fat	Fat Weight	Lean Body Weight
Experimental (Pre)	1328.71	38.12	28.47	28.06	29.452	17.971	49.048
Experimental (Post)	1330.29	38.59	29.29	27.41	29.461	17.977	49.065
Control (Pre)	1262.35	37.76	28.53	23.41	25.67	16.412	49.051
Control (Post)	1264.65	37.35	28.65	23.12	25.663	16.41	49.099

Fig. 9: Mean Values of Components of Health-Related Fitness (i.e., Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance, Flexibility, % Body Fat, Fat Weight and Lean Body Weight) in Experimental and Control Group (n=17 Each) before (Pre) and After (Post) 6-weeks Bhastrika Pranayama Training Programme (Experimental Group Only)

CONCLUSION

Based on the analysis of the results obtained, we conclude that insignificant between-group differences were noted in Cardiorespiratory Endurance, Muscular Strength, Muscular Endurance, flexibility, % Body Fat, Fat Weight and Lean Body Weight of University Level Boys.

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Comparison of Flexibility and Agility of Table Tennis Players and Badminton Players in School Students

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ABSTRACT

The study was under taken with the purpose of comparing selected physical fitness variables in Table Tennis Players and Badminton Players. The variables selected were Agility and Flexibility. 60 male school students were selected as subjects aging 14 year to 16 year (15.17 ± 0.51) who were actively involved in their respective games. Among these 30 belonged to Badminton game and rest 30 belonged to Table Tennis game. Descriptive Statistics and Independent 't' test were employed using IBM SPSS-17 Software. Findings suggest that the players belonging to Badminton game were superior in both Agility and Flexibility in comparison to the players belonging to Table Tennis game.

Keywords: *Agility, Flexibility, School Students, Badminton Players, Table Tennis Players*

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INTRODUCTION

The study of growth and development of childhood and adolescence are one of the important areas in education as well as physical education. So, physical education teachers and professionals must be acquainted with the nature of development of different motor skills in childhood and adolescent due to participating in different type of activities (Mondal *et al*., 2014).

Human body is a gift by nature. Life in the present time is not less than the blessing of God. Scientific discoveries have changed the entire face of our world. It has changed the thorny life into the bed of roses. Good health provides sound and solid foundation on which fitness rests and at the same time fitness provides one of the most important key to health, and living one's life to fullest. The negative effects of degraded physical fitness on both the individual and society are serious and multi-dimensional. It can cause many risk factors to heath including coronary heart disease, certain forms of cancer, hypertension, respiratory problems, and each associated with increases in all cause mortality (Cataldo, 1999). Low levels of physical activity and cardio-respiratory fitness are both associated with higher risk of all cause and disease specific mortality (Thune *et al*., 1998).

Schools have the potential to improve the health of young people by providing instruction in physical education that promotes enjoyable lifelong physical activity. Diseases and health problem resulting from an inactive lifestyle have their origins early in life. This is when an active life style should be established. Fitness begins at birth and should continue throughout a person's life. Fitness improves general health and it is essential for full and vigorous living. The physically fit child feels more alert and eager to do things. A weak child is a weak brick in the wall of the country. The wealth of a country depends entirely upon the health of every citizen of the country (Sarma, 2015).

The complex nature of physical fitness can be best under stood in terms of its components such as cardiovascular endurance, strength, flexibility, speed, agility and muscular endurance. In addition to these components of physical fitness there are many other factor which contribute to physical fitness including heredity, living standard, nutrition, hygienic conditions, environmental and climate factors etc. (Sallis. *et al*., 1992).

The purpose of this study was to compare the school going active male students involved in Table Tennis game and school going active male students involved in Badminton game, so as to find out which of these two categories is more physically fit in response to tests administered. This may help the coaches and parents to promote their children in the respective games according to the required fitness characteristics.

METHODOLOGY

Subjects: For this study total of 60 male school students were purposively selected as subjects aging 14 year to 16

Table 2: Comparative Analysis of Agility and Flexibility of Badminton Players and Table Tennis Players in School Going Students

	Levene's Test for Equality of Variances		T-test for Equality of Means			
Test Items	F-Value	P-Value	T-value	P-Value	Percentage Mean Difference	Std. Error Difference
Agility	0.32	.576	3.14*	0.003	4.81	0.17
Flexibility	1.63	.207	3.49*	0.001	12.73	1.04

*Significant, 't'.05 (58) =2.000

year (15.17 ± 0.51) who were actively involved in their respective games. Among these 30 belonged to Badminton game and rest 30 belonged to Table Tennis game from Guwahati, Assam.

Variables selected and criterion measures:

- Shuttle runs 10 yard (9.14 mts.) X 6 for agility (measured in seconds).
- Straight Knee Sit & Reach test for flexibility (measured in centimeters).

Statistical Technique: The data set was checked for its normality in respect to outliers, skewness, kurtosis, equality of variances etc. Descriptive statistics and Independent 't' test was employed to each variables for comparing them. The level of significance chosen was 0.05. IBM SPSS 17 was used to execute the statistical functions.

RESULTS

The data set was checked for its normality in respect to outliers, skewness, kurtosis, equality of variances etc. It was found to be perfect in all sense to be treated with parametric statistics. After converting the raw data into group data, statistical test were employed to find out necessary information. The results and findings of the descriptive and independent t test are presented in the tables and illustrations bellow.

Table 1: Descriptive Test Scores of Agility and Flexibility of Badminton Players and Table Tennis Players in School Going Students

	Groups	No. of Subjects	Mean	Std. Deviation	Std. Error Mean
Agility	Badminton	30	10.58	0.67	0.12
	Table Tennis	30	11.10	0.61	0.11
Flexibility	Badminton	30	30.37	3.80	0.69
	Table Tennis	30	26.73	4.25	0.78

Table 1 shows the nature and characteristics of fitness scores of Flexibility and Agility of badminton players and table tennis players in school going students (i.e. number of subjects in each group, mean, standard deviation and standard error of mean).

Levene's test for equality of variances results shows that the variance of two groups were equal in both the fitness variables as p-Value of both the variables were more than.05 thus two sample t-ratio's assumption is fulfilled.

The scrutiny of Table 2 reveals that there lies a statistically significant difference between Agility of badminton players and table tennis players in school going students (t-value = 3.14, p= 0.003). Further statistically significant difference also lies between Flexibility of badminton players and table tennis players in school going students (t-value = 3.49, p= 0.001).

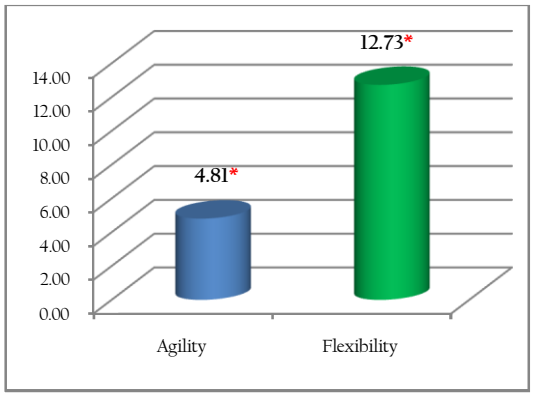

Fig. 1: Percentage Difference of Agility and Flexibility of Badminton Players and Table Tennis Players in School Going Students

* Significant at 0.05 level

The above figure is the graphical representation of the percentage difference of both the fitness variables in two different groups.

DISCUSSION

The findings that the students involved in Badminton game were found to be in the higher side in Agility compared to the students involved in Table Tennis game may be due to the fact that the game of Badminton is played in a relatively larger area than the game of Table Tennis and thus requires and develops more Agility for quick movements as well as to return to the initial position while covering the court during game. Again similar results in case of Flexibility was found, this may be due to the fact that while attacking the shuttlers contracts and relaxes their back as well as abdomen very often developing flexibility of those regions, whereas the movements involved during table tennis shots are more precise and controlled rather than stretch involved.

CONCLUSION

The conclusion which can be drawn on the basis of the present study is the players belonging to Badminton game were in higher side of Agility as well as in Flexibility than the players belonging to Table Tennis game. This may be due to the varied specific movements involved in the two different games.

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Comparison of Reaction Ability among Different Playing Positions of Handball Players

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ABSTRACT

The objective of the study was to compare Reaction Ability among different playing positions of handball players.The subjects for this study were seventy male Handball Players (10 from each Playing Position i.e. Keeper, Left Shooter, Center back, Right Shooter, Left winger, Pivot Player and Right Winger) were selected from Different Universities of India. Age of the subjects ranged from 16 to 24 years. Reaction Ability was selected as independent variable and playing positions were selected as dependent variables. Reaction Ability was measured by ball reaction exercise test and score was recorded in centimetres. To find out significant difference among the means of different playing positions of handball players in relation to Reaction Ability, one way analysis of variance was used at.05 level of significance. To test the homogeneity of variance, levene statistics was used. To compare paired means Sidak Post-Hoc test was used. Significant difference exist among the different playing positions of handball players in relation to Reaction Ability since obtained F-value was 6.327 (p=.000) which was significant at 0.05 level of significance.

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INTRODUCTION

If we talk about Reaction Time, this is the time between given stimulus and response to the stimulus(Kansal, D. K., 1996). Reaction Time is important in many sports, not only in sports but also in day today activities (Kamlesh, M. L., 2011). Important is, Reaction Time can be improved by practice and training. Sportsmen receive the stimulus by eye and ear as well as by kinaesthetic sense, accordingly than respond and react in different situations. Sportsmen with good Reaction Time respond or react to any situation in a better way.

OBJECTIVE OF THE STUDY

The objective of the study was to compare Reaction Ability among different playing positions of handball players.

METHODOLOGY

Subjects

The subjects for this study were seventy male Handball Players (10 from each Playing Position i.e.Keeper, Left Shooter, Center back, Right Shooter, Left winger, Pivot Player and Right Winger) were selected from Different Universities of India. Age of the subjects ranged from 16 to 24 years.

Variables

The study was taken on the basis of available literature on Reaction Ability and their tests findings of the related research studies. Keeping in the mind about specific purpose of the study, Reaction Ability was selected as independent variable and playing positions were selected as dependent variables.

Measures

Reaction Ability was measured by ball reaction exercise test and score was recorded in centimeters.

Statistical Analysis

To find outsignificant difference among the means of different playing positions of handball players in relation to Reaction Ability, one way analysis of variance was used at.05 level of significance. To test the homogeneity of variance, levene statistics was used. To compare paired means Sidak Post-Hoc test was used.

FINDING

Table 1: Test of Homogeneity of Variances

Reaction Ability			
Levene Statistic	**Df1**	**Df2**	**Sig.**
1.774	6	63	.119

Levene statistic was used to test the homogeneity of variances. Levene statistic of 1.774 (p=.119) was found to be significant at.05 level of significance, this proves that variances of groups (Playing Positions) are similar.

Table 2: Descriptive Statistics of Handball Players in Different Playing Positions

Reaction Ability								
Playing Positions	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Centre Player	10	111.76	4.97	1.57	108.20	115.32	102.11	119.55
Goal Keeper	10	110.96	11.22	3.54	102.93	118.99	97.22	137.02
Left Shooter	10	113.85	4.97	1.57	110.29	117.40	107.65	125.32
Left Winger	10	117.82	6.28	1.98	113.32	122.32	109.51	129.84
Pivot Player	10	129.83	7.16	2.26	124.70	134.96	121.14	141.51
Right Shooter	10	114.61	12.64	3.99	105.56	123.66	103.51	139.54
Right Winger	10	114.57	5.27	1.66	110.80	118.35	106.55	123.02
Total	70	116.20	9.74	1.16	113.88	118.52	97.22	141.51

Table 3: Analysis of Variance for the Comparison of Reaction Ability among Different Playing Positions of Handball Players

ANOVA					
Reaction Ability	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2463.084	6	410.514	6.327	.000
Within Groups	4087.546	63	64.882		
Total	6550.630	69			

It is evident from Table 3 that significant difference exist among the different playing positions of handball players in relation to Reaction Ability since obtained F-value was 6.327 (p=.000)which was significant at 0.05 level of significance. Since significant difference was found among the different playing positions in relation to Reaction Ability, Sidak Post-Hoc test was applied to find out significant difference between paired means.

Table 4: Sidak Post-Hoc Test for the Comparison of Paired Means of Different Playing Positions in Reaction Ability

(I) Playing Positions	(J) Playing Positions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Centre Player	Goal Keeper	.80400	3.60227	1.000	-10.5717	12.1797
	Left Shooter	-2.08500	3.60227	1.000	-13.4607	9.2907
	Left Winger	-6.05900	3.60227	.884	-17.4347	5.3167
	Pivot Player	-18.06900*	3.60227	.000	-29.4447	-6.6933
	Right Shooter	-2.84900	3.60227	1.000	-14.2247	8.5267
	Right Winger	-2.81300	3.60227	1.000	-14.1887	8.5627
Goal Keeper	Left Shooter	-2.88900	3.60227	1.000	-14.2647	8.4867
	Left Winger	-6.86300	3.60227	.735	-18.2387	4.5127
	Pivot Player	-18.87300*	3.60227	.000	-30.2487	-7.4973
	Right Shooter	-3.65300	3.60227	1.000	-15.0287	7.7227
	Right Winger	-3.61700	3.60227	1.000	-14.9927	7.7587
Left Shooter	Left Winger	-3.97400	3.60227	.999	-15.3497	7.4017
	Pivot Player	-15.98400*	3.60227	.001	-27.3597	-4.6083
	Right Shooter	-.76400	3.60227	1.000	-12.1397	10.6117
	Right Winger	-.72800	3.60227	1.000	-12.1037	10.6477
Left Winger	Pivot Player	-12.01000*	3.60227	.030	-23.3857	-.6343
	Right Shooter	3.21000	3.60227	1.000	-8.1657	14.5857
	Right Winger	3.24600	3.60227	1.000	-8.1297	14.6217
Pivot Player	Right Shooter	15.22000*	3.60227	.002	3.8443	26.5957
	Right Winger	15.25600*	3.60227	.002	3.8803	26.6317
Right Shooter	Right Winger	.03600	3.60227	1.000	-11.3397	11.4117

*. The mean difference is significant at the 0.05 level.

It is evident from Table 4 that significant difference exist between the Reaction Ability of Centre player and Pivot player (MD=18.06, p=.000); Goal Keeper and Pivot player (MD=18.87, p=.000); Left shooter and Pivot player (MD=15.98, p=.001); Left Winger and Pivot player (MD=12.01, p=.030); Pivot player and Right Shooter (MD=15.22, p=.002); Pivot player and Right Winger (MD=15.25, p=.002).

On the other hand insignificant difference exist between the paired means of Centre player and Goal Keeper (MD=.80, p=1.000); Centre player and Left

Shooter (MD=2.08, p=1.000); Centre player and Left Winger (MD=6.05, p=.884); Centre player and Right Shooter (MD=2.84, p=1.000); Centre player and Right Winger (MD=2.81, p=1.000); Goal Keeper and Left Shooter (MD=2.88, p=1.000); Goal Keeper and Left Winger (MD=6.86, p=.735); Goal Keeper and Right Shooter (MD=3.65, p=1.000); Goal Keeper and Right Winger (MD=3.61, p=1.000); Left Shooter and Left Winger (MD=3.97, p=.999); Left Shooter and Righter Shooter (MD=.76, p=1.000); Left Shooter and Right Winger (MD=.72, p=1.000); Left Winger and Right Shooter (MD=3.21, p=1.000); Left Winger and Right Winger (MD=3.24, p=1.000); Right Shooter and Right Winger (MD=.03, p=1.000).

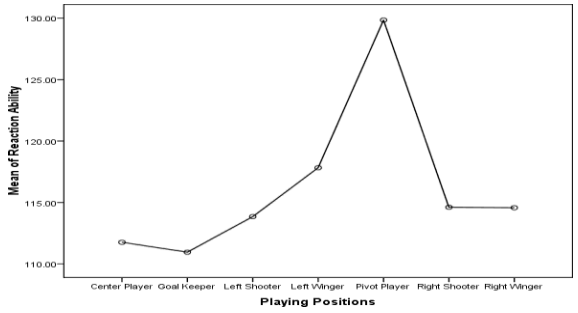

Fig. 1: Mean Plot for the Comparison of Reaction Ability among Different Playing Positions of Handball Players

Note: Lower the score better the performance since Reaction Ability in measured in centimetres and less distance indicates better performance.

DISCUSSION OF FINDINGS

Various studies have been conducted to compare reaction time in different sports as well as in different playing positions of a particular sport. Binboga, M., & Suveren, S. (n. d.) conducted a study to compare reaction time between smasher & setter positions in volleyball. Results reveal the significant difference.

Another study was conducted by Foroghipour, H., Monfared, M.O., Pirmohammadi, M., & Saboonchi, R. (2013) with a objective to compare reaction time between volleyball & tennis players. Results show insignificant difference between volleyball & tennis players in relation to reaction time. On the basis of results of the above mentioned studies it may be concluded that different type of reaction time is required at different playing positions as well as there are some sports in which similar type of reaction type is required.

In the present study significant difference was found among different playing positions in relation to reaction ability. If paired means are compared, significant difference was found in case of some pairs & on the other hand insignificant difference was found in case of more than fifty percent pairs. On the basis of the results, it may be concluded that some playing positions are distinct in nature with respect to reaction ability. But some playing positions possess similar nature of reaction ability. It is advised that during training of handball players or during planning any programme care should be taken about the specific playing position requirement.

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Impact of Playing Positions on Quickness of National Level Netball Players

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ABSTRACT

The objective of the study was to find out significant difference among the means of different playing positions of Netball Players in relation to Quickness. A total of 70 National level Netball players were selected from different playing positions i. e. 10 players from each playing position (GS = Goal Shooter, GA = Goal Attack, WA = Wing Attack, C = Centre, GD = Goal Defence, WD = Wing Defence and GK = Goal Keeper). The age of the subjects was ranging from 17 to 28 years. In this study Quickness was selected as independent variable and seven playing positions were selected as dependent variable. Quickness was measured by Hexagon Test and score was recorded in Seconds. To find out significant difference among the means of different playing positions of Netball Players in relation to Quickness, One way Analysis of Variance was used at.05 level of significance. Significant difference exist among the different playing positions of Netball players in relation to Quickness since obtained F-value was 2.853 (p = 0.016) which was found significant at 0.05 level of significance. Study suggests that training programme for Netball players should be according playing position.

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INTRODUCTION

The game of Netball is played by many countries of the world. The game is very popular at International level. The game is played by four equal quarters (Taylor, *et al*., Taylor, K.L., Bonetti, D.L., & Tanner, R.K., 2013). The game of basketball was invented in the year 1891 by Dr. James Naismith, he also gave birth to Netball i.e. popular game played by women in many countries. Netball game is played between two teams consisting seven players in each team, all players play on specific position. There are restrictions to move. Players can move in specific area. Basically, Netball is a non-contact game in case of ball with a player it is essential that opponent player should remain 0.9 meter away from player, If any player comes near to the player less than this distance that is called obstruction. The most important part of the game is that each player must be expert of offensive and defensive play (Shakespear & Caldow, 2009). **Goal Shooter (GS):** Main task of GS is shooting. There are several pre-request for GS such as accuracy in shooting and development of ability to create appropriate space to receive pass. **Goal Attack (GA)**: Goal Attack also requires shooting technique. GA should possesses the ability in assisting during the Centre court attack. He is responsible for defending two third of the court. **Wing Attack (WA):** WA is specialized in passing skills and give pass to GS and GA.: **Centre (C):** Centre player is known as racehorse. Centre should have the quality to judge defensive gaps. **Wing Defence (WD):** WD is specialized in defence. Another task is the attack through midcourt. **Goal Defence (GD):** GD is known as mobile defence players. GD players reacts quickly to opponents moves. **Goal Keeper (GK):** GK is the last line of defence. GK try to defend every attempted shot, also rebounds.

Successful performance of any player depends on "ability to react quickly" with a great extend. In quickness some factors like agility, speed and acceleration are not clearly distinguished (Vives, D. & Roberts, J., 2005). One important issue is to train quickness separately instead of training associated factors separately.

OBJECTIVE OF THE STUDY

The objective of the study was to find out significant difference among the means of different playing positions of Netball Players in relation to Quickness.

METHODOLOGY

Subjects

A total of 70 National level Netball players were selected from different playing positions i. e. 10 players from each playing position (GS = Goal Shooter, GA = Goal Attack, WA = Wing Attack, C=Centre, GD = Goal Defence, WD = Wing Defence and GK = Goal Keeper). The age of the subjects was ranging from 17 to 28 years.

Variables

In this study Quickness was selected as independent variable and seven playing positions were selected as dependent variable.

Measures

Quickness was measured by Hexagon Test and score was recorded in Seconds.

STATISTICAL ANALYSIS

To find out significant difference among the means of different playing positions of Netball Players in relation to Quickness, One way Analysis of Variance was used at.05 level of significance. Sidak Post-Hoc test was applied to find out significant difference between paired means. To test homogeneity variances of the groups Levene statistic was used. Since homogeneity was not found, option of Robust tests of (Welch and Brown-Forsythe) were applied.

FINDINGS

Table 1: Test of Homogeneity of Variances in Quickness of Netball Players

Levene Statistic	Df1	Df2	Sig.
4.166	6	63	.001

Levene statistic was used to test the homogeneity of variances. Levene statistic of 4.166 (p = .001) was found to be significant at.05 level of significance that shows that variances of playing positions (groups) are significantly different.

Table 2: Robust Tests of Equality of Means in Quickness of Netball Players

	Statistica	Df1	Df2	Sig.
Welch	1.273	6	27.628	.302
Brown-Forsythe	2.853	6	28.710	.026

Robust tests (Welch and Brown-Forsythe) were used. Since the assumption of homogeneity of variance is broken, these tests are used. Welch statistics of 1.273 (p = .302) was found insignificant and Brown-Forsythe statistic of 2.853 (p = .026) was found significant at.05 level of significance. Since Brown- Forsythe statistic was found significant, Null hypothesis is rejected.

It is evident from Table 4 that significant difference exist among the different playing positions of Netball players in relation to Quickness since obtained F-value was 2.853 (p = 0.016) which was found significant at 0.05 level of significance. Since, significant difference was found among the different playing positions in relation to Quickness, Sidak Post-Hoc test was applied to find out significant difference between paired means.

Table 3: Descriptive Statistics of Netball Players in Different Playing Positions

Positions	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Goal Shooter	10	15.8210	1.56608	.49524	14.7007	16.9413	13.12	18.88
Goal attack	10	16.4090	2.02251	.63958	14.9622	17.8558	13.73	19.95
Wing Attack	10	16.8360	5.78700	1.83001	12.6962	20.9758	12.30	32.20
Centre	10	15.9700	2.70225	.85453	14.0369	17.9031	12.09	20.21
Wing Defence	10	17.0110	2.39446	.75719	15.2981	18.7239	13.72	20.50
Goal Defence	10	16.4760	2.05715	.65053	15.0044	17.9476	13.03	19.28
Goal Keeper	10	21.7120	6.72886	2.12785	16.8985	26.5255	15.31	35.61
Total	70	17.1764	4.12498	.49303	16.1929	18.1600	12.09	35.61

Table 4: Analysis of Variance for the Comparison of Quickness among Different Playing Positions of Netball Players

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	250.869	6	41.811	2.853	.016
Within Groups	923.199	63	14.654		
Total	1174.067	69			

It is evident from Table-V that significant difference exists between the quickness of Goal Shooter and Goal Keeper (MD = 5.89, p = .021); Centre and Goal Keeper (MD = 5.74, p=.028).

On the other hand insignificant difference exist between the paired means of Goal Shooter and Goal Attack (MD = .59, p = 1.00); Goal Shooter and Wing Attack (MD = 1.02, p = 1.00) ; Goal Shooter and Centre (MD = .15, p = 1.00) ; Goal Shooter and Wing Defence (MD = 1.2, p = 1.00) ; Goal Shooter and Goal Defence (MD = .66, p = 1.00) ; Goal Attack and Wing Attack (MD = .43, p = 1.00) ; Goal Attack and Centre (MD = .44, p = 1.00) ; Goal Attack and Wing Defence (MD = .60, p = 1.00) ; Goal Attack and Goal Defence (MD = .07, p = 1.00) ; Goal Attack and Goal Keeper (MD = 5.30, p=.059) ; Wing Attack and Centre (MD = .87, p = 1.00) ; Wing Attack and Wing Defence (MD = .18, p = 1.00) ; Wing Attack and Goal Defence (MD = .36, p = 1.00) ;

Wing Attack and Goal Keeper (MD = 4.88, p = .117) ; Centre and Wing Defence (MD = 1.04, p = 1.00) ; Centre and Goal Defence (MD = .51, p = 1.00); Wing Defence and Goal Defence (MD = .54, p = 1.00) ; Wing Defence and Goal keeper (MD = 4.70, p = .153) ; Goal Defence and Goal Keeper (MD = 5.24, p = .066).

Table 5: Sidak Post-Hoc Test for the Comparison of Paired Means of Different Playing Positions in Quickness

(I) Playing Positions	(J) PlayingPositions	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Goal Shooter	Goal attack	-.58800	1.71195	1.000	-5.9942	4.8182
	Wing Attack	-1.01500	1.71195	1.000	-6.4212	4.3912
	Centre	-.14900	1.71195	1.000	-5.5552	5.2572
	Wing Defence	-1.19000	1.71195	1.000	-6.5962	4.2162
	Goal Defence	-.65500	1.71195	1.000	-6.0612	4.7512
	Goal Keeper	-5.89100*	1.71195	.021	-11.2972	-.4848
Goal attack	Wing Attack	-.42700	1.71195	1.000	-5.8332	4.9792
	Centre	.43900	1.71195	1.000	-4.9672	5.8452
	Wing Defence	-.60200	1.71195	1.000	-6.0082	4.8042
	Goal Defence	-.06700	1.71195	1.000	-5.4732	5.3392
	Goal Keeper	-5.30300	1.71195	.059	-10.7092	.1032
Wing Attack	Centre	.86600	1.71195	1.000	-4.5402	6.2722
	Wing Defence	-.17500	1.71195	1.000	-5.5812	5.2312
	Goal Defence	.36000	1.71195	1.000	-5.0462	5.7662
	Goal Keeper	-4.87600	1.71195	.117	-10.2822	.5302
Centre	Wing Defence	-1.04100	1.71195	1.000	-6.4472	4.3652
	Goal Defence	-.50600	1.71195	1.000	-5.9122	4.9002
	Goal Keeper	-5.74200*	1.71195	.028	-11.1482	-.3358
Wing Defence	Goal Defence	.53500	1.71195	1.000	-4.8712	5.9412
	Goal Keeper	-4.70100	1.71195	.153	-10.1072	.7052
Goal Defence	Goal Keeper	-5.23600	1.71195	.066	-10.6422	.1702

*. The mean difference is significant at the 0.05 level

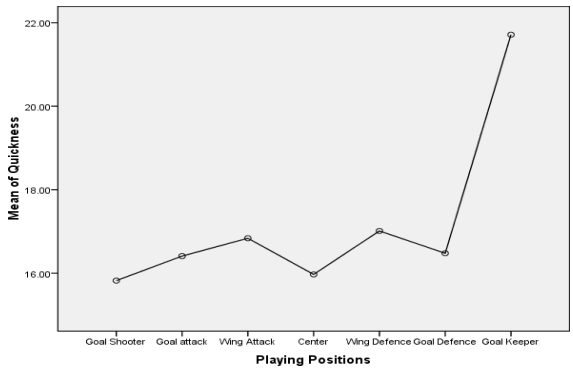

Fig. 1: Mean Plot for the Comparison of Quickness among Different Playing Positions of Netball Players

Note: Lower the score better the performance since quickness in measured in seconds and less duration indicates better performance.

DISCUSSION OF FINDINGS

Significant difference was found among Netball players in quickness pertaining the different playing positions. Results of the study revealed that significant difference exist between Goal Shooter (GS) and Goal Keeper (GK); Centre (C) and Goal Keeper (GK). Except these two paired mean differences, no significant difference was found between the remaining paired means. This might be due to the reason that Goal Keeper (GK) need low level of Quick movements in comparison of Goal Shooter (GS) and Centre (C). From the results of the study it may be advised that training programme for the Netball players should be according to playing positions. In relation to quickness development, Netball players of all playing positions may be trained together except Goal Keeper (GK). A study was conducted by Delextrat, A. & Cohen, D. (2009) on women basketball players by taking strength, power, speed and agility. Study also suggested that specific fitness training should be undertaken according to different playing positions. Speed and agility are closely associated with quickness. Since, during the moves in the game Basketball and Netball, fitness is more or less of similar nature. Present study supports the above mentioned study and also supports the recommendation to develop different movements such as speed over short distances, strength development of lower and upper body, development of agility, jumping ability etc.

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