

Regd. No. WBBIL/2007/22677

ISSN 0975-265X

---

**INDIAN JOURNAL  
OF  
YOGA  
EXERCISE & SPORT SCIENCE  
AND  
PHYSICAL EDUCATION**

---

VOLUME : IV

NO: 1&2

2010

INDIAN JOURNAL OF YOGA  
EXERCISE & SPORT SCIENCE  
AND PHYSICAL EDUCATION

Volume: IV

Number: 1 & 2

2010

**Editorial Board**

Patron :	Mrs. H. Mondal
Board of Advisors :	Prof. AK. Banerjee (Chairman), Prof. PK Chatterjee, Prof. RR Powell, Prof. H. Kannan, Dr. AN Dey, Prof. P. Devnath, Dr. SH Deshpande.
Board of Reviewers :	Prof. S. Bhowmik (Chairman)
Yoga	Dr. S. Mondal
Exercise and Sports Physiology	Dr. S. Bandopadhyay, Dr. S. S. Das
Exercise and Sports Psychology	Dr. A.K. Biswas, Dr. S. Mridha
Exercise and Sports Biomechanics	Dr. MC Ghosh, Dr. SK Mondal
Exercise and Sports Sociology	Dr. M. Mondal
Exercise and Sports Management	Dr. A Pal
Exercise and Sports Statistics	Prof. BN Kundu, Dr. D. Roy
Editor :	Dr. Samiran Mondal

Regd. No.: WBBIL/ 2007 / 22677

ISSN 0975-265X

65X

**INDIAN JOURNAL OF YOGA  
EXERCISE & SPORT SCIENCE  
AND PHYSICAL EDUCATION**

Volume: IV

Number: 1&2

2010

**BI-ANNUAL PUBLICATION OF  
EXERCISE AND SPORT SCIENCE RESEARCH CENTRE**

**FINANCED BY : "PROFESSOR SATADAL MONDAL MEMORIAL FUND"**

*Owned, printed and published by Dr. Samiran Mondal,  
Department of Physical Education, Visva - Bharati University, West Bengal, India  
Printed at Mira Offset, Bolpur (School Bagan) W.B.*

**INDIAN JOURNAL OF YOGA  
EXERCISE & SPORT SCIENCE  
AND PHYSICAL EDUCATION**

Volume: IV

Number: 1 &amp; 2

2010

**Contents**

	<b>Page No</b>
<b>Editorial</b>	
<b>Editorial</b>	
<b>Yoga</b>	
1. OFF SEASON ANALYSIS OF THE EFFICACY OF YOGA AND FIFA RECOMMENDED PROGRAMMES ON FITNESS ABILITIES AND SKILLS OF FOOTBALL PLAYERS IN GOA STATE	1
<i>Sopan Kangane, Esperanca, A. J. Afonso</i>	
2. IMPACT OF PRANAYAMA ON SELECTED COMPONENTS OF BLOOD: AN ANALYTICAL STUDY	7
<i>P. M. Kasundra, P.B. Thumar, Jayesh D. Mungra</i>	
3. BODY COMPOSITION AS A MEASURE OF HEALTH-RELATED PHYSICAL FITNESS OF ELITE TEEN-AGE YOGA PERFORMERS : A PROFILE STUDY	14
<i>Sanjib Mridha</i>	
4. INFLUENCES OF GYMNASTIC EXERCISES AND YOGIC PRACTICES ON SELECTED PHYSIOLOGICAL, BIO-CHEMICAL AND PERFORMANCE VARIABLES OF COLLEGE WOMEN STUDENTS	23
<i>K. Divya, A. Shenbagavalli</i>	
<b>Exercise and Sports Physiology</b>	
5. ROENTGENOGRAPHIC EVALUATION OF CARDIAC VOLUMES IN RESPONSE OF TRAINING ON ADOLESCENT MALES	33
<i>K. Mukhopadhyay, A.K. Uppal</i>	
6. EFFECT OF PHYSICAL ACTIVITY AND AEROBIC FITNESS ON HEALTH RELATED PHYSICAL FITNESS VARIABLES OF OVER WEIGHT AND OBESE ADOLESCENCE	46
<i>V. Ramesh, P.K. Subramaniam</i>	

7. ANALYSIS OF INTERVAL TRAINING ON SPEED AND SPEED ENDURANCE OF UNIVERSITY WOMEN PLAYERS 53

*K.Palanisamy, M.Rajashekarana, P.Kulothungan*

8. EFFECT OF AEROBIC CROSS TRAINING AND AEROBIC TRAINING ON INSPIRATORY AND EXPIRATORY RESERVE VOLUME 57

*P. Degaleesan, P. Kulothungan,<sup>1</sup> M. Rajasekaran*

9. BODY COMPOSITION OF ATHLETES OF INDIVIDUAL SPORTS 64

*Manohar Lal, Y. P. Sharma, Hari Singh, Surishtha Devi*

10. EFFECT OF PLYOMETRIC TRAINING ON SELECTED BIO-MOTOR ABILITIES AMONG FOOTBALL PLAYERS 72

*S. Manikandan, N. Premkumar, M. Rajashekarana, K. Murugavel*

11. RELATIONSHIP BETWEEN SELECTED BODY COMPOSITION AND MOTOR PERFORMANCE VARIABLES OF EARLY ADOLESCENT BOYS. 78

*Saikot Chatterjee, A.K. Banerjee*

**Exercise and Sports Psychology**

12. A Comparative Study of Happiness Between Male and Female University Athletes 84

*Rajkumar Sharma, Ashish Kumar Nigam*

**Exercise and Sport Biomechanics**

13. ANALYSIS OF SPRINT PERFORMANCE OF INDIAN VARSITY MALE ATHLETES 91

*M. Sankar, V. Gopinath*

14. A BIOMECHANICAL ANALYSIS OF PENALTY STROKE IN FIELD HOCKEY 98

*Ikram Hussain, Arif Mohammad, Asim Khan, Mohd. Arshad Bari, Saleem Ahmed*

**Exercise and Sports Sociology**

15. IMPACT OF SOCIO ECONOMIC CONDITIONS ON WOMEN SPORTS PARTICIPATION IN DIFFERENT LEVELS IN TAMIL NADU AND PONDICHERRY 103

*A. Muthu, V. Jayanthi, D. Sakthiganavel*

**Exercise and Sports Management**

16. AN ANALYTICAL SURVEY OF ESTABLISHING SOCCER PROFESSIONALISM IN MANIPUR STATE 110

*Ksh. Birbal Singh, S. Ranjit Singh, Y. Shantikumar Singh, L. Thambal Singh*

17. "AN INTRODUCTION TO TANNUDU BANTI: A NEW BALL GAME OF ANDHRA PRADESH" 118

*N.G Reddy*

18. DEMAND FOR FOOTBALL ATTENDANCE AND THE INTEREST OF THE STAKEHOLDER 121

*Asish Paul*

19. Guide Line for Contributors 129

e No  
ED  
OA  
1  
AN  
7  
SS  
14  
ED  
3E  
3  
OF  
13  
ED  
6

**INDIAN JOURNAL OF YOGA  
EXERCISE & SPORT SCIENCE  
AND PHYSICAL EDUCATION**

**Volume: IV**

**Number: 1&2**

**2010**

**EDITORIAL**

Recently Govt. of India has been giving more concentration on higher education and specially on research. Following that guide line UGC published a gazette notification for MPhil and Ph.D. For any research degree course work with research method, statistics, computer application, specialization, review of related literature are must for all. At the same time UGC mentioned that before submission of any thesis at least one paper should be published from that thesis on a referred journal. Also UGC notified that every research guide have to specify his / her area of specialization and do the research on that line. In future from this specialized list paper setter, moderator, examiner, reviewer, interviewer will be selected.

We very much appreciate and support that move of UGC for quality research and education in the concerned subject. For that, from this issue we organize separate editorial board for each specialization in our subject. Hope, in future there will be more board. With this letter I am requesting all of you please follow the UGC guide line and be acquainted with it as early as possible. May God bless you and peace prevail in you life.

*Samiran Mondal*

Editor

Indic

O  
R

\*De  
Cha  
\*\*R  
Kai

The  
train  
and  
usu  
Go  
Fit  
Dri  
two  
rec  
acc  
Mi  
col  
we  
tra  
as  
wl  
by  
pri  
Fu  
in  
Ye  
th

**OFF SEASON ANALYSIS OF THE EFFICACY OF YOGA AND FIFA RECOMMENDED PROGRAMMES ON FITNESS ABILITIES AND SKILLS OF FOOTBALL PLAYERS IN GOA STATE**

**Sopan Kangane\*, Esperanca, A. J. Afonso\*\***

\*Dean, Faculty of Physical Education, University of Pune, Pune-7 & Reader, M.Ms. Chandrashekar Agashe college of Physical Education, Pune-37, Maharashtra (India).

\*\*Research Scholar M. Phil., SMYM Samiti's Scientific Research Department, Kaivalyadham, Lonavla, Pune, (India).

**ABSTRACT**

The present study was undertaken with a view to study the effect of FIFA recommended training and the combined training (Yoga plus FIFA) interventions for improving the fitness and skill abilities of football players in Goa. This experimental research was conducted by using simple random sampling to select fifty (n=50) national level football male players of Goa state as subjects, age 15 to 18 years. The pre test data was collected administering Fitness tests (Harvard step test & Bend and reach test) and Skill tests (Juggling with head, Dribbling & scoring, and Shooting for accuracy). Subjects were randomly assigned into two equal groups, experimental groups A & B. Group A underwent exercise training as recommended by FIFA consists of a set of exercises i.e. ball balance, ball control, & shooting accuracy, while Group B received Yoga exercise training i.e. Asanas, Pranayama, Bandha, Mudra, and Kriya plus exercise training as recommended by FIFA i.e. ball balance, ball control, & shooting accuracy. Experimental Groups A & B were practiced for a total of 6 weeks, 80 minutes per day in the morning except Sundays & holidays. In fact, during daily training both the groups participated in a common warming up, conditioning exercises training as recommended by FIFA. The subjects of the Gr. A participated in the cool down exercises, whereas the subjects of the Gr. B underwent Yoga practices. The data have been recorded by using standard procedures. Descriptive statistics have been applied to process the data prior to employing inferential statistics. The inferential statistics applied was 2x2x5 ANOVA. Further, Scheffe's post hoc test was employed to record comparative effects of the training investigations.

Yoga exercise training plus exercise training as recommended by FIFA has put better influence than the exercise training as recommended by FIFA in improving Fitness and Skills.

**Key words:** Off season, FIFA, Fitness abilities, and Skills

### **Introduction**

Football, known as the "king of sports", is the most popular sport in the world. It is a sport that draws together the young and old throughout the five continents of the world. The game of football demands a great deal of physical effort on the part of each player. Moreover abilities like strength, aerobic endurance, speed of movement, agility, flexibility etc. are required to play vigorous game (Wiser, 1967; Sager, 1970).

The need of resistance training in football is probably the most obvious. Conditioning programs and exercises for football must be sport specific. The individuals who have added weight training to their regimen almost always demonstrate greater aptitude for the game. Football players can benefit from working harder during both the In-season and Off- season.

The In-season training should be designed to maintain as much strength as possible, but in actuality, all the strength is developed during off season training. Hence, it is perceived that imbibing Yoga and FIFA training program would be beneficial for football players during off season to improve performance during competition.

Normally the off season training precedes the pre competitive training in preparation of players for any competition. During off season training the main emphasis is on the development of strength, endurance, speed, and flexibility. A solid off season training regimen can give athlete an edge and help prevent injuries when the next season begins. Off season training has many advantages. In general it is seems that to improve sports performance during competitive games there is need to impart off season training to players.

Yoga can help to competitive performance. Meditation can help in improving concentration,, which leads to better performance. Finally, yoga tunes body and helps to better coordinate actions. It brings the breath, awareness, and physical body into harmony, which allows the body to work at its maximum fitness capacity. This improves physical wellness and fluidity to enhance not just the physical well-being but also permeate all levels of our being.

In fact, it is assumed that yoga practice during off season period may prove better for the players of football. Therefore, an experimental research entitled, *Off Season Analysis Of The Efficacy Of Yoga And FIFA Recommended Programmes On Fitness Abilities And Skills Of Football Players In Goa State.*

### **Material and Methods**

The present study was undertaken with a view to study the effect of FIFA recommended training and the combined training (Yoga plus FIFA) interventions for improving the fitness and skill abilities of football players in Goa. This experimental research was conducted by

Indi  
usin  
Goa  
The  
reac  
accu  
& B  
Groi  
i.e. t  
trair  
Bhu  
(Udi  
stea  
Kar  
& B  
heal  
(Ko  
rela  
exe  
and  
Exp  
the  
part  
FIF  
sub  
star  
Re:  
De:  
stat  
test



using simple random sampling to select fifty (n=50) national level football male players of Goa state as subjects, age 15 to 18 years.

The pre test data was collected administering Fitness tests (Harvard step test & Bend and reach test) and Skill tests (Juggling with head, Dribbling & scoring, and Shooting for accuracy). Subjects were randomly assigned into two equal groups, experimental groups A & B.

Group A underwent exercise training as recommended by FIFA consists of a set of exercises i.e. ball balance, ball control, & shooting accuracy, while Group B received Yoga exercise training i.e. Asanas (Shavasana, Makarasana, Sarvangasana, Halasana, Paschimottanasana, Bhujangasana, Dhanurasana, Chakrasana), Pranayama (Anuloma- Viloma), Bandha (Uddiyana), Mudra (Viparītkarani), and Kriya (Jalneti). Yogic exercises are known to increase steadiness of body (Kocher, 1972 & Kocher & Pratap, 1972), breath control (Bhole & Karambelkar, 1972; Khodeskar, 1988; Robson, 1973), neuromuscular coordination (Sahu & Bhole, 1983), perceptual abilities (Sahu & Gharote, 1985) and provide better psychological health in terms of emotional control (Kocher & Pratap, 1971), and reduce in anxiety level (Kocher, 1976; Larrye, 1974). They in turn, increase concentration and provide muscular relaxation. Thus, yoga practices were, therefore, selected as training intervention. Plus exercise training as recommended by FIFA i.e. juggling with head (Ball balance), Dribbling and scoring (Ball control), Shooting for accuracy & (Shooting accuracy).

Experimental Groups A & B were practiced for a total of 6 weeks, 80 minutes per day in the morning except Sundays & holidays. In fact, during daily training both the groups participated in a common warming up, conditioning exercises training as recommended by FIFA. The subjects of the Gr. A participated in the cool down exercises, whereas the subjects of the Gr. B underwent Yoga practices. The data have been recorded by using standard procedures.

### Results

Descriptive statistics have been applied to process the data prior to employing inferential statistics. The inferential statistics applied was 2x2x5 ANOVA. Further, Scheffe's post hoc test was employed to record comparative effects of the training investigations.



the specific variables were identified, which showed significant changes as a result of Yoga intervention.

The result helps to interpret that selected Yoga training could be use effectively to improve C. V. Efficiency (CD=0.42,  $p<0.05$ ), Flexibility (CD=0.39,  $p<0.05$ ), Juggling (CD=0.34,  $p<0.05$ ), Dribbling & scoring (CD=0.32,  $p<0.05$ ), and Shooting accuracy (CD=0.30,  $p<0.05$ ) of footballers in Goa state.

### Discussion

Many reports indicate that along with physical fitness and skills, a footballer must enrich relaxed mental state. To improve the state of tranquility of mind, in this study, yoga has been included as one of the training intervention along with FIFA recommended exercise regimen for footballers.

The experiment was designed with two groups viz; FIFA recommended exercise regimen and Yoga plus FIFA recommended exercise regimen. The report indicates that the first intervention i.e., FIFA recommended exercise regimen helped to improve both the fitness and skills of the selected footballers of Goa state.

The results revealed that although both the training interventions were effective, Yoga plus FIFA recommended exercise regimen was found better than the FIFA recommended exercise regimen only in improving physical fitness variables i.e., C. V. Efficiency and flexibility of footballers of Goa state.

Further, regarding football skills the results as obtained are amazing. Along with FIFA recommended exercise regimen, yoga played an important role in improving juggling the ball on head, dribbling the ball and scoring, and accuracy in goal shooting. To achieve better skills, one must require high level of neuromuscular coordination. The result indicates that yoga might have contributed proper state of neuromuscular coordination, which resulted to achieve the football skills. Thus, the hypothesis; inclusion of yoga training in FIFA recommended program would be more effective on both fitness and skill abilities of the football players, has been sustained.

### Conclusion

The result helps to draw the following conclusion; FIFA recommended exercise regimen is good for achieving fitness and skills of the national level footballers of Goa state. However, inclusion of Yoga in the FIFA recommended exercise program contributes additional improvement in fitness and skills of the footballers during off season.

## References

1. Baker, D. (2001). The effects of an in-season of concurrent training on the maintenance of maximal strength and power in professional and college aged rugby football players. *Journal of strength and conditioning research*, 15,2, pp. 172-177.
2. Balasubramanian, B. and Pansare, M. S. (1991). Effect of yoga on aerobic and anaerobic power of muscles. *Indian Journal of Physiology and Pharmacology*. 35, 4, pp.281-282.
3. Bobby and Brown (1980). *Successful soccer development the individual*. New York: Edinburg, pp. 8-19.
4. Dupont, G, et.al., (2004). The effect of in-season high intensity interval training in soccer players. *Journal of strength and conditioning research*, 18,3, pp. 584-589.
5. Madanmohan, et.al., (1992). Effect of yoga training on reaction time, respiratory endurance, and muscle strength. *Indian Journal of Physiology and Pharmacology* 36, 4, pp.229-233.
6. Michle, Gray, et.al., (2004). Speed training program for high school football players. *The sport journal*, 7, 1.
7. Mosher, R. e. (1985). Interval training: The effects of 12 week program on elite male soccer players. *Journal of sports medicine and physical fitness*, 25, pp. 84-86.
8. Raju, P. s. (1994). Comparison of effects of yoga and physical exercise in athletes. *Indian journal of medical research*, 100, pp. 81-6.
9. Raub, J. A. (2002). Psychophysiological effects of hath yoga on musculoskeletal and cardiopulmonary function. *Journal of alternative complementary medicine*, 8, 6, pp. 797-812.
10. Trumby, Rubin. (1980). *More skillful soccer*. Pp. 11-62.
11. Watson, A. W. (1995). Physical and fitness characteristics of successful footballers. *British journal of sports medicine*, 29, 4, pp. 229-31.

# Impact of Pranayama on Selected Components of Blood: An Analytical Study

P. M. Kasundra\*, P.B. Thumar\*\*, Jayesh D. Mungra\*\*\*

\*Reader, M.D. College of Physical Education, Gujarat Vidyapith, Sadara Gujarat, India.

\*\*Director, The Maharaja Sayajirao University of Baroda, Gujarat, India.

\*\*\*M.Phil. Student, M.D. College of Physical Education, Gujarat Vidyapith, Sadara Gujarat, India.

## Abstract

The objective of the study was to assess the impact of Pranayama Training on selected Components of Blood. For the present study subject selected were students of Bachelor of Arts studying in Mahadev Desai Gram Seva Mahavidyalaya. Randomly 30 students were selected for the study and then subjects was divided into two equal groups randomly consisting of 15 subjects each belonging to one experimental (Group A) and one control group (Group B). Group A were exposed to Pranayama and group B was control group. Experimental group participated in Pranayama training for eight weeks.

The variables and test items selected for the present study were Cholesterol, Blood Glucose, Hemoglobin, WBC, RBC, Platelets. For analyzing the data t-test was used to find out the significant difference between Pre-Test and Post-Test.

The study revealed significant difference in all the components of Blood in Pre-Test and Post-Test of Experimental Group. This study revealed significant difference in Pre-Test and Post-Test of Experimental Groups of selected blood components i.e. Cholesterol, Blood Glucose, Hemoglobin, WBC, RBC, Platelets. This shows that Pranayama training has an impact of Pranayama Training on selected Components of Blood.

## **Introduction**

Pranayama is the first step towards re-orienting and improving the functioning of mind and body by learning to utilize the air we breathe. The Yogis were the first to discover the importance of this and so actually devised an exact science of breathing. They called it PRAN-AYAMA, from the Sanskrit word pran means breathe, and ayama means cessation.

Pran is the link between the physical and the astral bodies. It is Pran that pumps blood from the heart into the arteries. Pranayama implies correct breathing and control over breathe.

The purpose of yoga breathing exercises is to supply the body with oxygen and clean carbon dioxide. Oxygen in the blood is vital for assimilation of food we eat for full filling body's various needs like rebuilding tissues, providing energy for functioning of brain, nerves, heart and other vital organs.

One can live without food and water for days together but one cannot live with air even for a few minutes. If the breath is steady and clam, the mind is also becomes steady and calm. Pranayama practice reduces the impurities of blood and mind. Studies of the breathing have shown that the methods of respiration affect the whole organism.

By practicing Pranayama one can have good appetite, cheerfulness, good figure, strength, stamina, good concentration courage, and high standard of health. It has been said that, there is no purificatory action greater than Pranayama.

As a result of breathing, the freshly oxygenated blood (during inhalation) travels from lungs to the heart. The heart pumps it via arteries and blood vessels to every part of the body, where in turn it seeps into every tissue and bone cell. This improves the blood circulation and more oxygen/ prana or cosmic energy reaches all parts of our body.

### Objective of the Study

The objective of the study was to assess the effect of Pranayama Training on selected components of Blood. Prasad, Sunita (2006) conducted a research to study the impact of Pranayama and Yoga on Lipid Profile in Normal Healthy Volunteers. The study was conducted on normal healthy volunteers, 41 men and 23 women, to evaluate the impact of Pranayama and Yoga asanas on blood lipid profiles and free fatty acids, in two stages. In stage-I, Pranayama was taught for 30 days and in stage-II, yogic practices were added to Pranayama for another 60 days. A Significant reduction was observed in triglycerides, free fatty acids and VLDL-cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of HDL-cholesterol was seen only in the men at the end of stage-I. At the end of stage-II, free fatty acids increased in both men and women, and women demonstrated a significant fall in serum cholesterol, triglycerides, LDL-and VLDL-

Indi  
cho.  
Prar

Bhr  
Ma  
to 1  
incl  
and  
Hai  
bet  
Ph  
Me

T  
pr

T

V
C
B
H
R
W
P

cholesterol. The results indicated that HDL-cholesterol was elevated in men with Pranayama, while triglycerides and LDL-cholesterol decreased in women after yoga asanas.

Joshi Bhanu Prakash (2003) had studied the impact of Kapalbhathi, Vaman and Bhramari Pranayama on college going students (age group 18-25 years ) of J.S. Sanskrit Mahavidyalaya, Saptrishi Ashrama, Hardwar. Total samples were 40 males. They belonged to 12<sup>th</sup> standard and practice Yoga daily for one hour in the morning, in which he had included Kapalbhathi, Vaman, Bhramari Pranayam for two months. All the Psychological and Physiological tests were measured in Brahmavarchas Research center Shanti Kunj Hardwar. By statistical analysis it was observed that there was a significant relationship between the practice of Kapalbhathi, Vaman and Bhramari on Haemoglobin, E.S.R., F.V.C., Physical and mental health.

### Methodology

**Sample:** For the present study, subjects selected were the students of Bachelor of Arts studying in Mahadev Desai Gram Seva Mahavidyalaya. Thirty students were selected for the study and then subjects were divided into two equal groups randomly consisting of 15 subjects each belonging to one experimental (Group A) and one control group (Group B). Group A was exposed to Pranayama and group B was control group. Experimental group participated in Pranayama training for eight weeks. Age group of subjects was varying from 18 to 22 years.

**Tools :** The variables and test items selected for the present study were presented in the table No. : 1

**Table No – 1 :**

### Variables

Variables	Measured by instrument
Cholesterol	Bio-chemistry analyzer machine
Blood Glucose	
Hemoglobin	Fully automatic hematology analyzer machine
RBC	
WBC	
Platelets	

**Pranayama Training Schedule :**

S.N.	Pranayama	Mon	Tue	Wed	Thu	Fri	Sat
1	Yogic Exercise	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
2	Omkar	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
3	Suryabhedan	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
4	Chandrabhedan	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
5	Bhastrika	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
6	Bhamari	5 min.	5 min.	5 min.	5 min.	5 min.	5 min.
7	Anulom-vilom	10 min.	10 min.	10 min.	10 min.	10 min.	10 min.

**Note:**

1. One minute rest was given between each Pranayama
2. Above mentioned program was taken for first four weeks then in next four weeks 2 min. were increases in all Pranayama and in Anulom-vilom 3 min. were increased.
3. The training schedule was conducted in the morning session at 6am to 7am.

**Analysis**

Analysis of the data collected on 30 subjects belonging to two group i.e. one experimental (15subjects) and one control group (15subjects) to study the effect of Pranayama on selected components of blood is given below:

Data was analyzed using t-test at .05 level of significance. The subjects of both groups were compared on selected components of blood variable i.e. Cholesterol, Blood Glucose, Hemoglobin, WBC, RBC, Platelets. The below Table-2 shows the analysis of t-test.

Variables

Cholesterol

Blood Glucose

Hemoglobin

WBC

RBC

Platelets

Significance

Findings

1. On cor  
Group  
Group



Table – 2

Variables	Group		Mean	SD	Mean Difference	t-ratio
Cholesterol	Experimental	Pre-test	135.25	23.35	19.58	8.86*
		Post-test	115.67	19.26		
	Control	Pre-test	106.99	13.83	3.21	1.30
		Post-test	110.20	14.39		
Blood Glucose	Experimental	Pre-test	93.18	9.14	5.80	2.484*
		Post-test	88.57	6.00		
	Control	Pre-test	89.23	9.13	0.94	1.445
		Post-test	90.17	8.13		
Hemoglobin	Experimental	Pre-test	12.81	1.35	1.26	7.523*
		Post-test	14.07	0.88		
	Control	Pre-test	14.25	1.30	0.06	0.668
		Post-test	14.31	1.39		
WBC	Experimental	Pre-test	6.96	1.43	1.17	4.158*
		Post-test	8.13	1.32		
	Control	Pre-test	7.10	1.99	0.19	1.232
		Post-test	7.29	1.83		
RBC	Experimental	Pre-test	5.04	0.45	0.49	6.138*
		Post-test	5.53	0.40		
	Control	Pre-test	5.30	0.55	0.05	1.902
		Post-test	5.35	0.56		
Platelets	Experimental	Pre-test	221.20	55.45	21.47	4.21*
		Post-test	242.67	57.68		
	Control	Pre-test	219.20	56.42	1.93	1.748
		Post-test	221.13	56.93		

\* Significant at 0.05 level  $t_{0.05} (14) = 2.145$

### Findings of the Study

1. On comparing the mean scores of Cholesterol of Pre-Test and Post-Test of Experimental Group significant difference was found where as in Pre-Test and Post-Test of Control Group no significant difference was found.

2. Further, on comparing the mean scores of Blood Glucose of Pre-Test and Post-Test of Experimental Group significant difference was found where as in Pre-Test and Post-Test of Control Group no significant difference was found.
3. Significant difference was found on comparing the mean scores of Hemoglobin of Pre-Test and Post-Test of Experimental Group where as no significant difference was found in Pre-Test and Post-Test of Control Group.
4. The WBC as a Component of Blood have significant difference in mean scores of Pre-Test and Post-Test of Experimental Group where as no significant difference was found in Pre-Test and Post-Test of Control Group.
5. Also RBC as a Component of Blood have significant difference in mean scores of Pre-Test and Post-Test of Experimental Group where as no significant difference was found in Pre-Test and Post-Test of Control Group.
6. There was significant difference in Platelets as a component of Blood in mean scores of Pre-Test and Post-Test of Experimental Group where as no significant difference was found in Pre-Test and Post-Test of Control Group

**Refer**

1. Dorli
2. Shri Y
3. Swan
4. Achar
- Book
5. Swan
- Pvt. I
6. Swan
7. Janar
8. Prasa
- K.J.F
- Jour
9. Bhan
- (Phys
- Anve

**Conclusion**

Yoga is a great gift that has its origin in Indian Civilization. In One side it is a science to convert ordinary person into a divine personality and on the other hand it provides ways for salvation. It is a process of total health.

The present study revealed significant difference in Pre-Test and Post-Test of Experimental Groups of selected blood components i.e. Cholesterol, Blood Glucose, Hemoglobin, WBC, RBC, Platelets. This shows that Pranayama training has an effect on selected components of Blood.

Thus, to increase efficiency of blood and stay healthy one must practice Pranayama on daily basis. It is strongly advised that, those who are having health related problems such as High Blood Pressure; Breathing Problem etc. should consult doctors and yoga experts before starting any program related to Pranayama.

In the last, we should return towards our own Indian tradition and utilize our treasure of knowledge along with the scientific methods of knowledge.

References

1. Dörling Kindersley, Yoga – mind and body, USA: D.K. Publishing book 1999.
2. Shri Yogendraji, Yoga in Modern life, Yoga and Total Health, 1996.
3. Swami Mahadev, Pranayama Rahsya, Kankhal: Diyayog Mandir trust, 2000.
4. Acharya BhagwanDev, Yoga: Light of Spiritual Discipline, New Delhi: Diamond Pocket Books, 1987.
5. Swami Sivananda, Yogic Home Exercises, Bombay: D.B. Taraporevala Sons & Co. Pvt. Ltd., 1983.
6. Swami Sivananda Saraswati, Kundalini Yoga, Madras: My Magazine of India, 1935.
7. Janardan Swami, Pranayam with yoga Kirya, Nagpur: Sanjeev Printing Press, 1980.
8. Prasad K.V.V., Madhavi Sunita, Sitarama Raju, Reddy Venkata, Sahay B.K. and Murthy K.J.R., Impact of Pranayama and Yoga on Lipid Profile in Normal Healthy Volunteers, Journal of Exercise Physiology online Volume 9, Number 1, February 2006.
9. Bhanu Prakash Joshi, Effect of Some Yogic Practice on Human Subjects (Physiological & Psychological), Abstracts 14<sup>th</sup> International Conference on Prana-Anveshan, Bangalore, INDIA (18-21 Dec, 2003).

## BODY COMPOSITION AS A MEASURE OF HEALTH-RELATED PHYSICAL FITNESS OF ELITE TEEN-AGE YOGA PERFORMERS : A PROFILE STUDY

**Sanjib Mridha\***

*\*Associate Professor & Head  
Department of Physical Education  
University of Kalyani, West Bengal*

### ABSTRACT

Yoga, now-a-days, becoming more and more popular as a form of physical activity for the people of all walks of life seeking health and happiness. It improves physical fitness of different categories of people. Body composition is an essential component of health-related physical fitness. To understand body composition, which is one of the measures of health-related physical fitness, of elite yoga performers who practice yogasana on long-term basis. Volunteers of this study were best ten yoga performers of under 19-year (n=10, Group-A), under 17-year (n=10, Group-B) and under 14-year (n=10, Group-C) boys, on whom the measurements were taken during West Bengal State Level (Inter District) School Yogasana Championship in October, 2009. Body composition variables of this study were body mass index (BMI), body fat % (BF%), lean body mass (LBM) and waist-to-hip ratio (WHR). BF% was measured by skin fold method. Each volunteer used to practice yogasana for at least three years. Except weight of Group-C, height and weight of the three groups was significantly lower ( $p < 0.01$ ) than Indian norm (ICMR, 1990). BMI of Group-A was significantly higher ( $p < 0.05$ ) and Group-B & Group-C were at per compared to the ICMR norm. BMI of Group-A was significantly higher than Group-B & Group-C, but there was no difference between Group-B and Group-C. BF% was low (6-10%) in Group-B (6.9%), but it was optimal (10-20%) in Group-A (11.17%) and Group-C (10.45%). Significantly lower ( $p < 0.05$ ) BF% was seen in Group-B compared to Group-A and Group-C. LBM was significantly higher ( $p < 0.01$ ) in gradually higher age group. WHR was the highest in Group-C and the lowest in Group-B and there was significant difference ( $p < 0.05$ ) only between Group-B and Group-C. The findings of the present study indicate that the levels of body composition variables of elite yoga performers of three teen-age groups are conducive to their good health-related physical fitness.

Indian

Key w

Intro

activi  
childr  
sustai  
struct  
effect  
disea  
mark

have  
four  
Heal  
of th  
rese  
vigo  
phys  
diab  
rela  
mus  
rela  
leve  
phy

vit:  
ofl  
fitr  
ex  
ma  
W:  
an  
ob  
in

**Key words :** Body composition, elite yoga performer, teen-age, health-related physical fitness

## Introduction

Yoga, now-a-days, becoming more and more popular as a moderate form of physical activity for the people of all walks of life seeking health and happiness. Common people, children to senescent, practice external forms of yoga, i.e., asana, kriya and pranayama to sustain their health and well-being. Regular practice of yogic activities helps to improve structural as well as various bodily functional aspects of man. Even yogic practices may effectively control various hypokinetic diseases like diabetes, blood pressure, cardio-vascular diseases, those are being considered as the major threats to the technologically advanced mankind (Nagarathna & Nagendra, 2008).

Health-related physical fitness consists of those components of physical fitness that have a relationship with good health (ACSM, 1998). It is now being considered as the fourth learning domain with the other three are cognitive, affective and psychomotor domains. Health-related physical fitness has now been separated from psychomotor domain because of the increasing recognition of its importance at present (Lacy & Hastad, 2006). The research of the 1990s suggests that the perspective on exercise and fitness must shift from vigorous exercise programs to more moderate and wide ranging physical activities. Moderate physical activity can substantially reduce the risk of developing or dying from heart disease, diabetes, colon cancer and high blood pressure (USDHHS, 1996). Components of health-related physical fitness are – body composition, cardio-respiratory endurance, flexibility, muscular strength and muscular endurance. Exercise, proper nutrition, adequate rest, relaxation and good health habits are the influencing factors for achieving a considerable level of health-related physical fitness, which is even foundational to sport or skill-related physical fitness (Heyward & Wagner, 2004).

Body composition refers to the body in terms of lean mass (muscle, bone, vital tissue and organs) and fat mass. It is the only non-performance component of health-related physical fitness, whereas, other components of this category of fitness involve some type of performance such as running, stretching and muscular exercise. Body composition is very useful to predict growth, physical fitness, maturation, clinical condition, and age related changes in our body (Heyward & Wagner, 2004). From 1980s onwards, the prevalence of childhood overweight and obesity has increased at an alarming rate (NCHS, 2001). The prevalence of obesity (10.9%) has doubled and prevalence of overweight (15.5%) has increased in the children of the US. (Styne, 2001).

A major concern is that children who are obese tend to become obese adults who have a relatively high risk of developing diseases and disorders associated with excess body weight and body fatness. Therefore body composition of the growing children has stimulated much interest in identifying health-related physical fitness. Body composition of a person can be understood by body mass index (BMI), body fat% (BF%), lean body mass (LBM) and waist-to-hip ratio (WHR). BMI is commonly used method of determining an individual's weight is whether underweight, healthy or overweight in relation to their particular body type ([http://www.newworldencyclopedia.org/entry/Physical\\_fitness](http://www.newworldencyclopedia.org/entry/Physical_fitness), 2009). BF% gives an apprehension of fatness of an individual. From BMI we may get an overweight person but he may not possess excess amount of fat. Over-fatness refers to a state of poor health that results from possessing an unacceptable ratio of fat to lean body mass (Lacy & Hastad, 2006). The WHR is commonly used as an indirect measure of lower- and upper-body fat distribution (Ohrvall et al, 2000).

The purpose of this study was to predict the profile of body composition of teenage elite yoga performers. Besides, comparisons were made among the groups and with the standard norms (ICMR, 1990; WHO, 1998; Lohman et al, 1997 and Bray & Gray, 1988b).

### Material & Methods

A total of thirty subjects were chosen who were selected as the best ten performers in three age category, i.e., under 19-year (n = 10, Group-A), under 17-year (n = 10, Group-B) and under 14-year (n = 10, Group-C). Measurements were taken during West Bengal State Level (Inter District) School Yogasana Championship in October 2009. The subjects were the Bengali teens. Body composition variables of this study were BMI, BF%, LBM and WHR. BMI was measured by the ratio of weight in kilogram / (height in metre)<sup>2</sup>. For each subject height was recorded to the nearest 0.1 cm and weight to the nearest 0.5 Kg. BF% of the subjects of below sixteen years was measured by two-site skinfold method (Slaughter et al, 1988) and for remaining subjects by four-site skinfold method (Durnin & Womersley, 1974). LBM was predicted by deducting fat mass from body weight and WHR was obtained from dividing the waist circumference to hip circumference of a subject. The researcher is a level-II anthropometrist and he himself took the anthropometric measurements following the standard techniques (Lohman et al, 1988).

Indian

stand:  
comp  
weight  
group  
0.05 l

Resu

A, 15  
three  
both  
stand  
weig  
Resu  
Tabl

Varia

Heig  
ICM  
Weig  
ICM  
BMI  
ICM

\*\*

BM  
18.5  
BM  
199  
(Lo  
Grc  
Grc

Data of the study were analyzed using SPSS package version 10.0. Mean and standard deviation were used as descriptive statistics to predict the profile on body composition variables of the three groups. For comparison with standard norm of height, weight and BMI, student's t-test was conducted and for inter-group comparison among the groups, independent t-test was conducted. Differences were considered significant at  $p < 0.05$  level. The data are presented as mean  $\pm$  standard deviation (SD).

## Results

Mean age of the subjects of three age groups were  $18.23 \pm 0.58$  years for Group-A,  $15.92 \pm 0.63$  years for Group-B and  $13.17 \pm 0.71$  years for Group-C. The results of three groups' physical standard i.e., height, weight and BMI are presented in Table-1 in the both forms of descriptive and comparative statistics. Comparing with Indian national standard (ICMR, 1990), it is observed that height and weight of the yoga performers (except weight of Group-C) were significantly lower ( $p < 0.01$ ) than the norm (ICMR, 1990). Results of the four body composition variables are presented in Table-II.

**Table I : Physical standard of the three teen-age groups in respect to ICMR norm**

Variables	Groupwise Value of Mean (SD)			t-value		
	Gr. A	Gr. B	Gr. C	Gr. A	Gr. B	Gr. C
Height (cm.)	160.70(4.52)	155.1(7.69)	142.4(7.73)	11.40**	6.53**	4.33**
ICMR Norm Height	177.0	171.0	153.0			
Weight (Kg)	57.4(4.01)	47.5(4.71)	37.4(5.56)	6.00**	7.04**	1.99 <sup>NS</sup>
ICMR Norm Weight	65.0	58.0	40.9			
BMI (Kg /m <sup>2</sup> )	22.57(1.71)	19.72(0.93)	18.52(2.01)	3.36**	0.40 <sup>NS</sup>	1.48 <sup>NS</sup>
ICMR Norm BMI	20.75	19.84	17.47			

\*\*Significant at 0.01 level; \*Significant at 0.05 level, NS = Not Significant

**BMI:** The BMI of Group-A is  $22.57 \pm 1.71$ , Group-B is  $19.72 \pm 0.93$  and Group-C is  $18.52 \pm 2.01$ . The BMI of Group-A is significantly higher ( $p < 0.01$ ) than the norm, but BMI of the other two groups, i.e., Group-B and Group-C is at par with the norm (ICMR, 1990). All the three groups' BMI is within the range of healthy group, that is 18.5–24.9 kg (Lohman et al, 1997). Significantly higher ( $p < 0.01$ ) BMI is observed in Group-A than Group-B and Group-C. But there is no difference in BMI between Group-B and Group-C.

**Table II : Inter-group comparison of body composition variables**

Variables	Groupwise Value of Mean (SD)			t-value (intergroup)		
	Gr. A	Gr. B	Gr. C	A & B	B & C	A & C
BMI (Kg/m <sup>2</sup> )	22.57(1.71)	19.72(0.93)	18.42(2.01)	4.65**	1.86 <sup>NS</sup>	4.98**
BF%	11.17(4.81)	6.91(1.97)	10.45(4.06)	2.59**	2.48*	0.36 <sup>NS</sup>
LBM (Kg)	50.87(2.53)	44.25(4.86)	33.43(4.72)	3.82**	5.05**	10.30**
WHR	0.81(0.02)	0.80(0.02)	0.83(0.04)	1.07 <sup>NS</sup>	2.28*	1.66 <sup>NS</sup>

\*\* Significant at 0.01 level, \* Significant at 0.05 level, NS = Not Significant

**BF%:** BF% of Group-B is in the low category (5–10%) but it is in optimal range (10–20%) in case of Group-A and Group-C according to norm (Lohman et al, 1997). BF% of Group-B is significantly lower than Group-A ( $p < 0.01$ ) and Group-C ( $p < 0.05$ ), however, there is no difference between Group-A and Group-C.

**LBM:** LBM of Group-A is  $50.57 \pm 2.53$  Kg, Group-B is  $44.25 \pm 4.86$  Kg and Group-C is  $33.43 \pm 4.72$  Kg. Inter group comparison in LBM reveals that there is a significant increase of LBM ( $p < 0.01$ ) in comparatively higher age group.

**WHR:** WHR is the highest in Group-C and the lowest in Group-B and significant difference ( $p < 0.05$ ) is there between Group-B and Group-C only. But there is no difference between Group-A & Group-B and Group-A & Group-C. WHR of the three groups is in the healthy category is  $< 0.83$  (Bray & Gray, 1988b).

## Discussion

Height is a status of growth and body size of growing ups. The present study data (Table-1) of the three teen-age elite yoga performers reveal that they are shorter in stature than the national standard (ICMR, 1990). Another growth measure of teens is body weight. Weight of the most junior group (Group-C) is at par with the norm but the other two groups are having a considerably lower body weight than the national standard (ICMR, 1990). Comparing this study with the study of Mukhopadhyay et al (2005) on the Bengali adolescents (age: 11–14 year) it is observed that body weight is more and height is almost same in Group-C boys.

BMI of the three groups is at par with the national standard, and in case of Group-A it is even higher (ICMR, 1990). BMI of Group-B and Group-C is also higher than the adolescent Bengali boys (Mukhopadhyay et al, 2005 & Banerjee et al, 2005). BMI of all the three groups is in the healthy category (18.5–24.9) of World Health Organization standard

Indian Jou  
(WHO,  
adolesc  
criticism  
and for  
underno  
status th  
measur  
(WHO,  
Group-  
their he  
not unc

Illust

BMI

18.5

BMI

BF%

low

that

anc



(WHO, 1998). BMI of growing ups increases with age from six year onwards through adolescence (Fredericks et al, 2000) and the same trend also observed in this study. A criticism on this study is that the researcher did not considered the socio-economic status and formal dietary intake by the subjects. Because, BMI is suppose to affect by undernourishment, which is prevalent in India. Though BMI is an abstract index of nutritional status than as a measure of body composition (Wells, 2001), but it is a very convenient measure in any community where local reference for body composition is not available (WHO, 1995), which is very relevant to this study. However, the subjects of Group-A and Group-B are lower in weight than the national standard but their body weight in terms of their height, is not less than our national standard (ICMR, 1990) and in that sense they are not underweight.

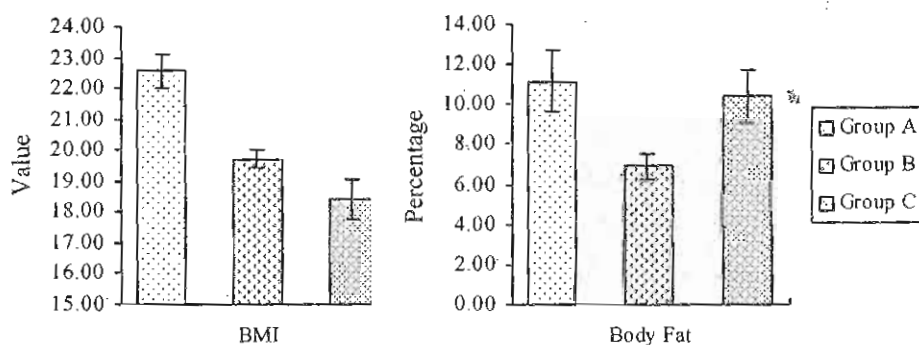


Illustration No. 1 : BMI of three groups  
(Mean ± SE bar)

Illustration No. 2 : %Body Fat of three groups  
(Mean ± SE bar)

BMI for normal weight category :  
18.5 – 24.9 kg (WHO, 1998)

BF% standard (Lohman et al, 1997) for children -  
low : 5% - 10%, optimal : 11% - 20%

BMI for normal weight category : 18.5-24.9kg BF% standard

BF% gives an objective measure for body composition. In all the three age groups it is low (5–10%) and optimum (11–20%) (Lohman et al, 1997). This phenomenon indicates that the elite teenage yoga performers, are having greater body mass per unit body area and their heaviness is not due to fat mass but due to their LBM or essential body mass.

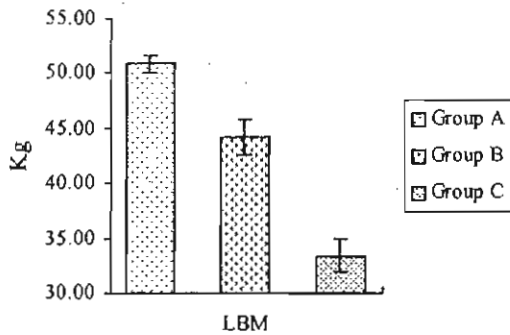


Illustration No. 3 : LBM of three groups  
(Mean ± SE bar)

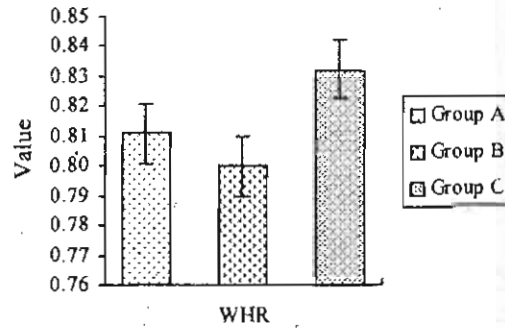


Illustration No. 4 : WHR of three groups  
(Mean ± SE bar)

WHR norm (Bray & Gray, 1988b) – low : < 0.83

LBM of the three groups is comparatively high because they possess low to medium BF%. Therefore, for a given body weight to the elite yoga performers, they are having good amount of LBM. Significant difference in LBM among the groups is seen and the value is high according to higher age.

WHR is a measure of fat distribution in upper and lower body and it helps to predict the susceptibility of cardiovascular and metabolic diseases one could have experience in future (Ohrvall et al, 2000). WHR of the three groups of teen-age elite yoga performers are in a very healthy category which is less than 0.83 (Bray & Gray, 1988b).

Body composition of growing ups or teens shows an indication to become normal weight, overweight and obese in adulthood. However, in all of the four body composition variables of the elite teen-age yoga performers are in a good state of health-related physical fitness.

**Conclusion**

Though the present study has many limitations, i.e., socio-economic status of the subjects, number of subjects are not more to make a generalized conclusion, and body composition of yoga performers who are not up to the level of the subjects of this study

Ind  
but  
pres  
gro  
  
Ref  
1. A  
q  
f  
1  
2. A  
[  
3. I  
I  
4. I  
:  
5. I  
(  
6. I  
:  
7. I  
:  
8.  
9.  
10

but practice yoga on regular basis are not considered. However, the findings of the present study indicate that body composition of elite yoga performers of three teen-age groups is conducive to their good health related physical fitness level.

### References

1. American College of Sports Medicine. Position stand : the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine & Science in Sports & Exercise*. 1998;30(6):975-91.
2. Available from: [http://www.newworldencyclopedia.org/entry/Physical\\_fitness](http://www.newworldencyclopedia.org/entry/Physical_fitness), c2009 [cited 2009 Nov 11].
3. Banerjee I, Ghia N, Bandopadhyay S, Sayed HN, Mukherjee D. Body mass index in Bengali adolescents. *Indian Pediatrics*. 2005;42:262-7.
4. Bray GA, Gray DS. Obesity. Part 1-pathogenesis. *Western Journal of Medicine*. 1988b; 149:429- 41.
5. Durnin JVGA, Womersley J. Body fat assessed from total body density and its estimation from skinfold thickness : Measurement on 481 men and women aged from 17 to 72 years. *British Journal of Nutrition*. 1974;32:77-97.
6. Fredericks AM, Van Buuren, S, Wit JM, Verlooe-Vanhorick SP. Body index measurements in 1996-97 compared with 1980. *Arch Dis Child*. 2000;82:107-12.
7. Heyward VH, Wagner DR. *Applied body composition assessment*. 2nd ed. Champaign, IL: Human Kinetics; 2004.
8. Indian Council of Medical Research. c1990 [cited 2009 Aug 28]. Height and weight of boys at different ages. Available from: <http://indiachildren.com/htwtc.htm>.
9. Lacy AC, Hastad DN. *Measurement and evaluation in physical education and exercise science*. 5th ed. San Francisco : Benjamin Cummings; 2006.
10. Lohman TG, Houtkooper L, Going SB. Body fat measurement goes high-tech : not all are created equal. *ACSM's Health & Fitness Journal*. 1997;7:30-5.

11. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Chicago : Human Kinetics; 1988.
12. Mukhopadhyay A, Bhadra M, Bose K. Anthropometric assessment of nutritional status of adolescents of Kolkata, West Bengal. *Journal of Human Ecol.* 2005;18(3):213–16.
13. Nagarathna R, Nagendra HR. Yoga for promotion of positive health. Bangalore : Swami Vivekananda Yoga Prakashna; 2008.
14. National Center for Health Statistics. Prevalence of overweight among children and adolescents : United States, 1999. Washington DC; 2001.
15. Ohrvall M, Brglund L, Vessby B. Sagittal abdominal diameter compared with other anthropometric measurements in relation to cardiovascular risk. *International Journal of Obesity and Related Metabolic Disorders.* 2000;24:497–501.
16. Slaughter MH, Lohman TG, Boileau RA, Horswill, CA, Stillman RJ, Van Loan MD, et al. Skinfold equations for estimation of body fatness in children and youth. *Human Biology.* 1988;60:709–23.
17. Styne DM. Childhood and adolescent obesity. Prevalence and significance. *Pediatric Clinics of North American.* 2001;48:823–54.
18. US Department of Health and Human Services; Department of Health and Human Services, Centers for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion. Physical activity and health : a report from Surgeon General: Atlanta, US; 1996.
19. Wells JCK. Measurement : A critique of the expression of pediatric body composition data. *Arch. Dis. Child.* 2001;85:67–72.
20. World Health Organisation. Obesity : preventing and managing a global epidemic. Report of a WHO consultation on obesity. Geneva; 1998.
21. World Health Organisation. Physical status : The use and interpretation of anthropometry. Technical report series. no. 854. Geneva; 1995.

**INFLUENCES OF GYMNASTIC EXERCISES AND YOGIC PRACTICES ON SELECTED PHYSIOLOGICAL, BIO-CHEMICAL AND PERFORMANCE VARIABLES OF COLLEGE WOMEN STUDENTS**

K. Divya\*, A. Shenbagavalli\*\*

\*Ph.D Scholar, \*\*Professor & Chair Person  
Department of Physical Education  
Alagappa University Karaikudi, Tamil Nadu.

**ABSTRACT**

The Purpose of the study was to find out the effects of Gymnastic Exercises and Yoga Exercises on college students on selected Physical Performance, Physiological and Bio-chemical variables in this study. The subject selected for this study was 90 college women students divided into three groups, control group, yoga exercises group and gymnastic exercise group. The age group of the subject was 18 to 21 years. To assess the effects of 12 weeks training for gymnastics and Yogic exercises Programme, and the following dependent variables were chosen, Vital Capacity, Heart Rate Breath Holding Time, Systolic Blood Pressure, Diastolic Blood Pressure, Blood Sugar and Cholesterol, Endurance, Speed and Abdominal Strength. The obtained data were statistically analysed through ANACOVA to test the significance difference and the result showed that the Gymnastic exercise and Yogic Exercise brought significant improvement among the college women on all variables except in diastolic Blood Pressure.

**Introduction**

Modern World is the outcome of many scientific inventions through the countries. Scientific instruments and machinery help to lead the daily life with ease and comfort. The modern man depends mostly upon the scientific equipment for his daily routine, involving mainly his mental powers to have a comfortable life, resulting in fall deterioration in his physical health and capacity. Modern man need not toil like his forefathers in his daily life. So he has become less vigorous and less active. The inactivity and pressure of work result in stress, which is on the increase in the urban areas. Fatal cardiac arrests even youngsters in their early thirties. It is here the concept and the initiative for games and physical exercises gain utmost importance.

It is highly competitive world the man has to live in. so mental stress takes a heavy toil of his health. So for a man to be fit, he has not only to resort to physical exercises, but also to Yoga practices to give rest to his over worked mind.

“Physical fitness experts recommend a thirty minutes workout of continues exercise. The exercise need not be difficult or strenuous. However a person’s condition improves, he or she should increase the number of times each activity is performed”.<sup>1</sup>

Physical education has long believed that exercise is essential to maintain good health. During the past twenty years a great deal of evidence has been reported by the medical researches supporting the value of vigorous exercise for the promoting health.<sup>2</sup>

‘Gymnastics’ is the system of physical exercises either for recreation or for promoting health and body building. It is the means for the improvement of physique of a man or woman. Gymnastics is a sport involving the performance of sequences of movements requiring physical strength, flexibility, balance and kinesthetic awareness such as hands springs, handstands, forward rolls, aerials and tucks. Yoga exercises believe in bringing valuable qualities that it builds up a store of physical health through the practice of a system of exercises called asanas which keep the body clean and fit. Yoga asanas are for speedy removal of toxins and keeping blood circulation and all internal processes functioning smoothly.

The investigator was interested to find out the effect of gymnastic exercises and Yoga exercises on college women on selected physical performance, physiological and biochemical variables in this study, which would bring out the present status of these college women on their physical, physiological and bio-chemical variables encourage them to involve in gymnastic and yoga exercises for improvement of their health related fitness.

It was hypothesized that:

- There would be a significant difference in the selected physiological variables due to gymnastic exercise group and yogic exercise group.
- There would be a better improvement in the bio-chemical variables due to gymnastic exercise group and Yogic exercise group.
- There would be a better improvement in the performance variables due to gymnastic exercise group and Yogic exercise group.

### Methodology

The investigator randomly selected 90 college women students, divided in to three groups, namely, control, Yoga exercises and gymnastic exercises group. The age group of

Indian:  
the sub  
Yoga e  
Contr  
obtain

progr  
Wet S  
was t  
used  
stand  
testec  
dash

Trai

Exei  
laun  
IV v  
of th

prac  
Bh  
Vip  
rep

gyl  
per  
sta  
ex  
(19

as  
wi

the subject was 18 to 21 years. Experimental group I involved twelve weeks training on Yoga exercise. Experimental group II involved twelve weeks training on gymnastic exercises. Control group was not involved in any kind of training. Pre and post test scores were obtained on the following physiological, bio-chemical and performance variables.

To assess the effects of 12 weeks training for gymnastic and Yogic exercises programme, the following dependent variables were chosen:

Wet Spiro meter was used to measure the vital capacity, Digital blood pressure monitor was used to estimate the blood pressure and heart rate. Nose clip, and stop watch was used to measure the Breath holding time. Bio-chemical variables were measured using standard equipments in a private bio-chemical laboratory. The performance variables were tested through standard tests. 9 mins run/walk test was to measure the endurance. 50 meters dash was to measure the speed and sit ups was to measure the abdominal strength.

### Training schedule

The training schedule were given to the Experimental group I (gymnastic Exercises). upward jump on the sport, opposite toe touching, stretching exercises, sideward launching, caterpillar walk, forward roll, back ward roll, tank roll, cart wheel, sit ups . I<sup>st</sup> to IV weeks repetition 5, V to VIII weeks repetition 7, IX to XII weeks repetition 10, duration of the exercise 3mins, after the 5<sup>th</sup> exercise rest for 5mins.no.of.sets 1.

The training schedule were given to the Experimental group II (Yogic practices). Padmasana, Vajrasana, Sarvangasana, Matsyasana, Paschimothasana, Halasana, Bhujangasana, Dhanurasana, Yogamudra, ArthaMatsyendrasana, Chakrasana, Viparithakarani, Savasana. Duration of the asana 45 mins. Asana pose Maintained 30sec. repetition 2, in between the asana 30 sec. Rest.

The following statistical procedures were employed to estimate the influences of gymnastic exercises and yogic practices on selected physiological, bio-chemical and performance variables of college women students. Analysis of co-variance (ANACOVA) statistical technique was used to test the adjusted post-test mean difference among the experimental group as recommended by Clarke and Clarke<sup>3</sup> (1972) and Best and Khan (1986). In all the cases 0.05 level was fixed as level of significance Which was considered as appropriate. If the adjusted post-test result was significant the scheffe's post-hoc test was used to determine the significance of paired mean difference.

### Computation of Analysis of Co-Variance

	Control Group	Gymnastic Group	Yoga Group	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	'F' Ratio
Adjusted post test mean (vital capacity)	1.77	2.25	2.13	Between Within	3.48 1.72	2 86	1.74 0.02	86.88*
Adjusted post test mean (heart rate)	74.98	69.89	69.92	Between Within	495.31 634.31	2 86	247.66 7.37	33.58*
Adjusted post test mean (breath holding time)	38.70	44.39	54.67	Between Within	3914.71 1744.94	2 86	1957.36 20.29	96.47*
Adjusted post test mean (systolic blood pressure)	109.45	102.43	103.28	Between Within	870.8 2098	2 86	435.43 24.40	17.85*
Adjusted post test mean (Diastolic blood pressure)	73.59	71.91	71.43	Between Within	73.20 1661.41	2 86	36.60 19.32	1.89
Adjusted post test mean (blood sugar)	100.70	91.94	87.70	Between Within	2614.83 424.56	2 86	1307.41 4.94	264.83*
Adjusted post test mean (cholesterol)	166.09	157.29	170.92	Between Within	2838.50 3453.52	2 86	1419.25 40.16	35.34*
Adjusted post test mean (speed)	9.56	8.32	8.64	Between Within	24.82 5.73	2 86	12.41 0.07	186.35*
Adjusted post test mean (endurance)	1673.80	1997.03	1957.34	Between Within	1847277.56 190391.99	2 86	923638.78 2213.86	417.21*
Adjusted post test mean (sit-ups)	12.22	20.09	18.49	Between Within	1012.80 965.89	2 86	506.40 11.23	45.09*

\*Significant at 0.05 level = 3.109 (df 2,86)

### Result

were 1. F-ratio: 86. The 74.98, F-ratio 86. The groups than th freedom gymnast F-ratio for the yogic than th freedom yogic greater of free yogic greater of free 9.56, ratio 3 The ac 1673. the tab 2 and were table 1 and 8



## Results

The adjusted post test means (Vital capacity) of control, gymnastic and yogic groups were 1.77, 2.25 and 2.13 respectively. The obtained F-ratio 86.88 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Heart rate) of control, gymnastic and yogic groups were 74.98, 69.89 and 69.92 respectively. The obtained F-ratio 33.58 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Breath holding time) of control, gymnastic and yogic groups were 38.70, 44.39 and 54.67 respectively. The obtained F-ratio 96.47 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Systolic blood pressure) of control, gymnastic and yogic groups were 109.45, 102.43 and 103.28 respectively. The obtained F-ratio 17.85 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86.

The adjusted post test means (Diastolic blood pressure) of control, gymnastic and yogic groups were 73.59, 71.91 and 71.43 respectively. The obtained F-ratio 1.89 is lesser than the table F-ratio 3.109. It is insignificant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Blood sugar) of control, gymnastic and yogic groups were 100.70, 91.94 and 87.70 respectively. The obtained F-ratio 264.83 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Cholesterol) of control, gymnastic and yogic groups were 166.09, 157.29 and 170.92 respectively. The obtained F-ratio 35.34 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86.

The adjusted post test means (Speed) of control, gymnastic and yogic groups were 9.56, 8.32 and 8.64 respectively. The obtained F-ratio 186.34 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (Endurance) of control, gymnastic and yogic groups were 1673.80, 1997.03 and 1957.34 respectively. The obtained F-ratio 417.21 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86. The adjusted post test means (sit ups) of control, gymnastic and yogic groups were 12.22, 20.09 and 18.49 respectively. The obtained F-ratio 45.09 is greater than the table F-ratio 3.109. It is significant at 0.05 level of confidence for the degrees of freedom 2 and 86.

\*Significant at 0.05 level=3.109 (df 2,86)

(sit- ups)

Wt/min

702.89

86

11.23

10

**The Scheffe's post hoc test**

	Control Group	Gymnastic Group	Yogic Group	MD (1&2, 1&3, 2&3)	C.I
Vital capacity	1.77	2.25	2.13	80,0.360,0.120	0.091*
Heart rate	74.98	69.89	69.92	5.08,5.06,0.23	1.747*
Breath holding time	38.7	44.39	54.67	5.69,15.97,10.28	2.900*
Systolic blood pressure	109.45	102.43	103.28	7.02,6.17,0.85	3.180*
Blood sugar	100.7	91.94	87.7	8.760,13.00,4.240	1.431*
Cholesterol	166.07	157.29	170.92	8.80,4.83,13.63	4.080*
Speed	9.56	8.32	8.64	1.14,0.92,0.32	0.170*
Endurance	1673.800	1997.03	1957.340	3.230,283.540,39.690	30.294*

Abdominal strength 12.22 20.09 18.49 7.870,6.270,1.600 2.158\*

The Scheffe's post hoc test ordered adjusted means between the groups for Vital Capacity. The mean difference between control group and Gymnastic Group, control group and Yogic group, Gymnastic Group and Yogic group were 0.480, 0.360 and 0.120 respectively and the scheffe's post hoc test C.I Value result is 0.091. As the C.I value is less than the MD for all the three comparisons, the difference is significant. The adjusted means between the groups for Heart rate. The mean differences of the three groups were 5.08, 5.06, 0.23 and the C.I Value result is 1.747. In the first two comparisons are significant and the third comparison is insignificant. The adjusted means between the groups for Breath holding time. The mean difference of the three groups were 5.69, 15.97, 10.28 and the C.I value result is 2.900. As the C.I value is less than the MD for all the three comparisons, so the difference is significant. The adjusted means between the group for Systolic blood pressure. The mean difference of the three groups were 7.02, 6.17, 0.85 and the C.I Value result is 3.180. In the first two comparisons the difference in MD is significant and the third comparison is insignificant.

The adjusted means between the groups for blood sugar. The mean differences of the three groups were 8.760, 13.00, 4.240 and the C.I Value result is 1.431. As the C.I value is less than the MD for all the three comparisons and the difference is significant. The adjusted means between the groups for blood cholesterol. The mean differences of the three groups were 8.80, 4.83, 13.63 and the C.I Value result is 4.080. As the C.I value is less than the MD for all the three comparisons and the difference is significant. The adjusted means

between and the compar Endura the C.I.V and the strengtl Value re insignifi

**Discus**

The fo rate, br gymnna pressur the Yog were si is in ag studyir among much t The di exerci exerci D. Mi progra the fin holdin The fo Breati consci medit as jog the flo flow c few n fall as

between the groups for Speed. The mean differences of the three groups were 1.14,0.92,0.32 and the C.I Value result is 0.170. As the C.I value is less than the MD for all the three comparisons and the difference is significant. The adjusted means between the groups for Endurance. The mean differences of the three groups were 323.230,283.540,39.690 and the C.I Value result is 30.294. As the C.I value is less than the MD for all the three comparisons and the difference is significant. The adjusted means between the groups for abdominal strength. The mean differences of the three groups were 7.870,6.270,1.600 and the C.I Value result is 2.158. In the first two comparisons are significant and the third comparison is insignificant.

### Discussion on findings

The following physiological variables were selected for this study, vital capacity, and heart rate, breath holding time, systolic pressure and diastolic pressure. The result revealed that gymnastic group was better in vital capacity, heart rate, breath holding time and systolic pressure followed by Yogic practice and control group. While testing the difference between the Yogic exercise group, and gymnastic exercise group, it was found that the mean difference were significantly differed in vital capacity and breath holding time. The findings of this study is in agreement with the findings of Birkel (1992) and Harinath et. al. (2004), who after studying college men and women found improvement statistically significant in vital capacity among the subjects. This study further outlines that gymnastic exercises has contributed much for improving vital capacity of the college women than yoga exercises.

The difference in heart rate and systolic pressure among the yogic exercise and the gymnastic exercise were not significant. As the diastolic pressure was concerned, either the gymnastic exercise or yogic exercises did not alter this variable among college women students. Earnest D. Michel et.al pulse rate and blood pressure changes occur during the physical training programme Research Quarterly, 31. (196). The findings of the study was in agreement with the findings of Madanmohan et.al.(1993).who reported significant improvement on breath holding time due to yoga exercise.

The following organs are used in respiration: mouth, nose, wind pipe, lungs and diaphragm. Breathing is one of the few bodily functions. This, within limits, can be controlled both consciously and unconsciously conscious attention to breathing is common in many forms of meditation, specifically anapana and other forms of yoga. In rhythmic muscular activity such as jogging, swimming and bicycling, the dilation of blood vessels in working muscles enhance the flow of blood through lanes portion of the peripheral vasculature. The increased blood flow during moderate rhythmic exercise cause systolic pressure to rise rapidly in the first few minutes of exercise. As steady rate exercises continues, systolic pressure may gradually fall as the arterioles in the muscles continue to dilate and peripheral resistance to blood flow

becomes reduced. It is documented that in the studies conducted by Harinath et.al (2004) yogic practices for three resulted in improvement in systolic blood pressure and the findings of this study is in agreement with the previous studies.

Each physical activity can be related to one or more of muscular mechanism of bio chemical because with its blood and bio-fluid is nothing but a mixture of chemicals of bewildering complexity. It's the documented that physical exercise could increase blood flow in trained subject and improve in the microcirculation. There will be increased peripheral blood flow which brings sugar amount to the site of utilization. Such increased utilization of glucose may bring about desirable decreased if glucose, if glucose may bring about desirable decrease if blood sugar. Whether gymnastic exercise group and yogic exercise group better in controlling blood sugar, the findings proved that yogic practice significantly decreased blood sugar level. The findings of this study is in agreement with the findings of Arileli, (1986) and Hong and Lien, (1984) who found physical exercises reduced blood glucose and blood cholesterol levels of the men and women subjects.

Whereas cholesterol is the most well-know fat, it may be no more a culprit that the other fats. Many blood fats are manufactured by the body it self, While other are ingested in the high fat foods, particularly saturated fats whatever the sources of fat and the type of fats involved, The following two conclusions are justified by the resent research, exercise can reduced blood fat levels, particularly for individuals who have above normal blood fat levels and There is an increased risk of coronary heart disease with increased blood fat levels. Whether gymnastic exercises group or yogic exercise groups better in reducing blood cholesterol, the findings proved that gymnastic exercises significantly decreased blood cholesterol level of college women than gymnastic exercise.

Speed is the performance pre requisite to do motor actions under given conditions in minimum time. Speed is a determining factor in explosive sports such as sprints, jumps, and most field sports. Whether gymnastic exercises group and yogic exercise groups improves better speed, the findings proved that the gymnastics group had improved better physical performance speed than yogic group significantly. The findings of this study is in agreement with the studies of Leshkevitch and others and Travis who found that exercises improves significantly on the speed of young sports men and college players respectively. The findings of this study is also in agreement with the studies of Reddy and Kumar (2001) who found that yogasana improved significantly speed of girl students.

Endurance is the ability to do sports movements, with the desired quality and speed, under conditions of fatigue. Endurance is a very important ability in sports. But at the same time it is an ability that the importance of which is often over looked in several sports endurance is product of all psychic and physical organs and systems. No other motor ability depends so much on the working capacity of complete psycho-physical apparatus of humans as

Indian  
endur  
physic  
of this  
the fir  
with t  
other  
The a  
the a  
streng  
of spo  
bette  
gymi  
varia  
and t  
abdc

It is  
sign  
syste  
vari  
yog  
train  
cho  
is b

1.7  
2.7  
1  
1  
3.1

04) endurance. All other performance factors depend on one or more parts of this psycho-physical apparatus and the result are directly or indirectly affected by endurance. The findings of this study that gymnastic exercises improved endurance significantly is in agreement with the findings of Ukoho who found that exercise improves endurance significantly is in agreement with the findings of Sujatha who found yogic exercises is more beneficial in the long run than other physical exercises, which rely on the number of rapid movements for effective exercising. The abdominal strength is very much important in sports because the abdominal part become the axis of the body the center of gravity also will fall mainly in the abdomen. The abdomen strength is help to maintain the body posture there by involving in many activities in the field of sports and games. Whether gymnastic exercises group and yogic exercise groups improves better abdomen strength, the finding proved that there was no significant difference between gymnastic group and yogic group. Lohan and Rajesh (2002) reported physical physiological variables including abdominal strength improved by training of yogasana on one hundred and twenty subjects tested. The findings of this study that yogasana improves significantly abdomen strength of the college women.

#### Conclusion

It is concluded that the gymnastic exercise training and yogic practices have improved significantly the physiological variables vital capacity, breath holding time, heart rate and systolic pressure, the bio-chemical variables as blood sugar and cholesterol, the performance variables as speed, endurance and abdominal strength. Gymnastic exercises training and yogic practices have not improved the diastolic pressure significantly. Gymnastic exercise training is better in improving the variables vital capacity, heart rate and systolic pressure, cholesterol, speed, endurance, and abdominal strength than the yogic group. Yogic Exercise is better in improving the breath holding time and blood sugar than the gymnastic group.

#### Reference

1. The World Book Encyclopedia. vol.15 (Sydney: World Book, Inc., 1993), pp.469-471.
2. Ted A. Baumgartner and Andrew S. Jackson, Measurement for Evaluation in Physical Education and Exercises Sciences(3<sup>rd</sup> ed; Dubeque, Iowa: W.Mc, Brown Publishers,1987),p.11.
3. Harrison H.clarke and David H. Clarke Advanced Statistics With application to physical education, Edglewood cliffs, New jersy: Prentice Hall,Inc,1972

4. Birkel, D.A., (1992) "Hatha Yoga: improved vital capacity of college student". *Indian journal of Physiological Pharmacology* 36(4):229-33.
5. Harinath K, Malhotra AS, Pal K, Prasad R (2004) Hathayoga and Omkar meditation on cardiorespiratory performance, psychologic profile, and melatonin secretion". *J Altern compliment Med.* 2004 Apr, 10(2):261-8
6. Earnest D. Micheal et.al pulse rate and blood pressure changes Occur During the physical training programme *Research Quarterly*, 31.(196)43.
7. Madanmohan, Thombre, D.P., Balakumar B., (1993). "Effects of yoga Training on reaction time, respiratory endurance and muscular strength", *Indian journal of Physiological Pharmacology*. 34(4), 350-2.
8. Arileli, A. (1986). The effects of Training, Fat, carbohydrate Ingestion on Exercise- Induced Changes in glucose and Triglycerides Blood levels. *Chemical Abstracts*, 104.
9. Hong, C. Z., and Lien, I.N. (1984). Metabolic effects of Exhuastive Training of Athletes, *Archieves of Physical Medicine and Rehabilitation*. 65(7); 362-5.
10. C.C. Leshkevith, et.al., "The Influence of Sequence of Exercise in Training Under takings in the development of the Physiological foundations of Speed, Strength, Endurance of Young Sports men", *Research Quarterly*, Vol. 83:2 (Oct 1982), p.500.
11. F. Travis, et.al., "Invincible Athletic Programme : Aerobic Exercise and Performance Without strain" *International journal of Neuroscience*, Vol. 85:3 (April 1996), pp.301-308. P.Ramesh Reddy and Ravikumar, (2001). "A Comparative Study of Yogasana and Aerobic Dance and Their Effects on Selected Motor Fitness Components in Girls Students". *Bi-annual for Movement* 18:34-36.
12. Ukoho, "Exercise Way Physical Fitness – Health for all- All For Health , Exercise, Be Fit , Be Healthy ", *WHO*, 440:2 (November, 1988, ), pp.1-2.
13. Sujatha, "What the experts says , *The Hindu*" (26 june, 1999).
14. Usha Logan and Rajesh (2002) "Effects of Asana and Pranayamas on Physical and Physiological Components of boys between age group 12 -16 years ", *Journal of Sports and Sports Sciences* 25(1)50-56.
16. Hardy Singh. *Science of Sports Training* (New Delhi: DVS Pubilication, 1991), p.15.
17. Arthur C. Grey ton, *Text Book of Medical Physiology* (Philadelphia: sounders college PUBLISHING, 1979).
18. Chrusch, M.J., (2001). Creatine Supplementation Combined with resistance Training *Medicine and Science in Sports and exercise* 33(12):2111-7.
19. Daniel D. Ranheim (1985) *Modern Principles of Athletic Training*, St. Louis :The Mosby college Publishing co.

Roer

\*Hea

Berha

\*\*P

Gwal

Sport

proc

phys

respi

and

estin

of th

aero

thro

mal

exp

end

(P&lt;

case

Key

Int

The

of a



## Roentgenographic Evaluation of Cardiac Volumes in Response of Training on Adolescent Males

K. Mukhopadhyay\*, A.K.Uppal\*\*

\*Head, Department of Physical Education, Union Christian Training College, Berhampore, West Bengal.India

\*\*Professor and Ex Dean, Laxmibai National College of Physical Education, Gwalior.M.P.

### ABSTRACT:

Sportsman increases the internal environment through scientific and systematic procedure and maintains this through planned training programme. The key physiological systems of the body in relation to training are circulatory and respiratory systems. The purpose of the study was to evaluate the cardiac volumes and  $Vo_{2max}$  of 15 weeks training on adolescent males. The cardiac volumes were estimated by the method of Musshof and Reindal from two teleroentgenograms of the subjects viz. a left lateral chest view and chest P.A view. For measuring the aerobic power maximum volume of Oxygen consumption ( $Vo_{2max}$ ) were measured through sub-maximal heart rates by the use of Fox equation. Eight (8) adolescent males aged  $14.83 \pm .63$  and six (6) boys aged  $14.72 \pm .72$  were treated as experimental and control groups respectively. After 15 weeks of strength and endurance training the cardiac volumes and  $Vo_{2max}$  were improved significantly ( $P < 0.01$ ) and resting and sub-maximal heart rates were decreased significantly in case of experimental group.

**Key words:** Cardiac volume, Resting heart rates, Sub-maximal heart rates,  $Vo_{2max}$ , Training.

### Introduction:

The athlete's training is a multistage and multisided process of the expedient use of aggregate factors i.e. means, methods and conditions so as to influence the

development of an athlete and ensure the necessary level of preparedness. To assess the left ventricular functional aspects in response of training is very few in number; most of the studies are cross-sectional in nature. To calculate the volume of a three dimensional organ, the heart, became possible as early as 1916 with the use of roentgenograms. Since that time the importance of heart size and heart volume has gained more and more recognition (*Durusoy 1974*). Roentgenography is considered very useful, as the only practical method to evaluating the cardiac morphology of many patient (*Stein P.D, Lewinson H and Potts K.H, 1974*). This parameter, was also re-appreciated with the advent of modern sports and high intensive training (*Ahuja. A, Goswami. A and Ahuja. A, 1994*). Of late echocardiography, instead of roentgenography was become popular to find out the different kind of hypertrophy in sports discipline. Cardiac morphology by roentgenography was first determined by *Roher (1916)*, followed by *Danger (1919)*, *Kahlstrof (1932)*, *Pennier et. al. (1982)*) and others *Katona, (1982)*, *Mathur D.N. and Igbokwe NU. (1988)*, *RosKamm H. (1967)* and *Reindall et.al (1974)*. *Kahlstrof (1932)* already showed that there exists a direct relation particularly between the cardiac volume and the body weight. He found this relation to be 8 and 7 ml per kg body weight for men and women respectively and it does not exceed ml. Later many other researchers have shown that this value might be little higher normally in adult life. All parts of athlete's heart are enlarged and its performance increases following high intensity sports training. Highly trained endurance athletes show the most enlarge hearts. Regular physical exercise induces changes in the body that are a physiological adaptation to increased loads. In general, these adaptations are favourable and enable the individual to increase physical performance capacity (*Macfarlane and coworkers, 1991*). Adaptations of training also include the structure and function of cardiovascular system in addition to its functional control (*Urhausen. and Kindermann. 1992*). Strength training induces changes to pressure loads, whereas endurance training requires volume loads and elicits an increased maximal cardiac output, by increasing stroke volume (*Andersen. Scherling. and Saltin. 2000 and Astrand and et al, 2003*). It has become clear that sports performance and training induced adaptations are determined mainly by genetic factors and to a limited extent by training (*Kuipers Harm, 2005*). All forms of athletic training are associated with left ventricular hypertrophy (LVH).



Oxygen consumption is an important aspect which may detect the athletes working ability. Physically the  $VO_{2max}$  assessment is indication of the functional state of the respiratory, circulatory and metabolic system. The greater the capacity of the dimensional and functional factors of an athlete's endurance ability, the higher will be the  $VO_{2max}$  of that athlete (*Shephard 1982*).

In India this particular type of experimental work is not much in evidence. Therefore, the purpose of the present study was to investigate the 15 weeks training effect of the heart volumes and  $Vo_{2max}$  on adolescent males.

### Method:

8 students of class eight standard whose mean age were  $14.83 \pm 0.63$  years were treated as experimental group and 6 students of same class whose mean age were  $14.72 \pm 0.72$  years were belonged to control group. The mean height of the experimental and control group were  $160 + 6.54$  and  $154.4 \pm 6.98$  centimetres respectively.

The cardiac volumes were determined by two teleroentgenograms of the chest: a posterior view and a left lateral view. These teleroentgenograms were taken at the end of the mid-inspiration in recumbent position. A focus of the film distance of 200 cm was constantly maintained to reduce magnification and enhance the sharpness. The following measurements were taken in a centimetre scale from the teleroentgenograms (**Figure -1 & 2**).

L = Long cardiac diameter in P/A view (in cm).

$$B = B_1 + B_2$$

$B_1$  = Greatest cardiac diameter perpendicular to L from right cardiac border (in cm).

$B_2$  = Greatest cardiac diameter perpendicular to L from left cardiac border (in cm).

D = Greatest horizontal diameter in left lateral view (in cm).

Cardiac Volume (ml) =  $0.4 * L * B * D$  (*Musshoff and Reindall, 1976*)

Relative heart volumes were measured by the ratio of heart volume and respective body weight (ml/kg) of the subjects.

The resting and submaximal heart rates were estimated through palpation method and the  $VO_{2max}$  of the subjects were determined using Fox equation (*Fox, 1988*).

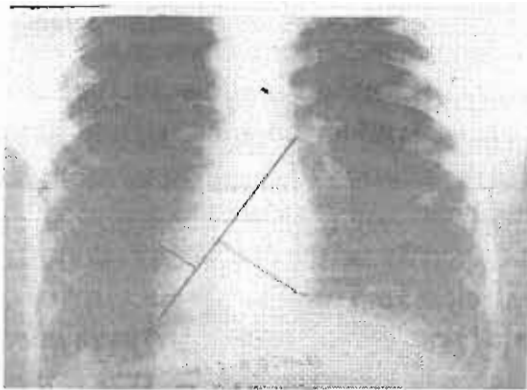


Fig - 1 Chest PA View



Fig - 2 Chest LL View

### Statistical analysis

Student 't' test were applied to find out the significant difference in pre- and post- training experimental group in comparison to the control group.

### Training procedure

For experimental group 15 weeks training programme was conducted. Two types of training were applied, viz. (i) strength training and (ii) endurance training.

India

(

P

2

e

I

(

I

I

Rep

Set:

Der

Spe

Re

**(i) Strength training**

Maximum strength development for first 10 weeks with additional weight and explosive strength development for next 5 weeks were imparted to the experimental group.

**Method:** Repetition

**Organisation:** In Circuit

**Load duration:** 3 hours and once in a week

**Intensity:** 80-90%

**Repetition:** To complete exhaustion in each set, last 2-3 repetitions were done with external assistance or help.

**Set:** 3-7

**Density or Recovery:** 60-240 seconds

**Speed of movement:** Slow to explosively smooth.

**(ii) Endurance training**

The principles of basic endurance development for first five weeks, then specific endurance training for next 10 weeks were imparted to the experimental group. For first 5 weeks continuous slow running for 30-45 minutes with heart rate of 140-160 beats/min were given and the next 10 weeks the following training method was adopted.

**Method:** Interval training method.

**Intensity:** 60-80%

**Duration:** 70-80 seconds, two days per week.

**Distance:** 400 meters

**Repetitions:** 10-20 repetitions

**Recovery:** Active and incomplete. Next repetition was started when heart rate comes to 120-130 beats per minute.

**Results:**

All the personal profiles were slightly higher in case of experimental group. **Table -I** indicates the personal data of the samples of the study.

**Table -I: Physical characteristic of the subjects**

Personal variables	Experimental group	Control group
Age (years)	14.83 ± 0.63	14.72 ± 0.72
Height (cms)	160 ± 6.54	158.4 ± 6.54
Weight (kgs)	51.87 ± 3.9	49.83 ± 3.54

**Table -II: Statistical data of the control group**

Variables	Pre test		After 15 weeks		't' ratio
	Mean	S.D.	Mean	S.D.	
Heart Volume (ml)	423.38	± 42.18	434.37	± 43.28	2.38
Body Weight (kg)	49.83	± 3.54	50.0	± 03.74	82
Relative Heart Volume (ml/ kg)	8.55	± 0.46	8.67	± 0.51	0.11
Resting Heart Rate	74.17	± 3.6	73.83	± 2.9	1.36
Sub-maximal Heart Rate	152.6	± 9.2	152.67	± 9.36	1.16
Vo <sub>2max</sub> (Lit/min)	2.65	± 0.19	2.68	± 0.19	1.87

Ta

Variab

Heart

Body

Relati

Volur

Restir.

Rate

Sub-n

Heart

Vo<sub>2ma</sub>

The 1

onse!

After

impr

weig

train

signi

Vo<sub>2n</sub>

min

shov

unaf

**Table -III: Statistical data of the experimental group**

Variables	Pre test		After 15 weeks		t' ratio
	Mean	S.D.	Mean	S.D.	
Heart Volume (ml)	446.11	± 26.14	465.91	± 24.88	4.86 **
Body Weight (kg)	51.87	± 3.9	52.75	± 3.41	1.63
Relative Heart Volume (ml/kg)	8.6	± 0.41	8.82	± 0.58	1.83
Resting Heart Rate	73.25	± 4.89	65.25	± 7.17	10 **
Sub-maximal Heart Rate	150.75	± 7.9	137.75	± 8.9	38.24 **
Vo <sub>2max</sub> (Lit/min)	2.73	± 0.32	3.12	± 1.4	13 **

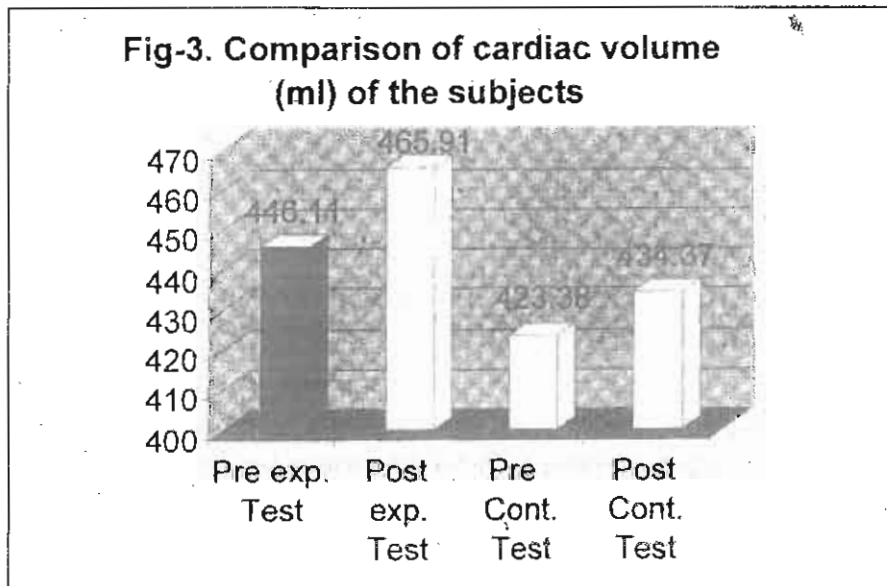
\*\* = Significant at .01 level, (t 7, 0.05 = 3.71).

The mean cardiac volumes of experimental and the control groups before the onset of training were  $428.38 \pm 42.18$  ml and  $446.11 \pm 26.14$  ml respectively. After the training treatment period the experimental group showed significant improvement ( $p < 0.01$ ) than that of control counterpart [Table II and III]. The body weight and relative heart volume of both the groups were unchanged following training. The resting and sub-maximal heart rates of experimental group showed significant decreased after training than that of control group [Table II and III]. The Vo<sub>2max</sub> of experimental and control group before the training were  $2.65 \pm 0.19$  lit/min and  $2.73 \pm 0.32$  lit/min respectively. After the training the experimental group showed significant increase of Vo<sub>2max</sub> ( $p < 0.01$ ), whereas, the control group was unaffected after 15 weeks.

### Discussions:

The heart volume varies depending upon the type of sports, age, training experience and genetic endowment. Astrand (1952) has classified the well trained athletes into three groups (a) Endurance sports (cyclists, Canoeists, cross country skiers, long distance runners) having higher heart volumes (b) Middle distance runners and swimmers, Soccer and Tennis players having a heart volume between 800-900 ml and (c) Anaerobic sports Viz sprinters, jumpers, gymnasts, throwers below 800 ml. *Shepherd* (1982) found that cardiac volume of 12-13 years old boys were 401 ml. In our study the mean cardiac volume were 446.11 ml (experimental) and 465.91 ml (control), which were much closer to findings of *Shepherd* (1952) and *Goswami* (1994).

**Fig-3. Comparison of cardiac volume (ml) of the subjects**



The cardiac hypertrophy of endurance athlete consists of an increase in the size of the left ventricular wall, with a sustained venous return as a consequence of an imposed large cardiac output; a large preload is placed in the myocardium. In non-endurance athletes (i.e. strength type activities performer), the cardiac hypertrophy consists of just opposite, the ventricular wall while the ventricular cavity remains normal in size as a consequence of after loading (*Danzer 1919*,

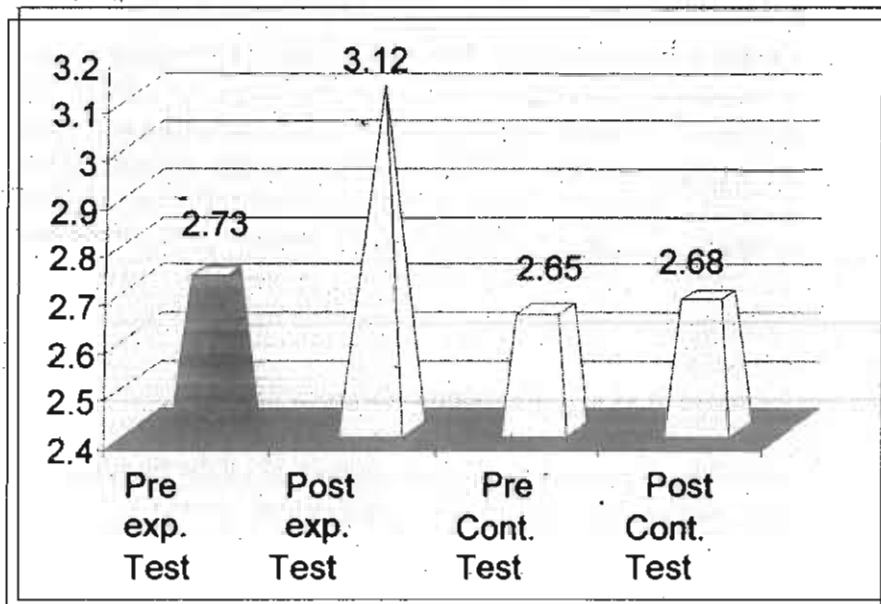
Indian  
Karr  
and I  
The  
deve  
has b  
a ren  
resul  
Panr  
impr  
the a  
The  
(exp  
and  
depe  
inter  
volu

*Karrison. Nordesjo. and Saltin. 1974, Medved and Medved 1976 and Mathur and Igbokwe 1988.*

The study of *Spina (1992)* also showed that 12 weeks endurance training developed the left ventricular hypertrophy and increase in cardiac output. Heart has been found to be effected by different type of physical training and especially a remarkable change in heart volume was evident after prolonged period of training, resulting cardiac hypertrophy (*Kahlstrof 1932, Medved and Medved 1976, Pannier BeKaert. and Pannier 1982, and RosKamm 1967*).The significant improvement of cardiac volume of the experimental group after training due to the adaptation of training loads causing cardiac hypertrophy (**Fig-3**).

The mean relative heart volume of the present study were 3.55 (control) and 8.6 (experimental group) which were much closure to the findings of *Ohyabu (1987)* and *Goswami ( 1994 )*.The relative heart volume of an individual is largely depended upon the body weight and heart volume of that individual. 15 weeks of interval training was not sufficient enough for significant change of relative heart volume and body weight of the subjects of the present study.

**Fig-4. Comparison of Vo2max (lit/min) of the subjects**



Sub-maximal Heart Rate of the experimental subject reduced significantly after training. In general, it is observed that the activity of the heart of any individual can be measured under three different conditions of the body, namely (i) Resting, (ii) Sub-maximal and (iii) Maximal work. Regular participation in aerobic exercise often results in a decrease in resting and sub-maximal heart rate, although the explanation of this well-established phenomenon has not been conclusively elucidated. A complex network and interaction of nerves and chemicals regulate the speed of heart as well as the opening in blood vessels to accommodate the distribution of blood throughout the body. The resting heart rate is under the influence of the autonomic nervous system's sympathetic and parasympathetic nerves. The lowering of resting and sub-maximal heart rate following interval training in the present study proposed to be due primarily to an increase in parasympathetic activity with a minor decrease in sympathetic discharge (Katona et al, 1982, Smith et al 1989). As with same load of work, the increase SV can easily manage to supply optimum quantum of blood to active muscles of the body with significant reduction in  $HR_{sub}$ . More over, endurance training helps to generate higher cardio-respiratory efficiency by (i) Increased availability of Oxygen at the level of lung, (ii) By greater transportation of Oxygen via haemoglobin and (iii) By higher extraction power of Oxygen ( $O_2$  utilization) at tissue level. Thus,  $HR_{sub}$  might have reduced or we can say that due to training adaptation the energy cost of sub-maximal work might have reduced considerably in case of experimental group in contrast to the control group. The findings of  $HR_{sub}$  were duly supported by Mathews and Fox (1968), Ekblom (1968), Frick (1963), Winder et al (1978) and Karisson (1974).

The  $VO_{2max}$  of the experimental subjects improved significantly following training in contrast to the control group (figure-4). Several factors determined the rate at which  $O_2$  may be supplied active tissue and these must be properly co-ordinate and integrate with the work of muscle if the body is to attain its highest efficiency. The several contributing factors are (i) Ventilation of lung, which ordinarily increases with the increase in the load of work, (ii)  $O_2$  carrying capacity of the blood, determine by the haemoglobin content of the blood, (iii) Unloading of Oxygen at tissue level during activity, (iv) Minute volume of the heart during exercise, cardiac out runs parallel with the consumption of  $O_2$ , (v) Increase in muscle mitochondria.

The significant increased of  $VO_{2max}$  of experimental group following training may be due to resting and sub-maximal bradycardia, significant increment of stroke volume as a result of adaptation to training. The finding of  $VO_{2max}$  was supported by the findings of Vaccaro (1987), Frick and co-workers (1970), McArdle, Katch and Katch (007) and Esteban et al.(2002).



### Conclusions:

Within the limitations of the present study, it was resolved that 15 weeks combination of strength and endurance training were effective for cardiac hypertrophy of adolescent males. The heart rates of resting and sub-maximal level decreased significantly following endurance training, which further facilitated the significant improvement in  $Vo_{2max}$  of the experimental subjects. Teleroentgenography was found to be effective for measurement of cardiac diameters of an individual. With the advent of echocardiography, instead of roentgenography, more accurate cardiac measurements are possible.

### References:

1. Ahuja. A, Goswami. A and Ahuja. A. (1994). Cardiac Volume of Elite Indian Weightlifters. NIS Scientific Journal, 17(1):3-10.
2. Andersen. JL, Scherling. P and Saltin. B. (2000). Muscle, genes and athletic performance. Sci Am, 283:48-55.
3. Astrand, P.O. (1952) Experimental studies of Physical work capacity in relation to sex and age. Ejnar Muuksgaard, Copenhagen Ch. XII.
4. Astrand. P.O, Rodahl. K, Dahl H.A and Stromme. S.B. (2003). Body fluids, blood and circulation. Text book of Work Physiology. Human Kinetics. 4<sup>th</sup> ed. Illinois. USA: 127-176.
5. Cumming G and danzinger R. (1963). Bicycle ergometer studies in children: Correlation of pulse rate with oxygen consumption. Pediatrics, 32; 202.
6. D. Vinereanu et al. (2002) "Left ventricular long-axis diastolic function is augmented in the hearts of endurance-trained compared with strength-trained athlete". Clin. Sci. (Lond) Sep; 103(3):249-57.
7. Danzer CS (1919). The cardiothoracic ratio: An index of cardiac enlargement. Am. J. Med. Sci. 157; 513.
8. Durusoy F. (1974). Heart volume and its relationship to body weight in trained sportsmen. J. Sp[orts Med. Phy. Fit, 14; 178-182.
9. Ekblom, *et.al.* (1968) Effect of Training on Circulatory Response to Exercise, J. Appl. Physiol, 24, 4, 518-528.
10. Esteban et. al. (2002) Physical training increases heart rate variability in healthy prepubertal children. European Journal of Clinical Investigation, 32(7), 479-487.
11. Frick. M, Konttinen. A and Sarajas. S. (1963) Effects of Physical Training on Circulation at Rest and During Exercise Am. J. Cardiol, 12, 142 - 147.

12. Frick. M.N. Sjogren. A.L., Perasalo. J. and Pajunen. S. (1970) Cardiovascular dimensions and moderate physical training in Young men. *J.Appl.Physiol*, 29(4), 452-455.
13. Kahlstrof A. (1932).Uber eine artodiagraphische herzvolumen bestimmung. *Foftschritte gebiete Rontgen strahlen*, Fortsschritte gebiete Rontgen strahlen,45;123.
14. Karpovich. P.V.and Sinnings. WE (1971).*Physiology of muscular activity*. W.B.Saunders company, Philadelphia,1971
15. Karrison. J., Nordesjo. L.O. and Saltin. B. (1974) Muscle Glycogen Utilization During Exercise After Physical Training, *Acta Physiol. Scand.* 90, 210-217.
16. Katona, P.G; McLean,K., Dighton,D.H., & Guz,A. (1982) Sympathetic parasympathetic cardiac control in athletes and nonathletes at rest . *Journal of Applied Physiology*, 52,1652-1657.
17. Keul et.al. (1982). The athlete's heart hemodynamics and structure. *Int.J.Sports Med.*3; 33.
18. Kuipers Harm.(2005).Cardiac adaptation to exercise. *Heart and Metabolism*, 26, 1-5.
19. MacFarlance N, Northridge DB, Wright Ar, Grant S and Dargie.HJ.(1991) A comparative study of left ventricular structure and function in elite athletes. *Br J Sp Med*, 25(1): 45-48.
20. Mathews. D.K and.Fox. E.L (1968). *The Physiological Basis of Physical Education and Athletics*. Philadelphia:W.B.Saunders Co. 626-627.
21. Mathur D.N. and Igbokwe NU. (1988). Heart volume and electrocardiographic studies in sprinters and soccer players. *J. Sports Med. Phys. Fit.* 402.
22. McArdle. WD, Katch. FL and Katch. VL. (2007)*Exercise Physiology: Energy, Nutrition & Human Performance*. Lippincott Williams & Wilkns, Philadelphia. 470-480.
23. Medved Rand Medved V. (1976). To which limit values has the athlete's heart enlarged ? *J.Sports Med. Phys. Fit.* 16;138.
24. Musshoff. K and Reindall H.(1966) Zur unter scuchung des herzens in horizontaler und vertikaler korpestllung. *Dtch Med wschr.*81;1001.
25. Ohyabu. Y, Nakano. S, Matsungea. Y, Sato.N and Honda. Y. (1987). Cardiac silhouette in well trained Japanese judo athletes. *Int. J. sports Cardiol.* 41;43.
26. Olson B.A (1967). Effect of training on work capacities of women. M.A. Thesis.
27. Pannier JL, BeKaert. IE and Pannier R. (1982). Echocadriographic and radiographic study of cardiac dimensions in relation to aerobic work capacity. *J. Sports Med. Phys. Fit.*22; 165.
28. Reindall et.al. herz kerislauf Kran kheiten und Sports. (1974).. Volume and its relation to body weight in trained sportsman.*Durccsoy.F. J. Sports Med. Phys.Fit.* 14;178-182.

- 10  
cular  
452-  
hritte  
nders  
uring  
thetic  
logy,  
ed.3;  
, 1-5.  
ative  
) : 45-  
ation  
udies  
rition  
urged  
r und  
uette  
phic  
'hys.  
ation  
178-
29. Roher F.(1916) Volumbestimmung Von Und Organon auf arthodiagraphic chem.. Wege Gortschf. Roentgenstr. 24; 285.
30. RosKamm H.(1967). Optimal pattern of exercise for healthy adults. Can.Med.Ass.J.96; 895.
31. Rowland.T.W. (1985) Aerobic Response to Endurance Training in Prepubesent Children: A Critical Analysis. Med Sci SportsExerc, 17(5), 493-7.
32. Shephard RJ (1982) Physical activity and growth: Yearbook Medical Publishers: Chicago, 60.
33. Smith,M.L., Hudson,D.L., Graitzer, H.M.,& Raven,P.B. (1989) Exercise training bradycardia : the role of autonomic balance. Medicine and Science in Sports and Exercise,21,40-44.
34. Spina et.al (1992). Exercise training prevents decline in stroke volume during exercise in young healthy subjects. J.Appl.Physiol.72; 6:2458-2462.
35. Stein P.D,Lewinson H and Potts K.H. (1974) Cardiac size and left ventricular performance. J.Am.Med.Assoc.229; 1614-1620.
36. Tanaka et.al.(1985). Cardiac size and distance running performance. J. Sports Med. Phys.Fit.25;49.
37. Urhausen. A and Kindermann. W.(1992). Echocardiographic findings in strength and endurance trained athletes. Sports Med., 13:270- 284.
38. Vaccaro. P. and Mahon.A. (Sept-Oct 1987) Cardiorespiratory Response to Endurance Training in Children, J.Sports. Med, 4, 5, 352-63.
39. Winder *et.al.* (1978)The Course of Sympathoadrenal Adaption to Endurance Exercise Training in Man, J. Appl. Physiol 45,3 ,370-374.

## EFFECT OF PHYSICAL ACTIVITY AND AEROBIC FITNESS ON HEALTH RELATED PHYSICAL FITNESS VARIABLES OF OVER WEIGHT AND OBESE ADOLESCENCE

V.Ramesh\* P.K. Subramaniam\*\*

\*Ph.D Research Scholars, \*\*Head & Reader

Department of Physical Education and Sports, Pondicherry University

### ABSTRACT

The aim of this study was to determine the effect of physical activity and aerobic fitness on health related physical fitness variables of overweight and obese adolescence. The selected variable includes muscular endurance flexibility, cardiorespiratory endurance, and body composition (body mass index). In this study, the data contains thirty obese boys in the age groups of 12 to 15 years. The samples were collected form Tirunelveli district higher secondary schools. Experimental design was randomly selected and divided into two groups as control group and experimental group. The experimental groups were given physical activity and aerobic exercise for a period of twelve weeks, both morning and evening on five days a week. Control group did not participate in physical activity and aerobic exercise training programme. The collected data was statistically analyzed by using analysis of covariance (ANCOVA). The Experiment group had a significant Improvement on the health related physical fitness variables of overweight and obese children than the control group. The 'F' ratio value was statistically analyzed and tested for significant difference at 0.05 level of confidence.

**Key Words:** Muscular Endurance Flexibility, Cardiorispirtory, Body Mass Index

### Introduction

Obesity has become one of the most major health problems facing our nation today. Its prevalence in India is such that it is considered an epidemic that has a powerful, unfavorable impact on the well-being of our society. Obesity affects all aspects of a child's life. The largest part of obesity among children significantly contributes to poor health and negative social perception in society. Obesity is a condition where there is excessive

Indi  
depe  
bala  
equa  
perh  
chik  
prob  
chik  
wat  
phys  
that  
bod  
fite  
Hov  
thei  
et al  
Aer  
deli  
grea  
200  
orde  
dist  
touc  
the  
pro  
Boc  
am  
wat  
hun  
maj  
dep

deposition of fat as a result of over eating. Body weight is a fairly accurate index of energy balance in healthy adolescence. If the calories consumed by a healthy adolescence are equal to the needs then body weight is maintained at a fairly constant level. Obesity is perhaps the most prevalent form of malnutrition in developed countries both among school children and adolescents. Moreover, there is a misconception that obesity is primarily a problem in the affluent countries infact, it is found in all countries at an unreliable level. The children were doing what comes in nature enjoying life. Those children sitting passively in watching television for up to one third of their walking day, participating in less and less physical education as other curriculum pressure takes precedence, and mounting evidence that even our youngest children are becoming more obese (Reilly .et al., 1999). An excess body mass in children and adolescents may lead straight to a decrease in cardiorespiratory fitness, thereby increasing the risk of morbidity and mortality in adulthood (Cunnane, 1993). However that the aerobic exercise of overweight and obese youngsters are comparable to their non-obese counterparts after aerobic exercise in normal level of fat-free mass. (Elliot. et al., 1989).

### **Aerobic Fitness**

Aerobic fitness has been defined as the ability of the lungs, heart, and blood vessels to deliver adequate amount of oxygen and nutrients to the cell to meet the demand one of the greatest causes of death in the world is coronary heart disease (Vivian . and Hayward, 2006) Aerobic activities are incorporated throughout the physical education curriculum in order to improve. These activities include walking activities, jogging, running, jumping rope, distance swims, stationary bicycling, aerobic dance, step aerobic, basket ball, hand ball, touch football, or any other activities which utilize the large muscles of the legs and elevate the heart rate. Cardiovascular endurance is defined as the ability of the heart and lungs to provide an adequate supply of oxygen to the body over an extended period of time.

### **Body composition**

The body consists of several components of physical fitness, absolute and relative amounts of muscle, fat mass, lean muscle mass and skeletal bone mass and total body water. (Malina et.al., 2004) A study was conducted on fat is an essential component of the human body, critical in maintaining normal physiological functions and homeostasis. The majority of body fat is stored in adipose tissue in subcutaneous sites, although there is some deposited around vital organs to play a primarily protective role in the case of trauma.

While debate continues on the nature of the relationship between activity and fitness in children and adolescents, regular physical activity has been associated with greater cardiorespiratory fitness (Mirwald et.al., 1981 and Rowland 1996).

### **Overweight and obesity:**

Obesity is an excessive amount of body fat relative to body weight and is not synonymous with overweight. Overweight is defined as a body mass index between 25 and 29.9 kg/M<sup>2</sup>. The prevalence of overweight and obesity has reached epidemic proportions. Childhood obesity is also a global problem. The prevalence of children and adolescents 6-19 years at risk for weight (BMI=85<sup>th</sup>-95<sup>th</sup> Percentile) in range from 29% to 35% (Hedley, et. al, 2004). These studies have indicated that overweight in adolescence predicted a wide range of adverse health effects in adulthood that were independent of adult weight (Gunnell. et.al., 1998).

### **Methods and Procedures**

The purpose of the present study is to find out the effect of physical activity and aerobic fitness on health related physical fitness variables of overweight and obese adolescence. For this purpose 30 obese students were selected at random, Form Tirunelveli district higher secondary schools. They were in the age group of 12 to 15 years. They participated in this research voluntarily and cheerfully out with any compulsion. Muscular endurance was measured using modified set-ups, Cardio-respiratory endurance was measured using 12 minute run/walk, flexibility was measured with the reliable equipment sit and reach box. The body mass index was calculated by measuring the height and body weight of the subjects. The height was measured in meters by using a stadiometer and weight was measured in kilograms by using a weighing machine. In the experimental design the subjects were divided into two equal groups. One group was considered as experimental group and the other group was considered as control group, the experimental groups were given physical activity and aerobic fitness for a period of twelve weeks, both morning and evening on five days a week. Control group did not participate in the physical and aerobic exercise programme.

### **Data Analysis of Interpenetration Results**

The data collected from the control group and experimental group on health related physical fitness variables were statistically by using the analysis of covariance (ANCOVA) as statistical technique. The level of significance was fixed at 0.05 level of confidence was used in this study. Table-I. The table shows that following datas

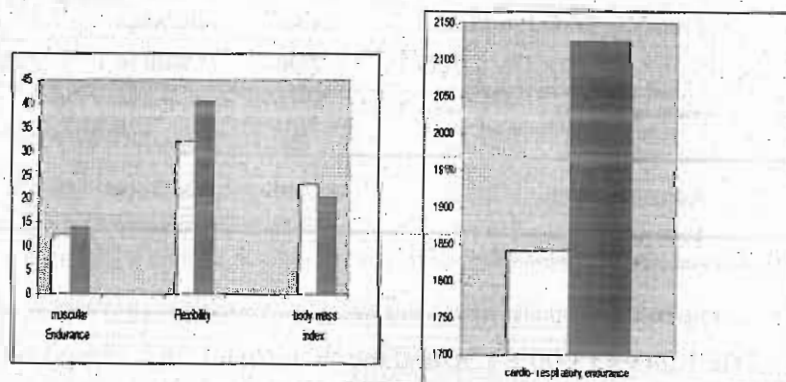
Means and Analysis of Covariance for the Pre-Test and Post Test Data on Muscular Strength, Muscular Endurance, Cardiorespiratory Endurance and Flexibility									
Variables	Test	Control	Experimental	Source of	Sum of	df	Mean	F ratio	
		group	group	variance	square		square		
Muscular endurance	Pre test	Mean	12.60	13.00	Between	2.133	1	2.133	1.262
		S.D	1.24	1.36	With in	47.33	28	1.690	
	Post test	Mean	12.60	14.07	Between	16.13	1	16.13	8.939*
		S.D	1.30	1.39	With in	50.53	28	1.81	
Flexibility	Adjusted	Mean	12.60	14.07	Between	7.01	1	7.01	15.218*
		Post test			With in	12.43	27	0.460	
	Pre test	Mean	34.73	35.133	Between	1.20	1	1.20	0.26
		S.D	6.55	7.03	With in	1294.67	28	46.24	
Post test	Mean	35.06	40.60	Between	229.63	1	229.6	4.63*	
	S.D	7.06	7.01	With in	1388.53	28	49.59		
Cardio-Respiratory Endurance	Adjusted	Mean	32.27	40.39	Between	196.75	1	196.75	154.4*
		Post test			With in	34.39	27	1.27	
	Pre test	Mean	1926.66	1873.33	Between	21333.3	1	21333.3	0.22
		S.D	263.13	357.50	With in	2758666.7	28	98523.81	
Post test	Mean	1866.66	2100.00	Between	408333.33	1	408333.33	4.60*	
	S.D	212.69	364.50	With in	2493333.3	28	89047.62		
Body Mass Index	Adjusted	Mean	1842.08	2124.58	Between	593968.95	1	593968.95	108.0*
		Post test			With in	148525.05	27	5500.92	
	Pre test	Mean	22.00	21.49	Between	1.37	1	1.37	0.341
		S.D	2.012	2.00	With in	112.00	28	4.00	
Post test	Mean	22.32	20.40	Between	27.65	1	27.65	7.964*	
	S.D	1.74	1.98	With in	97.20	28	3.5		
	Adjusted	Mean	23.32	20.40	Between	18.02	1	18.019	28.217*
	Post test			Within	17.241	27	0.639		

The Pre-test means of control group and experimental group on muscular endurance is  $12.60 \pm 1.24$  Vs  $13.00 \pm 1.36$  and the 'F' ratio is 1.262. The post-test means of control group and experimental group is  $12.60 \pm 1.30$  Vs  $14.07 \pm 1.39$  and the 'F' ratio is 8.939.



The adjusted post-test means of control group and experimental group is 12.60 Vs 14.07 and the 'F' ratio is 15.218. The results of the study indicate that there is a significant difference between the control group and experimental group on muscular endurance. The Pre- test means of control group and experimental group on flexibility is  $34.73 \pm 6.55$  Vs  $35.133 \pm 7.03$  and the 'F' ratio is 0.26. The post- test means of control group and experimental group is  $35.06 \pm 7.06$  Vs  $40.60 \pm 7.01$  and the 'F' ratio is 4.63. The adjusted post -test means of control group and experimental group is 32.27 Vs 40.39 and the 'F' ratio is 154.4. The results of the study indicate that there is a significant difference between control group and experimental group on flexibility. The Pre- test means of control group and experimental group on cardio- respiratory endurance is  $1926.66 \pm 263.13$  Vs  $1873.33 \pm 357.50$  and the 'F' ratio is 0.22. The post -test means of control group and experimental group is  $1866.66 \pm 212.69$  Vs  $2100.00 \pm 364.50$  and in the 'F' ratio is 4.60. The adjusted post- test means of control group and experimental group is 1842.80 Vs 2124.60 and the 'F' ratio is 108.0. The results of the study indicate that there is a significant difference between the control group and experimental group on cardio- respiratory endurance. The Pre- test means of control group and experimental group on body mass index is  $22.00 \pm 2.012$  Vs  $21.49 \pm 2.00$  and the 'F' ratio is 0.341. The post -test means of control group and experimental group is  $22.32 \pm 1.74$  Vs  $20.40 \pm 1.98$  and the 'F' ratio is 4.25. The adjusted post- test means of control group and experimental group is 23.32 Vs 20.40 and the 'F' ratio is 28.217. The results of the study indicate that there is a significant difference between control group and experimental group on body mass index.

#### Bar diagram for adjusted post test means for the Control Group and Experimental Group



#### Discus:

over rec  
related p  
physical  
weeks ir  
the regul  
the resu  
weeks o  
physical  
and box  
aerobic  
The evit  
adolesc  
have a  
other s  
(Freed  
aerobic  
fifty fiv  
physici  
trials a  
of activ  
**Conc**  
From t

related  
endur  
progra  
**Refer**

1. He  
K.



## Discussions and Findings

Overweight and obesity prevalence in children and adolescents has risen dramatically over recent decades (Magarey et.al., 2001). The results of the study specify that health related physical fitness changes improved significantly by their under going the selected physical activity and aerobic exercise practice. The study was conducted a period of twelve weeks involving fifteen subjects. The changes in the selected parameters were attributed to the regular practices of physical activity and aerobic exercise training programme. Specifically the results indicated significant increase in efficiency of selected variables during twelve weeks of training. Hence it was accepted at 0.05 level of confidence. The health related physical fitness variables of muscular endurance, flexibility, cardio-respiratory endurance, and body mass index were shown significant improvement through physical activity and aerobic exercise programme for the experimental group when compared with control group. The evidence based on research found that Greater energy expenditure in overweight obese adolescence may be particularly pertinent while considering that obese adolescence typically have a greater fat tree mass compared to non-obese adolescence, as reported here and in other studies (Davies et al., 1975, Rowland, 1991 and Maffeis et al., 1994,). A review (Freedson and Morrow, 1994) focusing on the relationship between physical activity and aerobic fitness among adolescents supports the outcomes of this study. They report that fifty five percentage of studies describe a small to more or less significant relationship between physical activity and aerobic fitness. These studies have indicated that both controlled trials and cross-sectional studies have indicated little but significant positive special effects of activity for both non- obese and obese adolescents (Baranowski, and Baror a 1994).

## Conclusions

From the analysis of above study the researcher made the following conclusion.

The experimental group has achieved significant development on selected Health related physical fitness variables of muscular endurance, flexibility, cardio-respiratory endurance, and body mass index in physical activity and aerobic exercise training programme for on twelve weeks training programme for reduction of obese adolescence.

## References

1. Hedley ,A.A., Ogden, C.I., Johnson , C.L., Carroll, M.D., Curtin;L,R., and Flegal, K.M.(2004) " Prevalence of Overweight and Obesity Among U.S. Children,

- Adolescents, and Adults". Journal of the American medical association 291 (23) pp 2847-2850.
2. Reilly, J.J., Dorostry, A.R. and Emmett, P.M.-(1999). Prevalence of Overweight and Obesity in British Children: Cohort Study. British Medical Journal, pp1019- 1039.
  3. Cunnana, S.C.(1993). Childhood Origins Of Lifestyle –Related Risk Factors for Coronary Heart Disease in Adulthood, Nutrition Health, 9 (2) pp107-115.
  4. Elliot, D.L., Goldberg, L., Kuehl, K.S. & Hanna, C. (1989). Metabolic Evaluation of Obese and Nonobese Siblings. Journal Pediatric 114(6) pp 957-962.
  5. Vivian .H. and Hayward, "Advanced Fitness Assessment And Exercise Prescription Human Kinetics, 5<sup>th</sup> Edition, (2006):pp104-109
  6. Malina, R.M., Bouchard, C. and Bar-Or, O. (2004). Growth, Maturation and Physical Activity. Champaign, Illinois, Human Kinetics.
  7. Mirwald, R.L., Bailey, D.A., Carmeron, N. and ramussen, R.L. (1981). Longitudinal Comparison of Aerobic Power in Active and Inactive Boys Aged 7 To 17 Years. Annals Human Biology 8(5) pp 405-414.
  8. Rowland, T., Miller, J., Vanderburgh, P., Goff, D., Martel, J.L. and Ferrone, L. (2000). Cardiovascular Fitness in Premenarcheal Girl and Young Women. International Journal of Sports Medicine. 21(3) p117-121.
  9. Bar-Or, O. and Baranowski, T. (1994). Physical Activity, Adiposity and Obesity among Adolescents. Pediatric Exercise Science, (6), pp 348-360.
  10. Gunnell, D.J., Frankal, S.J., Nanchahal, K., Peters, T.J. and Davey-Smith, G. (1998). Childhood Obesity and Adult Cardiovascular Mortality: A 57-Y Follow-Up Study Based On the Boyd-Orr Cohort. American Journal of Clinical Nutrition, (67) pp1111-1118.

\*Lect  
Depar  
Annar

on s  
unive  
of fif  
rand  
a per  
the tr  
spee  
both  
ANC  
that  
contr

**Intr**

Int  
short  
relati  
inten  
dicta  
comj  
Rest

## ANALYSIS OF INTERVAL TRAINING ON SPEED AND SPEED ENDURANCE OF UNIVERSITY WOMEN PLAYERS

K.Palanisamy\* M.Rajashekaran\*\* P.Kulothungan\*

\*Lecturer, \*\*Reader

Department of Physical Education and Sports Sciences  
Annamalai University, Annamalai Nagar, Tamilnadu

### ABSTRACT

*The study was designed to investigate the effect of interval training on speed and speed endurance of university women players. Thirty women university players were selected as subjects and segregated into two groups of fifteen subjects each as experimental group and control group following random procedure. The experimental group underwent interval training over a period of twelve weeks where as control group did not participate in any of the training except their regular activities as per the curriculum. Speed and speed endurance were assessed before and after the experimental period for both the groups by using 50 meters and 110 meters dashes respectively. ANCOVA was used to analyze the collected data. The results of this study showed that there was a significant difference between interval training group and control group on speed and speed endurance.*

### **Introduction**

Interval training can be best described as bouts of exercise interspersed with short rest intervals. It is based on the concept that more work can be completed relatively at a higher intensity compared to continuous-type of training. The intensity and duration of the work intervals and the length of the rest periods dictates the training response. Very short, all-out bouts of work coupled with complete recovery periods are used for speed and speed endurance development. Rest intervals are a critical component of the interval training program. For

sports such as basketball, handball, soccer, hockey, tennis, and so on, interval training may be more appropriate than continuous running because it can increase aerobic power without the associated detrimental effects on anaerobic power. Speed endurance training should form the later part of pre-season training and in-season training. It is important to develop a solid fitness base beforehand, which includes strength and endurance conditioning.

### Methodology

To achieve this purpose, thirty women university players from the Department of Physical Education and Sports Sciences, Annamalai University, studying on various classes were randomly selected as subjects. Their age ranged between 19 and 22 years. They were divided into two equal groups and each group consisted of 15 subjects. Group I underwent interval training for three days per week for twelve weeks and Group II acted as control and did not participate in any special training apart from the regular curricular activities. Speed and Speed endurance were selected as criterion variables. These variables were assessed before and immediately after the training period for both the groups by administering 50 meters and 110 meters dashes respectively. The collected data were statistically analyzed for significant difference, if any, by applying ANCOVA. In all cases 0.05 level was fixed as confidence interval to test the significance.

### Results and Discussion

TABLE-I  
SUMMARY OF ADJUSTED POST TEST SCORES ON SPEED  
OF EXPERIMENTAL AND CONTROL GROUPS.

Variables	Experimental Group	Control Group	Sum of Square	Df	Mean Square	'F' ratio
Speed	8.45	8.60	B 0.175 W 0.175	1 27	0.152 0.006	0.94*

\* Significant .05 level of confidence The table values required for significance with df 1 and 27 is 4.21

F  
test mea  
and 8.60  
mean of  
table va  
The resu  
the inter  
training

Varial  
Speed  
Endur

\* Signific  
is 4.21

test me:  
and 18.  
mean o  
table va  
The res  
Endura  
experir

for fev  
used to  
re synt  
the bes  
time ta

From the above table-I, it is observed that the F-ratio of adjusted post-test mean value of speed for interval training group and control group was 8.45 and 8.60 respectively. The obtained F ratio of 30.94 for the adjusted post test mean of interval training group and control group were greater than the required table value of 4.21 for significance with df 1 and 27 at 0.05 level of confidence. The results of this study showed that there was a significant increase in Speed for the interval training group as compared control group after the experimental training period.

**TABLE -II**  
**SUMMARY OF ADJUSTED POST TEST SCORES ON**  
**SPEED ENDURANCE OF EXPERIMENTAL AND**  
**CONTROL GROUPS**

Variables	Experimental Group	Control Group	Sum of Square	Df	Mean Square	'F' ratio
Speed	18.07	18.21	B 0.134		0.134	
Endurance			W 0.190	27	0.007	19.01*

\* Significant at .05 level of confidence The table value required for significance with df 1 and 27 is 4.21

From the above table-II, it is observed that the F-ratio of adjusted post-test mean value of speed for interval training group and control group was 18.07 and 18.21 respectively. The obtained F ratio of 19.01 for the adjusted post test mean of interval training group and control group were greater than the required table value of 4.21 for significance with df 1 and 27 at 0.05 level of confidence. The results of this study showed that there was a significant increase in Speed Endurance for the interval training group as compared control group after the experimental training period.

Speed and Speed Endurance are anaerobic activities. Any activities lasts for few seconds requires thirty seconds of recovery resynthesis 70% of ATP used to perform that event. A recovery of two minutes is sufficient to relatively re synthesis the most of the exhausted energy. Hence interval training is one of the best methods to develop anaerobic power. In the present study the average time taken to perform Speed and Speed endurance of Experimental group were

.45 and 18.07 seconds respectively. It relies more on ATP-CP System and can be developed through interval training .Hence interval training is the best suited for women players to improve the Speed and Speed endurance.

According to Johnson(1971) the interval training are highly effective in improving running performance. These findings are also agreement with the findings of *Billat, L. (2001)*, Ekblom B (1986) as the interval training showed as significant improvement of the performance of speed. Hence it was concluded from the results of the study and above literature the interval training programme has enhanced the performance of criterion variables such as speed and speed endurance.

### References

1. Bangsbo, J (1999) Preparing for the World Cup in soccer, *Science & sports (Paris)*; 14 (5). P.220-226
2. *Billat, L. Veronique, (2001), Interval Training for Performance, Sports Medicine. 31(1):13-31*
3. Ekblom B (1986), Applied physiology of soccer. *Sports Med*;3(1):50-60
4. James Hareman Johnson, (March 1971), "A Comparison of Slow Continuous Running, Interval Running and Pace Training Methods on Running Performance", *Dissertation Abstracts International*, 31: 9, 4523.
5. Stepto NK, Hawley JA, Dennis SC, Hopkins WG, (1999) Effects of Different Interval-Training Programs on Cycling Time-Trial Performance. *Medicine Science Sports Exercise.* ;31(5):736-41.
6. Viru A. (1995) Adaptations in sports training. Boca Raton, FL: CRC Press.

P. De

\* Ph.D  
Depa  
Anna

train  
volu  
grou  
each  
train  
grou  
stud  
peri  
rese  
sign  
on s  
was  
the  
pos  
tra  
anc

**EFFECT OF AEROBIC CROSS TRAINING AND AEROBIC  
TRAINING ON INSPIRATORY AND EXPIRATORY  
RESERVE VOLUME**

**P. Degaleesan\*, P. Kulothungan\*\*,<sup>1</sup> M. Rajasekaran\*\*\***

\* Ph.D. Scholar, \*\*Assistant Professor, \*\*\*Associate Professor  
Department of Physical Education and Sports Sciences  
Annamalai University, Tamilnadu

**ABSTRACT**

The purpose of the present study was to find the effect of aerobic cross training and aerobic training on inspiratory reserve volume and expiratory reserve volume. For this purpose, thirty subjects studying bachelor degree in the age group of 19 – 21 years were selected. They were divided into three equal groups, each group consisted of ten subjects, in which group – I underwent aerobic cross training, group – II underwent aerobic training and group – III acted as control group who did not participate in any special training. The training period for this study was three days in a week for twelve weeks. Prior to and after the training period the subjects were tested for inspiratory reserve volume and expiratory reserve volume. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, among the experimental groups and control group on selected criterion variable separately. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as an appropriate. Since there was three groups were involved in this study, the Scheffe'S test was used as post-hoc test. It was concluded after the aerobic cross training and aerobic training, that training groups have increased the level of inspiratory reserve volume and expiratory reserve volume significantly.

Key words: Aerobic cross training, Aerobic training, Inspiratory reserve volume, Expiratory reserve volume

## Introduction

Fitness has been defined as how well a person is adapted to and capable of living a certain lifestyle. The athlete obviously has greater fitness than the non athlete because of his training for a chosen event or events. The goal of most athletes is to become stronger, improve performance, and avoid injuries. It is difficult to achieve all of these goals by training in one sport alone.

Training is a programme of exercise designed to improve the skills and to increase the energy capacity of an athlete for a particular event, therefore training is essential for the development of physical fitness components (William and Sperry, 1976).

Physical training brings about changes in the muscles, improved neuromuscular co-ordination activities and a series of more general cardio-respiratory. Such as O<sub>2</sub> diffusion, O<sub>2</sub> uptake and respiratory volume (Lang 1971).

Aerobic exercise refers to exercise that involves oxygen consumption by the body. Aerobic means 'with oxygen' and refers to the use of oxygen in the body's metabolic or energy generating process. Many types of exercise are aerobic and are performed at moderate levels of intensity for extended periods of time. To obtain the best results, an aerobic exercise session involves a warming up period, followed by at least 20 minutes moderate to intense exercise involving large muscle groups, and a cooling down period at the end. (www.wikipedia)

Aerobics refers to a "variety of exercises that stimulate heart and lung activity for a time period sufficiently long to produce beneficial changes in the body". Aerobics or endurance exercises are those in which large muscle groups are used in rhythmic repetitive fashion for prolonged periods of time.

The concept of cross training is a relatively recent athletic application, in which a training regime includes the use of one distinct athletic discipline to build skills of fitness in another. Cross training is not the same as running. However

Eyestor  
intensit  
5 miles

1  
few scie  
that son  
from or  
noticea

## Metho

and 21  
divided  
10) unc  
10) anc  
volume  
data we  
after th

cycling  
For bot  
60% T.

Where

RHR =

Howev



Eyestone found that if the athletic performs cross training at high levels of intensity for one hour the same aerobic benefits will be obtained as running for 5 miles. (Eyestone 2008)

Numerous anecdotal reports claiming benefits for cross training, very few scientific studies have investigated this particular type of training. It appears that some transfer of training effects on maximum oxygen take ( $VO_2$  max) exists from one mode to another. The nonspecific training effects seem to be more noticeable when running is performed as a cross training mode.

### Methods:

To achieve the purpose, thirty college aged male subjects, between 19 and 21 years (mean age = 20 years  $\pm$  0.8 months) were randomly selected and divided into three equal groups of ten subjects each, out of which group – I (n = 10) underwent aerobic cross training, group – II underwent aerobic training (n = 10) and group - III (n = 10) remained as control. Data on inspiratory reserve volume and expiratory reserve volume, were collected by wetspirometer. The data were collected one day prior to the commencement of training and one day after the training.

The experimental groups underwent aerobic cross training (Swimming, cycling) and aerobic training (running) for three days per week for twelve weeks. For both experimental group, training load was fixed by Karvonen method

$60\% \text{ THR} = [0.60 \times \text{HRR}] + \text{RHR}$ .

Where, 
$$\frac{\text{HRR}}{(\text{Heart rate reserve})} = \frac{\text{HR MAX}}{(\text{maximal heart rate})} - \frac{\text{HR Rest}}{(\text{Resting heart rate})}$$

RHR = Resting heart rate

However overload principles was also adopted

**Table-I : Acrobic and Acrobic cross training**

Weeks	Aerobic Cross Training(%)	Aerobic Training(%)
1,2,3	65	65
4,5,6	70	70
7,8,9	75	75
10,11,12	80	80

The analysis of covariance (ANCOVA) was used to find out the significant difference if any, among the experimental groups and control group on selected criterion variables separately. In all the cases, .05 level of confidence was fixed to test the significance, which was considered as appropriate. Since three groups were involved in this study, the Scheffe's test was used as post-hoc test.

## Results

**Table – II - Adjusted post test value and F value of selected criterion variables**

Variables	Aerobic Cross Training group	Aerobic training group	Contro group	Source of variance	Sum of squares	df	Means square	'F' Ratio
Inspiratory Reserve Volume	2.70	2.68	2.63	Between	0.02	2	0.010	
					0.002	26	0.000076	37.98*
Expiratory	2.745	2.689	2.58	Between	0.140	2	0.070	331.45*

\* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with 2 and 26 was 3.37).

Va

In

Re

vo

Ex

Re

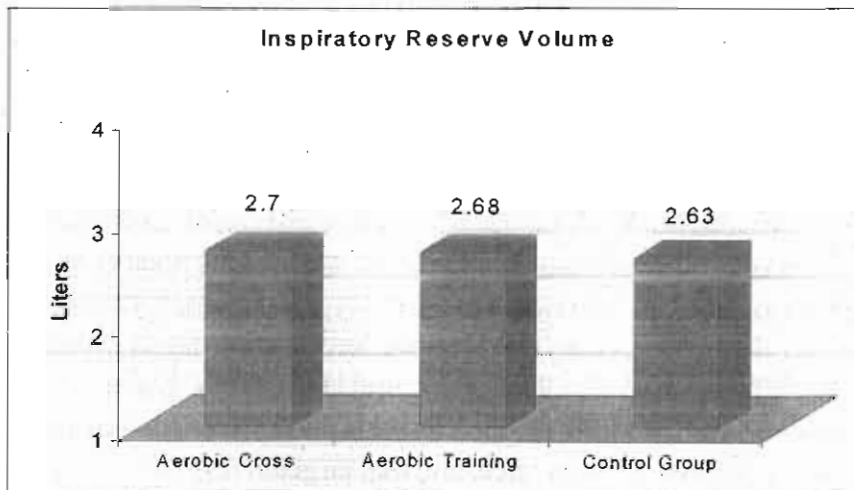
vo

**Table – III – Scheff’S Test for the Difference between the Adjusted Post-Test Mean of Selected Criterion Variables**

Variables	Aerobic cross VS Aerobic Training	Aerobic cross VS Control	Aerobic Training VS control	Confidence interval level at .05
Inspiratory Reserve volume	0.02*	0.07*	0.05*	0.012
Expiratory Reserve volume	0.056*	0.164*	0.108*	0.019

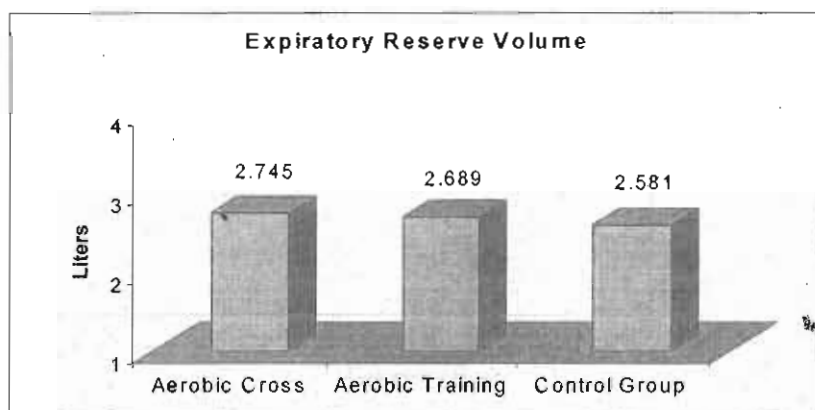
**Figure-1**

The adjusted post test mean values of aerobic cross training aerobic training and control group on Inspiratory reserve volume



**Figure-2**

**The adjusted post test mean values of aerobic cross training aerobic training and control group on Expiratory reserve volume**



The result of this study showed that there was a significant difference between the aerobic cross training, aerobic training and control groups on inspiratory reserve volume and expiratory reserve volume. Among the training aerobic cross training has better effect inspiratory reserve volume and Expiratory reserve volume.

### Discussion:

The result of the study reveal that there was a significant changes after the aerobic cross training and aerobic training in inspiratory reserve volume (Hass, 1987; Fabio et al 2010). The results of the study reveal that there was a significant changes after the aerobic cross training and aerobic training in expiratory reserve volume (Nicholas S. Hill, Cynthia Jacoby and Harrison W. Farber, 1991). Results from this study indicate that respiratory muscle fatigue is a limiting factor for underwater swimming performance, and that targeted respiratory muscle training

(PRMI  
perform  
study sl  
has inc

**Concl**

cross t  
volum  
the be  
volum

**Refer**

1. Eye
2. Fal  
aer  
net
3. Ha  
Ex
4. La  
Or
5. Ni  
Er  
an
6. UI  
Pl
7. W  
A
8. w

(PRMT > ERMT) improves respiratory muscle and underwater swimming performance (Uli A. Wylegala, David R. Pendergast, *et al.*). The findings of this study showed that the inspiratory reserve volume and expiratory reserve volume has increased due to the aerobic cross training and aerobic training.

### Conclusion:

From the results and limitations of the study was concluded that aerobic cross training and aerobic training will be given to improve inspiratory reserve volume and expiratory reserve volume. However aerobic cross training will be the best method to improve inspiratory reserve volume and expiratory reserve volume.

### References

1. **Eyestone**, Ed "Training Workout" Runner's world. March 2008..
2. **Fabio Esposito** et al. "Effect of respiratory muscle training on maximum aerobic power in normoxia and hypoxia", *Respiratory physiology and neurobiology* 170:3 (2010) p.268-272
3. **Hass F.E. et al**, "Effect of Aerobic Training on Forced Expiratory Airflow in Exercising Asthmatic Humans", *J Appl Physiol*, 63:3, (1987), 1230 – 1235.
4. **Lange K. Anderson**, *Fundamentals of Exercise Testing*, (Geneva: World Health Organization, 1971), p. 251,
5. **Nicholas S. Hill**, Cynthia Jacoby and Harrison W. Farber, "Effect of an Endurance Triathlon on Pulmonary Function", *Medicine and Science in Sports and Exercise*, 23:11, (1991), 1260 – 1264.
6. **Uli A. Wylegala**, David R. Pendergast, et al. *European Journal of Applied Physiology*, 2007, Volume 99, Number 4, P. 393-404.
7. **William J.C.P** and Sperry P.N (1976), *Sports Medicine*, London; Edward Arnold Publishers Ltd., P-8.
8. **www.wikipedia**

## BODY COMPOSITION OF ATHLETES OF INDIVIDUAL SPORTS

Manohar Lal\*, Y. P. Sharma\*\*, Hari Singh\*\*\*, Surishtha Devi\*\*\*\*

\*Assistant professor, Khalsa College of Physical Education, V.P.O. Heir, Amritsar (Punjab)

\*\* D. S. W. Himachal Pradesh University, Shimla (H.P).

\*\*Assistant Professor, Deptt. of Physical Education Himachal Pradesh University Shimla (H.P)

\*\*\*\*Assistant professor, Guru Gobind Singh College of Education (for women), Gidderbaha, Distt. Muktsar (Punjab)

### ABSTRACT

The present investigation has been conducted on 250 athletes with an aim to find out differences in body composition among the five individual sports namely athletics, boxing, judo, weight lifting and wrestling. The data for the present study were collected during the various inter colleges of Himachal Pradesh University in the session 2008-2009. Each athlete was tested for various anthropometric measurements necessary for estimation of bone mass, muscle mass and body fat percentage. The muscle and bone masses of each athlete have been estimated using Matiegka's (1921) method. Body density has been estimated by using Durnin and Womersley's (1974) equation. Further body fat percentage has been estimated by using formula devised by Brozek et al (1963). Analysis of variance (ANOVA) was used to find out significant difference among the athletes of individual sports. In case of any significance of mean difference, Scheffee's post hoc 't' test was applied for further analysis. From the findings, among the athletes of individual sports studied for this investigation, judokas have maximum average bone development (10.24 Kg) and track & field athletes have the lowest with (9.81 kg). Highest muscle development has been found with weight lifters (31.75 kg) and track & field athletes were the least muscle developed athletes with (28.39 kg) among the athletes of individual sports. Weight lifters have shown the highest fat possession (15.30%) and the track & field athletes with lowest fat percentage (11.13 %) among the athletes of individual sports.

**Key words:** Bone mass, muscle mass, fat percentage & individual sports

### Introduction

Studies of body composition in certain sports indicated that athletes who were very lean but heavy because of a well-developed musculature were superior in performance in certain competitive sports activities, such as football, weight lifting and shot put (Bullen, 1971).

India  
Athl  
shoul  
is mir  
borde  
comf  
dista  
Optir  
whicl  
perm  
fat is  
From  
the d  
infor  
used  
the c  
**Met**  
To a  
boxi  
in th  
were  
year  
estir  
mea  
wris  
at bi  
one  
and  
The  
Fur  
test  
box  
of a  
gro

**Athletes** : competing in weight classified sports (e.g. rowing, boxing, wrestling, Judo) should theoretically be more competitive when their muscle weight is maximum and fatness is minimum for a given weight classification. Hence 'over fat' athletes hovering on there-fore borderline of a particular weight category. may have the opportunity of losing fat and there competing in a more appropriate weight category (Neil P.C. 1991). On the other, long-distance swimming, water polo and synchronized swimming are sports where certain 'Optimal' level of body fat is required. The low density of fat gives it buoyancy characteristics, which is advantageous in their respected sports. The data obtain from champion performers permit as to speculate that the highly trained runners may achieve greater success if his body fat is less than 5% of body weight (Costill, 1981).

From these examples, it is evident that the examination of body composition, which includes the determination of muscle, bone and fat weight among athletes, is very essential. The information collected on athletes of individual sports of Himachal Pradesh University can be used for monitoring the training programs as well as counseling, providing information about the choice for a particular sport.

### **Methodology**

To achieve the purpose of this study 250 athletes of individual sports i.e. athletics (n=50), boxing (n=50), judo (n=50), weight- lifting (n=50) and wrestling (n=50), who participated in the various inter colleges of Himachal Pradesh University during the session 2008-2009 were randomly selected and used as subjects in this study. Age group ranged from 18-25 years. . Each athlete was tested for various anthropometric measurements necessary for estimations of bone mass, muscle mass and body fat percentage. A set of anthropometric measurements, which included height, body weight, bicondylar widths of humerus, femur, wrist and ankle, the circumference of upper arm, forearm, thigh and calf and the skin folds at biceps, triceps, forearm, thigh, calf (medial), supra-iliac and subscapular sites were taken on each subject by following standard technique of Heath and Carter (1967). The muscle and bone masses of each athlete have been estimated using Matiegka's (1921) method. The body density has been estimated by using Durnin and Womersley's (1974) equation. Further body fat has been estimated by using formula devised by Brozek et al 1963). To test the significance of mean difference among the athletes of individual sports namely athletics, boxing, judo, weight lifting and wrestling, analysis of variance (ANOVA) was used. In case of any significance of mean difference on the criterion measure to find out which pair of group was better among the other, the Scheffee's post-hoc 't' test was applied.

## Estimation of Body Composition

### 1. Percentage Body Fat:

For the estimation of body fat the body density can be calculated with the help of Durnin and Womersley (1974)

- a. Formula for male (17-19 years)

Body density =  $1.1620 - 0.0630 \log (\text{Biceps} + \text{Triceps} + \text{Sub Scapular} + \text{Supra Illiac skinfold})$

- b. Formula for male (20-29 years)

Body density =  $1.1631 - 0.0632 \log (\text{Biceps} + \text{Triceps} + \text{Sub Scapular} + \text{Supra Illiac skinfold})$

Body density, thus calculated was converted into % body fat by following equation devised by Brozek et al. (1963) method.

$$\text{Percentage Body Fat} = \left( \frac{4.57}{\text{Body Density}} - 4.142 \right) \times 100$$

### Body composition of athletes of individual sports

#### 2. Bone Mass:

Bone mass can be calculated from the bony diameters viz. humerus bicondylar diameter, femur bicondylar diameter, wrist diameter and ankle diameter by using the formula by Matiegka (1921).

$$O = 0^2 \times L \times K_1 / 1000$$

Where  $K_1$  (constant) = 1.2

$$L = \text{Height (cm)}$$

$$O = (O_1 + O_2 + O_3 + O_4) / 4$$

Where  $O_1, O_2, O_3$  and  $O_4$  representing maximum transverse diameter of humeral bicondylar diameter, wrist diameter, femur bicondylar diameter and ankle diameter (in cm) respectively.

#### 3. Muscle Mass:

Muscle mass has been calculated by Matiegka method (1921)

$$M = r^2 \times L \times K_2 / 1000$$

Where  $L$  = Height in cm

$$K_2 = 6.5 \text{ Constant}$$

$$r = (r_1 + r_2 + r_3 + r_4) / 4$$

Where  $r_1$  = Corrected radius of upper arm (flexed)

$r_2$  = Corrected radius of fore arm

$r_3$  = Corrected radius of medial thigh

$$\frac{C}{2\pi} \frac{1}{2}$$

### Result

The data were presented

### Body composition

#### Table 1

#### muscle mass

#### Parameters

Age

Height

Weight

Bone Mass

Muscle Mass

Fat

Percentage

Table

age, height, weight, sports were (yrs).

field

lifter



$$r_4 = \frac{C}{2\pi} - \frac{1}{2} \left( \frac{\text{Skinfold}}{10} \right)$$

Corrected radius =

### Result & Discussion

The data collected by adopting above procedure were statistically analyzed. The results were presented in the following table.

#### Body composition of athletes of individual sports

**Table I: Mean, standard deviation and F values of age, height, weight, bone mass, muscle mass and fat percentage among the athletes of individual sports**

Parameters	Athletics (N=50)	Boxing (N=50)	Judo (N=50)	Wt- Lifting (N=50)	Wrestling (N=50)	F value
	Mean± S.D	Mean± S.D	Mean± S.D	Mean± S.D	Mean± S.D	
Age	19.84 ± 1.80	20.38 ± 1.51	20.5 ± 1.68	19.8 ± 1.43	19.58 ± 1.18	3.37*
Height	171.84 ± 6.95	170.72 ± 7.81	169.96 ± 7.50	168.72 ± 6.01	169.26 ± 5.99	1.58
Weight	58.94 ± 7.29	61.14 ± 10.70	68.66 ± 13.33	67.11 ± 11.90	64.02 ± 10.81	7.28**
Bone Mass	9.81 ± 1.07	10.05 ± 1.27	10.24 ± 1.39	9.99 ± 1.29	10.19 ± 1.88	.75
Muscle Mass	28.39 ± 3.59	29.57 ± 5.47	31.19 ± 5.13	31.57 ± 4.48	29.90 ± 4.93	3.64*
Fat Percentage	11.13 ± 3.16	11.35 ± 3.43	14.15 ± 5.65	15.30 ± 4.37	11.66 ± 4.04	10.01**

\* Significant at .05 level; \*\* Significant at .01 level

Table I represents the comparison of mean, standard deviation and level of significance of age, height, weight, bone mass, muscle mass and fat percentage among athletes of individual sports. Wrestlers were found to be the youngest with average age of (19.58 yrs) and judokas were found to be oldest among the athletes of individual sports with average age of (20.5 yrs). The difference was found to be statistically significant, at the level of  $P < .05$ . Track & field athletes were tallest among all athletes with average height (171.84 cm) and the weight lifters were the shortest athletes with (168.72 cm). The difference was found to statistically

insignificant. Judokas were heaviest among all athletes with average weight (68.66 kg) and the track & field athletes were the lightest athletes with (58.94 kg), and difference was found to be statistically significant, at the level of  $P < .01$ . Judokas have maximum average bone development (10.24 kg) and track & field athletes have the lowest with (9.81 kg), and difference was found insignificant. Highest muscle development has been found with weight lifters (31.75 kg) and track & field athletes were the least muscle developed athletes with (28.39 kg) among the athletes of individual sports. The difference was found to be statistically significant, at the level of  $P < .05$ . Weight lifters have shown the highest fat possession (15.30%) and the track & field athletes with lowest fat percentage (11.13 %) among the athletes of individual sports. The difference was found to be statistically significant, at the level of  $P < .01$ .

### Body composition of athletes of individual sports

**Table II: Post-hoc 't' values of age, weight, muscle mass and fat percentage among athletes of individual sports**

Parameters	t value									
	Ath Vs Box	Ath Vs Judo	Ath Vs WL	Ath Vs Wrs	Box Vs Judo	Box Vs WL	Box Vs Wrs	Judo Vs WL	Judo Vs Wrs	WL Vs Wrs
Age	1.76	2.15*	.13	.85	.39	1.89	2.61*	2.28*	3.0**	.72
Weight	.95	4.20**	3.53**	2.22*	3.24**	2.57*	1.26	.67	1.98	1.31
Muscle Mass	1.22	2.94**	3.34**	1.58	1.72	2.12*	.36	.40	1.36	1.76
Fat Percentage	.26	3.58**	4.95**	.64	3.32**	4.69**	.37	1.37	2.95**	4.32*

Ath - Athletics, Box- Boxing, WL-Weight Lifting, Wrs- Wrestling

\* Significant at .05 level; \*\* Significant at .01 level

From table II, it was observed that there was a significant mean difference between the judokas and wrestlers ( $t=3.0$ ;  $p < .01$ ), having the maximum value followed by boxers and wrestlers ( $t=2.61$ ;  $p < .05$ ), judokas and weight lifters ( $t=2.28$ ;  $p < .05$ ), and then the track & field athletes and judokas ( $t=2.15$ ;  $p < .05$ ), in age, but insignificant mean difference was observed between boxers and weight lifters, followed by track & field athletes and boxers, track & field athletes and wrestlers, weight lifters and wrestlers, boxers and judokas and then track & field athletes and weight lifters. In body weight, it was clearly noticed that there was significant mean difference between track & field athletes and judokas ( $t=4.20$ ;  $p <$

g) and  
e was  
verage  
1 kg),  
d with  
hletes  
l to be  
est fat  
13 %)  
ficant,

mong

WL
Vs
Wrs
*.72
1.31
1.76
4.32*

en the  
's and  
track  
e was  
xers.  
is and  
there  
0; p<

.01), having the maximum value followed by track & field athletes and weight lifters (t=3.53; p<.01), boxers and judokas (t=3.24; p<.01), boxers and weight lifters (t=2.57; p<.05) and then the track & field athletes and wrestlers (t=2.22; p<.05), but insignificant mean difference was observed between judokas and wrestlers, followed by weight lifters and wrestlers, boxers and wrestlers, track & field athletes and boxers, and then judokas and weight lifters. In muscle mass, there was significant mean difference between the track & field athletes and weight lifters (t=3.34; p<.01), having the maximum value followed by track & field athletes and judokas (t=2.94; p<.01) and then the boxers and weight lifters (t=2.12; p<.05), but insignificant mean difference was observed between weight lifters and wrestlers, followed by boxers and judokas, track and field athletes and wrestlers, judokas and wrestlers, track & field athletes and boxers, judokas and weight lifters and then boxers and wrestlers. In fat percentage, there was significant mean difference between the track & field athletes and weight lifters (t=4.95; p<.01), having the maximum value followed by boxers and weight lifters (t=4.69; p<.01), weight lifters and wrestlers (t=4.32; p<.01), track & field athletes and judokas (t=3.58; p<.01), boxers and judokas (t=3.32; p<.01) and then judokas and wrestlers (t=2.95; p<.01), but insignificant mean difference was observed between judokas and weight lifters, followed by track & field athletes and wrestlers, boxers and wrestlers and then track & field athletes and boxers.

**Discussion**

The results of the present investigation indicated that judokas were oldest and wrestlers were youngest among the athletes of individual sports. There was significant difference among the athletes of individual sports in age. Further, on applying post hoc t test, it was found that judokas were significantly older than track & field athletes, weight lifters and wrestlers, respectively, and boxers were significantly older than wrestlers.

Track & field athletes were tallest and weight lifters were shortest among the athletes of individual sports. Kaur (2000) also reported that track & field athletes were tallest among the individual game players. However there was no significant difference among the athletes of individual sports in height. This indicates that individual sports athletes were of almost similar in height.

Judokas were heaviest and track & field athletes were lightest among the athletes of individual sports. The result of Kaur (2000) did not correspond with the results of present

study. Kaur was of view that track & field athletes were heavier than other groups. There was significant difference among the athletes of individual sports in weight. Further, on applying post hoc 't' test, it was found that judokas were significantly heavier than track & field athletes, boxers and wrestlers, respectively. Weight lifters were significantly heavier than track & field athletes and boxers, respectively. Similarly, wrestlers were significantly heavier than track & field athletes.

Judokas have maximum bone development and track & field athletes have the lowest. Highest muscle development has been found with weight lifters and track & field athletes were the least muscle developed athletes among the athletes of individual sports. Weight lifters have shown the highest fat possession and the track & field athletes shown lowest fat percentage among the athletes of individual sports. There was significant difference among the athletes of individual sports in muscle mass and body fat percentage and do not show significant differences in bone mass. Present study have shown same results as found by Sharma and Shukla (1997). Further, on applying post hoc 't' test for muscle mass, it was found that weight lifters possessed significantly greater muscle mass than track & field athletes and boxers, respectively. Similarly, judokas were significantly better in muscle mass than track & field athletes. For fat percentage, it was found that weight lifters possessed significantly greater fat percentage than track & field athletes, judokas and wrestlers, respectively. Similarly, boxers also possessed significantly greater fat percentage than track & field athletes and judokas, respectively.

### Conclusion

Among athletes of individual sports studied for this investigation, wrestlers were found to be youngest (19.58 yrs) and judokas were oldest (20.5 yrs) among the athletes of individual sports. In case of height and weight, the track & field athletes were tallest (171.84 cm) and lightest (58.94 kg), and weight lifters (168.72 cm) and judokas (68.66 kg) were shortest and heaviest, respectively among the athletes of individual sports. Judokas have maximum average bone development (10.24 Kg) and track & field athletes have the lowest with (9.81 kg). Highest muscle development has been found with weight lifters (31.75 kg) and track & field athletes were the least muscle developed athletes with (28.39 kg) among the athletes of individual sports. Weight lifters have shown the highest fat possession (15.30%) and the track & field athletes with lowest fat percentage (11.13 %) among the athletes of individual sports. Statistically, it has been observed that athletes of individual sports differ significantly from each other in age, weight, muscle mass and body fat percentage.

Refer  
Brozo

Bulle  
The  
Costi  
Public  
Craig  
Adva  
Durn  
and it  
aged  
Heat  
Joun  
Kaur

Mati  
Shar  
and

**References**

- Brozek, J.E, Granda, J.T, Anderson and Keys, A. (1963): Densitometric analysis of body composition revision of some qualitative assumptions, A.M.N.Y. Acad. Sci., 110: 113-140.
- Bullen, B.A. (1971). Overweight: In Encyclopedia of Sports Sciences and Medicine. The Macmillan Company New York.
- Costill, D.L. (1981): Scientific approach to distance running, Track and Field News Publication: pp. 10-40.
- Craig, N.P. (1991): Measuring body physique and composition. In better coaching, Advanced coach's Manual. Us. PP. 34
- Durnin, J.V.G. A. and Womersley, J. (1974): Body fat assessed from total body density and its estimation from skinfold thickness measurements on 481 men & women aged 16-72 years. Brit. J. Nutr. 32: 77-97.
- Heath, B. H. and Carter, J. E. L. 1967. A modified somatotype method. American Journal of Physical Anthropometry, 27, 57-74.
- Kaur, Navjeet. A comparative study of SAI trainers of team and individual games in relation to somatotypes and psychosocial variables unpublished Ph.d Thesis submitted to Punjabi University, Patiala. (2000).
- Matiegka, J (1921): The testing of physical efficiency, Hm. J. Phys. Anthropol., 4, 233.
- Sharma, S. S. and Shukla, N.B. Comparative study of body composition among individual and team games. Indian Journal of Sports Studies, Vol. 2 (1): (1997)

## EFFECT OF PLYOMETRIC TRAINING ON SELECTED BIOMOTOR ABILITIES AMONG FOOTBALL PLAYERS

S. Manikandan\*, N. Premkumar\*\*, M. Rajashekaran\*\*, K. Mnrugavel\*\*\*

\* Assistant Professor, \*\* Associate Professor

Department of Physical Education and Sports Sciences, Annamalai University.

\*\*\* Professor, Head & Director, Department of Physical Education, Bharathiar University.

### ABSTRACT

The purpose of the study was to find out the effect of plyometric training on selected bio-motor abilities among football players. To achieve this purpose, thirty male football players were selected as subjects, their aged between 18 to 25 years, they are studying in the Department of Physical Education and Sports Sciences, Annamalai University, Tamilnadu. The selected subjects were divided into two equal groups of fifteen subjects each, namely plyometric training group and control group. The plyometric training group trained for three alternative days in a week for eight weeks with three sets per exercise per session at 60 to 80% with a progressive increase in load with the number of weeks. Speed, leg strength and agility were selected as criterion variables and they were tested by using 50 meters dash, leg lift with dynamometer and shuttle run respectively. ANCOVA was used to find out the significant difference if any between the groups. The results of the study showed that there was a significant differences on speed, leg strength and agility between plyometric training group and control group.

**Key words:** Plyometric training, speed, leg strength, agility

### Introduction

Sports training aims at improving performance necessary for excellence in sports. Therefore the training methods should include all required performance factors for achieving

Indian Jo  
higher r  
develop

relation:  
approach  
and fori

combin  
in vario

of the g  
achiev  
the aim  
conditi  
games

**Meth**

bio-mc  
this, th  
Scienc  
at ranc  
fifteen  
criteri  
trainin  
trainin  
with d  
three  
in loa  
group

higher results. Coach and the players should be aware of the physical fitness that is to be developed through training for the optimum possible performance.

Plyometric training provides a mechanism and method to train for the optimum relationship between speed and strength. Improving playing speed depends on a complete approach to conditioning including strength training, plyometric drills and improving technique and form. Plyometric movements are performed in a wide spectrum of sports.

In football, it can be played more skillfully when athletes have the power that combines with strength and speed to develop explosive power for successful participating in various competitions.

In establishing the aim of plyometric training we must proceed from the definition of the general concept of training. We have stated that plyometric training is a means of achieving higher standard performances in football. From the foregoing it may be seen that the aim of plyometric training is to raise the special conditions: techniques, tactics and physical condition as well as the spiritual attributes indispensable in effectively participating in football games to the highest possible level.

### **Methodology**

The purpose of the study was to find out the effect of plyometric training on bio-motor abilities such as speed, leg strength and agility among football players. To achieve this, thirty football players studying in the Department of Physical Education and Sports Sciences, Annamalai University in the age group of 18 to 25 years were selected as subjects at random with their consent. The selected subjects were divided into two equal groups of fifteen subjects each namely plyometric training group and control group. The selected criterion variables were assessed using standard tests and procedures, before and after training regimen. Speed, leg strength and agility were tested before (pre) and after (post) the training program for both experimental and control group by using 50 meters dash, leg lift with dynamometer and shuttle run respectively. The plyometric training group trained for three alternative days in a week for eight weeks at 60% to 80% with a progressive increase in load with the number weeks. The intensity variation in 8 weeks of plyometric training group is given below.

**Load Dynamics**

Weeks \ Group	Percentage of Intensity
	Plyometric Training Group (%)
1 - 2	60 - 65
3 - 4	65 - 70
5 - 6	70 - 75
7 - 8	75 - 80

(5% of intensity was increased at once in two weeks)

After 10 to 15 minutes of warm-up the subjects underwent their respective plyometric training programme and the subjects performed 6 to 12 repetitions of plyometric exercises namely hopping, bounding, hurdles exercises, depth jumps, medicine ball throws, with a recovery distance of 20 to 40 metres or one to three minutes between repetitions. The control group did not participate in any specialized training during the period of study.

**Experimental design and statistical procedure**

The experimental design used for the present investigation was random group design involving 30 subjects for training effect. Analysis of Covariance (ANCOVA) was used as a statistical technique to determine the significant difference, if any, existing between

Variab

Speed

Leg

Stren;

Agili

(The t  
respec



TABLE - I

Variables	Test	Plyometric Training Group	Control Group	Source of Variance	SS	df	Mean Square	'F' Ratio
Speed	Pre test Mean	7.24	7.17	Between	0.03745	1	0.03745	520
	S.D	0.26	0.28	Within	2.017	28	0.07202	
	Post test Mean	6.69	7.12	Between	1.391	1	1.391	13.807
	S.D	0.22	0.39	Within	2.821	28	0.101	
	Adjusted Mean	6.65	7.15	Between	1.823	1	1.823	48.517
	Post test			Within	1.014	27	0.03757	
Leg Strength	Pre test Mean	88.8	86.26	Between	48.133	1	48.133	3.44
	S.D	3.39	4.06	Within	391.33	28	13.976	
	Post test Mean	93.13	86.73	Between	307.2	1	307.2	22.25
	S.D	2.97	4.33	Within	386.67	28	13.81	
	Adjusted Mean	93.13	86.73	Between	119.04	1	119.04	33.007
	Post test			Within	97.374	27	3.606	
Agility	Pre test Mean	10.93	10.99	Between	0.033	1	0.033	0.742
	S.D	0.252	0.162	Within	1.259	28	0.04495	
	Post test Mean	10.73	10.96	Between	0.385	1	0.385	22.049
	S.D	0.123	0.141	Within	0.489	28	0.0175	
	Adjusted Mean	10.73	10.96	Between	0.336	1	0.336	20.307
	Post test			Within	0.446	27	0.01653	

(The table value required for significant at .05 level with df 1 and 28; and 1 and 27 are 4.20 and 4.215 respectively).

air of ne en he  
up as en

## Results

The pretest mean of plyometric training group and control group on speed

( $7.24 \pm 0.26$  Vs  $7.17 \pm 0.28$ ) resulted in a 'F' ratio of 0.52. The posttest mean of plyometric training group and control group ( $6.69 \pm 0.22$  Vs  $7.12 \pm 0.39$ ) resulted in a 'F' ratio of 13.807. The adjusted posttest mean of plyometric training group and control group ( $6.65$  Vs  $7.15$ ) resulted in a 'F' ratio of 48.517. The results of the study indicate that there was a significant difference between plyometric training group and control group on speed.

The pretest mean of plyometric training group and control group on leg strength ( $88.8 \pm 3.39$  Vs  $86.26 \pm 4.06$ ) resulted in a 'F' ratio of 3.44. The posttest mean of plyometric training group and control group on leg strength ( $93.13 \pm 2.97$  Vs  $86.73 \pm 4.33$ ) resulted in a 'F' ratio of 22.25. The adjusted posttest mean of plyometric training group and control group on leg strength ( $93.13$  Vs  $86.73$ ) resulted in a 'F' ratio of 33.007. The results of the study indicate that there was a significant difference between plyometric training group and control group on leg strength.

The pretest mean of plyometric training group and control group on agility ( $10.93 \pm 0.25$  Vs  $10.99 \pm 0.16$ ) resulted in a 'F' ratio of 0.742. The posttest mean of plyometric training group and control group on agility ( $10.73 \pm 0.123$  Vs  $10.96 \pm 0.141$ ) resulted in a 'F' ratio of 22.049. The adjusted posttest mean of plyometric training group and control group on agility ( $10.73$  Vs  $10.96$ ) resulted in a 'F' ratio of 20.307. The results of the study indicate that there was a significant difference between plyometric training group and control group on agility.

## Discussion

The result of the study indicates that the plyometric training group had significantly improved the selected dependent variables namely speed, leg strength and agility. However, control group did not show any improvement on the selected variables as it was not involved in any of the specific training means. The result of the study in consonance with the findings of plyometric training has produced significant improvement on speed and leg strength (John M. Cooper, 1959). The plyometric training involving countermovement and loaded jump-squat training may be more effective for enhancing sport speed in elite players (Cronin, and Hansen, 2005). Footballers stops abruptly and changes direction quickly, to do this, he drops his center of gravity lows, leans away from the direction of run; plants the feet and this they

keeps his body under control, by offsetting the centrifugal force, he is ready to push of in the desired direction (John W. Bunn, 1972). The findings of plyometric as one of the training method to improve physical fitness variables for the game of soccer (Walter Winter's Bottom, 1954). The findings of the study was supported with the findings of (Watson, 1983), (Pothemus and Burkhard, 1990). It was inferred from the results of the present study that all the dependent variables were significantly improved due to the influence of plyometric training programme.

## Conclusion

It was concluded that the plyometric training program has resulted in significant improvement on selected bio-motor abilities such as speed, leg strength and agility.

## References

1. Cronin, J.B. and Hansen, K.T., "Strength and Power Predictors of Sports Speed". *J. Strength Cond. Res.*, 19(2): (2005), pp. 349-57.
2. Donald Chu A., *Jumping into Plyometrics*, (New York: Human Kinetics Publishers), 1998, p. 1.
3. Fredrick Haffield C. and Michael Yessis, *Plyometric Training Achieving Power and Explosiveness in Sports (Fitness System)*, 1986.
4. John M. Cooper, *Track and Field for Coach and Athletes*, (Englewood Cliffs: N.J. Prentice Hall, Inc., 1959), pp. 162-163.
5. John W. Bunn, *Scientific Principles of Coaching*, (2<sup>nd</sup> ed., Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1972), p. 125.
6. Pothemus and Burkhard, "The Effects of Plyometric Training Drills on the Physical Strength Gains of Collegiate Football Players". *National Strength and Conditioning Association Journal*, 2, (1990), pp. 13-15.
7. Walter Winter Bottom, *Soccer Coaching*, (2<sup>nd</sup> ed., London: The Naldrett Press, 1954), pp. 54-67.
8. Watson, A.W.S., *Physical Fitness and Athletic Performances*, (New York: Longman Inc., 1983).
9. Wilf and Evelyn Freeman, *Plyometrics*, LOWA Championship Books, 1984.

## RELATIONSHIP BETWEEN SELECTED BODY COMPOSITION AND MOTOR PERFORMANCE VARIABLES OF EARLY ADOLESCENT BOYS.

Saikot Chatterjee\*, A.K. Banerjee\*\*

\*Assistant Professor, Department of Physical Education  
Govt. Degree College Dharmanagar Tipura.

\*\*Professor, Department of Physical Education  
Kalyani University, Nadia, West Bengal.

### ABSTRACT

**Purpose:** The study was premeditated to draw the relationship between selected body composition variables and motor performance variables of early adolescent boys.

**Methods:** To accomplish this study 30 boys within the age group 12-13 years were randomly selected from a school in the Burdwan district of West Bengal. For estimation of their motor qualities, the boys were indulged in AAHPERD youth fitness tests composed of 50yds. dash, 600yds. run and walk, pull-ups, push-ups, sit-ups and standing broad jump. With the help of body weight and skin folds like calf and triceps body composition variables like lean weight, fat weight and body fat percentage were estimated by means of computer software. The Pearsons product moment method was employed to ascertain the relationship between the aforesaid variables.

**Results:** Body weight did not show any significant relationship with the motor quality variables, whereas body fat. percentage was found to be negatively and significantly correlated with performance in 50yds. dash, 600yds run and walk and pull-ups. Fat weight was also found to be significantly and negatively correlated with performance in 50yds. dash, 600yds run and walk. On the other hand lean weight was found to be significantly and positively correlated with performance in shuttle run and standing broad jump.

**Conclusion:** At this age group low fat weight, low body fat percentage and higher lean body mass are good indicators for better motor performance.

India

Key  
perfor

Back

contr.

cultur

globa

reach

imag

physi

work

area

Intro

Physi

and i

resea

and r

keen

selec

varia

Upp

with

pow

Evic

relat

of th

& L

type

forc

exce

dire

Suc

whic

absc

& F

**Key words:** Adolescent, Lean body mass, Fat mass, Body fat percentage, Motor performance.

**Background:** The world is advancing like a supersonic. Science and technology is contributing its utmost for the benefit of humankind in every sphere like education, art, culture, architecture, amusement, recreation, entertainment, games and sports etc. With this global trend of rapid advancement the area of physical education and sports science has reached its peak of excellence. Yet man's level of achievement in sports field is beyond imagination. This has given rise to the need for extensive research works in the field of physical education and sports science. On the contrary in the country like India research works in such areas are insufficient. Hence, the researcher thrived to conduct a study in the area of physical education and sports science.

**Introduction:**

Physical activity and body composition are unavoidable natural partners whose relationship and interdependence in determining motor performance is enormously imperative. Numerous research studies have been conducted to locate the relationship between body composition and motor performance variables and several conclusions have been drawn. Though the keenness as well as encouragement for the same is weaker in our country. So the researcher selected to pursue a study to locate the relationship between selected body composition variables and motor performance variables of early adolescent boys.

Uppal et al. (1986) found that there is a negative significant relationship of anaerobic power with body fat, body density, body weight, and wrist girth. The relationship of anaerobic power of height, upper leg length and chest girth is not significant.

Evidence from sports participants in various age groups has demonstrated an inverse relationship between fat mass and performance of physical activities requiring translocation of the body weight either vertically, such as in jumping, or horizontally, as in running (Boileau & Lohman, 1977; Malina, 1992; Pate et al., 1989). Excess fatness is detrimental to these types of activities because it adds mass to the body without additional capacity to produce force. Because acceleration is proportional to force but inversely proportional to mass, excess fat at a given level of force application will result in slower changes in velocity and direction (Boileau & Lohman, 1977; Harman & Frykman, 1992).

Successful performance of activities such as throwing, pushing, and weight lifting, each of which requires the application of force against external objects, is positively related to the absolute amount of FFM and, therefore, to body size (Boileau & Lohman, 1977; Harman & Frykman, 1992).

Cross-sectional data indicate that %BF is inversely related to aerobic capacity ( $VO_{2\max}$ ) expressed relative to body weight and is also inversely related to distance running performance (Cureton, 1992),

### Material and Methods:

Selection of subjects, selection of variables, instrument's reliability, tester's competency, reliability and validity of tests, procedure for administering the tests and statistical techniques, for analyzing the data have been depicted in this part of the research report.

### Description of Subjects:

Thirty (30) boys within the age group 12-13 years were selected randomly from a school in the Burdwan district of West Bengal as the subjects of the study. On a convenient date the students of class VII were asked to assemble at the school play ground with some prior orientation and notification. Among 150 students of the three sections (A, B&C) of class VII 30 boys were randomly selected with the help of drawing lots.

### Criterion Measured:

- (i) Motor quality variables. : 50 yard dash, standing broadyung 600 yard run and walk, 4×10 yards shuttle run, pull ups, sit ups were measured with standard methods.
- (ii) Body compositional variables.

### Measurement of Skin Folds:

As per requirement of my study and as per soft ware available for calculation of body fat percentage only the skin folds of the triceps and the calf has been estimated and recorded to their nearest mms. For measuring the aforesaid skin folds Lange skin fold caliper was used.

**Triceps Skinfold:** The skin fold was obtained over the triceps of the acromial process obcranon process. When the arm was hanging freely, the skin fold was lifted parallel to the long axis of the right arm 1 cm. above the site and measurement was taken about 1 cm. below the pinch or lifted position.

**Calf Skinfold:** The measurement was taken at the level of maximum circumference of the calf on the medial border of the leg. With the help of the mentioned skin folds and body weight of the subject's Lean Weight, Fat Weight and Body Fat Percentage were estimated with the help of computer soft ware.

### Statistical analysis employed for the study has been stated below:

Initially mean standard deviation and range of the raw scores were calculated with the help of scientific calculator and in the next step the raw scores were converted into

Indian  
stand  
scores  
with t

F

Grad  
to the

Tab  
vari

Mot

Bod  
Con  
Vari

Boc

Boc

Lea

Fat

Not

wit  
the

neg  
yar

rel  
(V  
pe

(F  
Ol  
pr

standard Z scores to minimize the occurrence of different units and with those standard scores coefficient of correlation 'r' was calculated through Pearson's product moment method with the help of computer software (SPSS).

**Result and Discussion:**

Graded discussion accompanied with the statistical analysis of the data collected according to the procedure presented earlier is as follows:

Table- Shows the correlation between the selected body composition variables and motor performance variables.

Motor performance Variables →	50 yard dash	600 yard run	Sit Ups	Pull Ups & walk	Shuttle run	Standing broad jump
Body Compositional Variables ↓						
Body Weight	.044	.320	.088	.169	-.239	.338
Body Fat %	-.464*	-.794*	-.212	-.410*	.315	-.230
Lean Weight	-.100	.057	.165	.343	-.385*	.457*
Fat Weight	-.389*	-.778*	-.183	-.272	.216	-.107

Note - \* Significant correlation.

**Body weight:** In this age group body weight did not reveal any significant relationship with the various motor performance variables incorporated in the study, which is clear from the above table.

**Body fat %:** According to analysis of data has been revealed that % B.F. is also negatively and significantly correlated with the motor performances like 50 yard dash, 600 yard run and walk and pull-ups. The findings of other researchers also suggest similar relationships. Cross-sectional data indicate that %BF is inversely related to aerobic capacity ( $V_{O_{2max}}$ ) expressed relative to body weight and is also inversely related to distance running performance (Cureton, 1992).

**Lean weight:** From the above table it is clear that lean weight or fat free mass (FFM) is significantly correlated with performance in Shuttle run and standing broad jump. Obviously the result of the present study is similar to the findings of the eminent researchers proposed as performance of activities such as throwing, pushing, and weight lifting, each of

which requires the application of force against external objects, is positively related to the absolute amount of FFM and, therefore, to body size (Boileau & Lohman, 1977; Harman & Frykman, 1992). Sarah et. al. (2003) reached to the conclusion in his study that on adolescent boys that on several measures under weight boys were less likely to be physically active than boys of normal weight. Leng Hual Foo et. al. (2006) in his study on Chinese adolescent girls found that greater muscle strength and higher lean body mass may reflect higher levels of physical activity. Thus it is clear from the above discussion that FFM or lean body mass is an important determinant factor for motor performance.

**Fat weight:** In the study the relationship between fat weight and performance in 50 yard dash and 600 yard run and walk was also negatively significant which reveals that the relationship between fat and above mentioned performances is inversely proportional. On the basis of research findings sports participants in various age groups has demonstrated an inverse relationship between fat mass and performance of physical activities requiring translocation of the body weight either vertically, such as in jumping, or horizontally, as in running (Boileau & Lohman, 1977; Malina, 1992; Pate et al., 1989). Excess fatness is detrimental to these types of activities because it adds mass to the body without additional capacity to produce force. Because acceleration is proportional to force but inversely proportional to mass, excess fat at a given level of force application will result in slower changes in velocity and direction (Boileau & Lohman, 1977; Harman & Frykman, 1992).

Findings summed up: From the above discussion it can be summed up that in this age group low fat weight, low body fat percentage and higher lean body mass are good indicators of better motor performance.

#### **Conclusion:**

A considerable amount of research has focused on the development of methods to more accurately and reliably measure body composition and to describe %BF levels of sports participants. Very little experimental research has investigated the relationship of body composition to sport performance thus the investigator has envisaged his endeavor to locate the relationship between body composition and motor performance. With the limited facilities available maximum emphasis was given to collection of accurate data and their interpretation. As ultimate conclusion it was derived that low fat weight, low body fat percentage and higher lean body mass are good indicators of better motor performance. It is a step on the part of the author to fill gaps of knowledge with regard to body composition and motor performance. Such type research studies are hopeful to aid the technique of sports training or coaching and also play a positive role in the process of talent search and their correct nurturing.



**References:**

1. AAHPER. (1976). AAHPER youth fitness test manual. Revised Ed. Washington, D.C. *American alliance for health Physical Education, and Recreation.*
2. Boileau, R.A., and T.G. Lohman (1977). The measurement of human physique and its effect on physical performance. *Orthopedic Clin. N. Am.* 8:563-581.
3. Slaughter, M.H., Lohman, T.G., and Boileau, R.A.(1978).relationship of anthropometric dimensions of lean body mass in children. *Human Biology*, 5: 469-482.
4. Uppal, A.K., Manga, P.J., and Reddy, R.V.K.(1986). Relationship of anaerobic power to selected body composition variables and anthropometric measurements. *Research Bulletin*, 5(1): 16-19.
5. Pate, R.R., C.A. Slentz, and D.P. Katz (1989). Relationships between skinfold thickness and performance of health related fitness test items. *Res. Quart. Exerc. Sport* 60:183-189.
6. Harman, E.A., and P.N. Frykman (1992). The relationship of body size and composition to the performance of physically demanding military tasks. In: B.M. Marriott and J. Grumstrup-Scott (eds.) *Body Composition and Physical Performance: Applications for the Military Services* Washington D.C.: National Academy Press, pp. 105-118.

## A Comparative Study of Happiness Between Male and Female University Athletes

Rajkumar Sharma\* Ashish Kumar Nigam\*\*

\*Grade-I SAI Gymnastic Coach, S.C.C., Department of Sports and Youth Welfare, District Sports Complex, Opposite-S.E.C.L, Bilaspur (Chattisgarh), India.

\*\* Assistant Professor, Department of Physical Education, Guru Ghasidas University, Bilaspur (Chattisgarh), India.

### Abstract

The purpose of this study was to examine and compare the level of happiness among male and female athlete students in Guru Ghasidas University, Bilaspur. The total number of 282 students (144 female and 138 male athletes) from Guru Ghasidas University, Bilaspur completed the Oxford Happiness questionnaire containing measures of study variables, validated inside the country. After distributing and collecting the questionnaires among the subjects, independent sample t-test and SPSS. 16 software showed that female athletes of this University had reported higher physical health, positive cognition, self- efficacy, happiness and life satisfaction than male participants. Even though both groups benefited a same level of self-esteem, but on the whole, the rate of happiness among female athlete students was higher.

Key Words: Happiness factors, University, Athletes, Gender, Student.

### Introduction

One of the main paths in psychology is to determine the meaning and indexes of mental diseases and mental health. Nowadays, mental diseases are regarded as one of the most important aspects in the social health. Due to the physicians' opinions, more than fifty percent of physical illnesses have mental origin. It is also estimated that one person out of twelve, may spend his/her life in the mental hospitals (Bird, 1986). However, investigations and researches in psychology and sport shows that sports and physical activities are one of the best ways to prevent mental diseases. According to scientific researches (Zohman, 1974), people with good physical fitness are stronger in confronting excitements, anxiety and doing physical activities with the least changes in life. In the other hand, the rate of suffering from mental diseases is less among athletes and fit people in compare with non-athletes.

Indian  
O1  
Assoc  
subjec  
provec  
(Zohr  
satisf  
It  
increa  
inves  
concl  
happi  
Belle  
aerobi  
satisf  
the eff  
that i  
depre  
result  
that th  
self-r  
A  
affec  
on th  
to the  
that tl  
in bo  
inves  
of Gu  
Mat  
T  
colle  
in Al  
T  
Mich  
valid

On the bases of opinions made by psychiatrists and the experts of International Association for Mental Health, sports and physical activity have positive effect on the subjective well-being, happiness and individual health. Furthermore, the scientific studies proved the positive relation between doing physical activities with satisfaction and body concept (Zohman,1974). Satisfaction from participating in physical activities will bring joy and life satisfaction, which may extend this feeling to other domains in the life (Zohman,1974).

It was revealed in a study that aerobic physical activities had meaningful effect on increasing the rate of happiness and mental health (Cooper,1983). Another study also investigated the effects of aerobic trainings on psychological characteristics and concluded that after aerobic physical activities, depression had decreased and the rate of happiness and life satisfaction had increased in the subjects of study (Norvell and Belles,1993). It was concluded from other researches that athletes in Track and Field (an aerobic sport) experienced less depression and anxiety in life and they advantage higher life satisfaction (Ungerlider, Golding & Porter,1990). In another study, researchers investigated the effects of anaerobic physical activities on psychological characteristics and concluded that intense physical activities, improve subject's manner and behavior, decrease depression and stress and increase their self-esteem (Pronk, Grouse & Rohack, 1995). The results of one study on the psychological advantages of intense physical activities had showed that this kind of training, decrease depression, stress and anxiety in the life and increase self-respect among the participants (McMahan,1994).

According to the mentioned studies, it is clear that physical activities have positive affect on psychological characteristics. However, there are many difference of opinion on the sport disciplines with the rate of their effectiveness. In the other hand and pointing to the psychological and physical differences between male and female, it seems possible that the effects of physical activities on psychological characteristics and the rate of happiness in both groups could not be the same. As a matter of fact, in this study, researchers investigated and compared the rate of happiness among male and female athlete students of Guru Ghasidas Central University, Bilaspur (CG).

### **Material & Methods**

The sample consisted of 144 male and 136 female athletes studying in different colleges affiliated to this newly established Central University and who had participated in All India Inter-university competitions during 2009-2010.

The Oxford Happiness Questionnaire (2002) developed and prepared by psychologist Michael Argyle and peter Hills at Oxford University, was used for the collection of data.. The validity and reliability of this questionnaire was examined inside the country with  $r=.93$

(Nourbala & Alipour, 1999). The 29-item OHQ with four possible answers, questioned about physical health, positive cognition, self- efficacy, self-esteem, life satisfaction and the happiness of subjects.

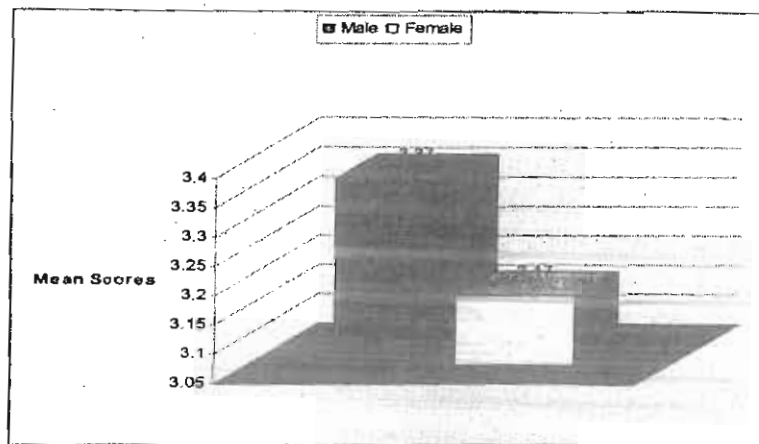
### Results of The Study

To assess the happiness on six dimensions for Inter -university level male and female athletes of different team games and sports, means and standard deviations were computed and data pertaining to this have been presented in table 1.

**Table -1 : Descriptive Statistics of Happiness Dimensions of Male and Female Athletes**

Dimensions	Sex	Mean	SD
Self - Esteem	MaleFemale	3.373.17	1.571.73
Life Satisfaction	MaleFemale	16.7220.27	5.555.80
Self-Efficacy	MaleFemale	5.537.42	2.112.16
Positive Cognition	MaleFemale	12.3314.08	5.013.81
Physical Health	MaleFemale	9.3114.97	2.693.07
Happiness	MaleFemale	47.1154.09	10.9912.87

The mean scores of happiness dimensions of male and female athletes of different games and sports in Guru Ghasidas University, Bilaspur have been depicted in figure 1 to 6



**Figure 1. Mean Scores of Self-esteem of Male and Female Athletes of Inter- university Level.**

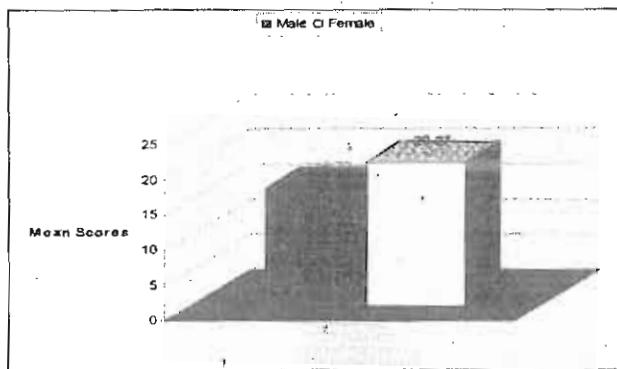


Figure 2. Mean Scores of Life Satisfaction of Male and Female Athletes of Inter- university Level.

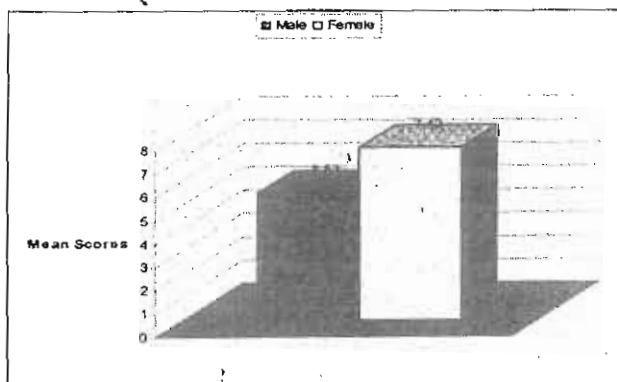


Figure 3. Mean Scores of Self-efficacy of Male and Female Athletes of Inter- university Level.

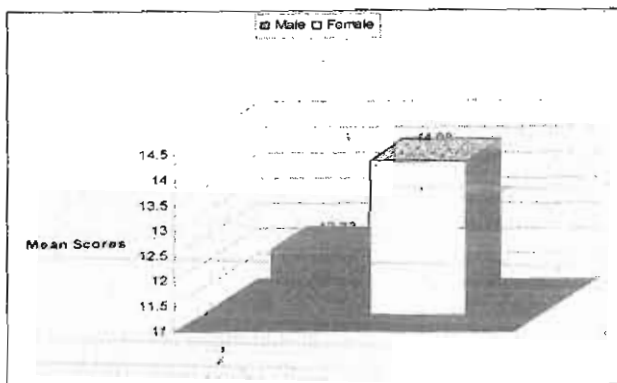


Figure - 4 : Mean Scores positive cognition of male and female athletes of Inter-University

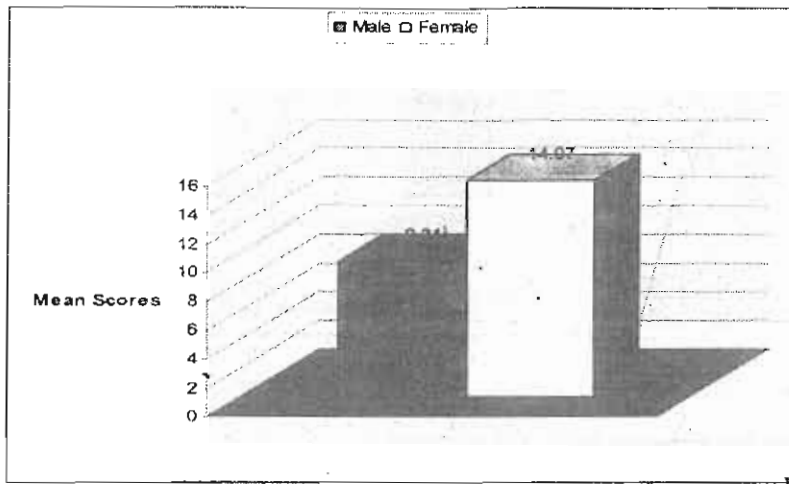


Figure 5. Mean Scores of Physical Health of Male and Female Athletes of Inter- university Level.

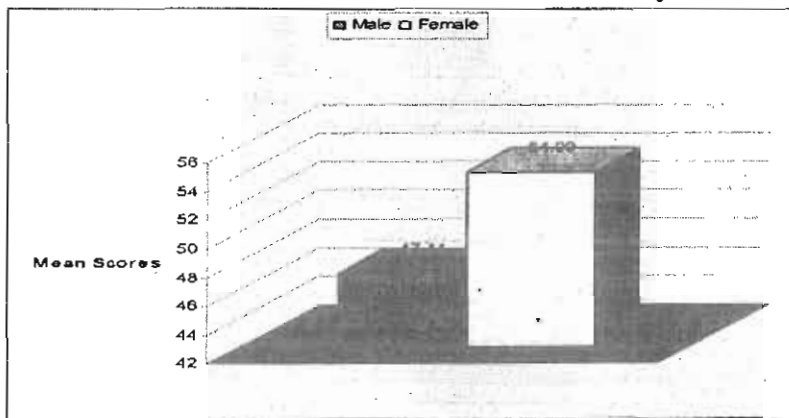


Figure - 6 : Mean Scores of happiness of male and female Athletes of Inter - Iniversity level

To assess the happiness of Inter-university level male and female athletes of different games and sports in Guru Ghasidas University , Bilaspur , t-ratio was computed and data pertaining to this have been presented in table 2. The level of significant was set at .05 level.

Dim  
Self  
Life  
Self  
Posi  
Phy  
Haj

\*Sig  
t .0:

spo  
He:  
anc

int  
the  
Di

eff  
fer  
ad  
se  
the

st  
ha

**Table - 2 : Comparison of Happiness Dimensions in Male and Female Athletes**

Dimensions	Sex	Mean	MD	$\sigma$ DM	t-ratio
Self - Esteem	Male	3.373.17	0.20	0.198	1.01
	Female				
Life Satisfaction	Male	16.7220.27	3.55	0.688	5.16*
	Female				
Self-Efficacy	Male	5.537.42	1.89	0.252	7.50*
	Female				
Positive Cognition	Male	12.3314.08	1.75	0.499	3.51*
	Female				
Physical Health	Male	9.3114.97	5.66	0.347	16.31*
	Female				
Happiness	Male	47.1154.09	7.98	1.00	7.98*
	Female				

\*Significant at .05 level  
 $t_{.05 (278)} = 1.97$

It is evident from table 2, that the male and female athletes of different games and sports differ significantly in their Life Satisfaction, Self-Efficacy, Positive Cognition, Physical Health, and Happiness dimensions, as the obtained t-values of 5.16, 7.50, 3.51, 16.31, and 7.98 were higher than the required  $t_{.05 (280)} = 1.97$  to be significant.

There was no statistically significant difference between male and female athletes in their self-esteem dimension of happiness, as the obtained t-value of 1.01 was less than the required  $t_{.05 (280)} = 1.97$ .

#### Discussion of Findings

The results of this study shows significance differences in life satisfaction, self-efficacy, positive cognition, physical health and the rate of happiness between male and female athletes in Guru Ghasidas Central University, Bilaspur (CG), in which female athletes advantaged better psychological characteristics, including physical health, positive cognition, self-efficacy, happiness and life satisfaction. Regarding the self-esteem of both groups, there was no significant difference.

Results of this research Showed that: the rate of self-esteem in male and female athlete students is in the same level. This means that being athlete or doing physical activities have same effects in both genders. This was supported by Mac Mahan (1994), as the

effect of physical activities on the rate of self-esteem in his study among male and female groups was same. There are also significant differences between physical health, positive cognition, self- efficacy, happiness and life satisfaction among male and female athletes of Guru Ghasidas Central University, Bilaspur (CG),, in which female athletes reported better physical health, positive cognition, self-efficacy, happiness and life satisfaction than male participants. This study was supported by Goodarzi et. al. (2008), as he found that female advantage physical activities more than male participants and the positive psychological characteristics had improved in their lives, more than the other group.

### Conclusions

The present study investigated the positive effect of physical activities on the rate of happiness among male and female participants in proper exercises. What is more interesting (as it was showed in this study) is the effect of physical activities on female athlete more than male participants.

Further research should identify the reasons for gender differences in such case, with laboratory and careful studies. Consideration should be given to male participants in physical activities to improve their happiness and mental health during physical exercises.

### References

- Bird, A.M.** Psychology and sport behavior. Mosby College Publishing Company; 1986.
- Zohman, L.R.** Exercise your way to fitness and heart health. American Health Association; 1974.
- Cooper, K.H.** Aerobic program for total well- being. New York: Bantam Doubleday Dell; 1983.
- Goodarzi, M., Rajabi, R., Yousefi, B., and Mansoor, S.** "A Comparative Study of Happiness among Male and Female Athlete Students in University of Tehran" World Journal of Sport Sciences 2008; 1(1) : 61-64.
- Norvell, N. and Belles D ;** Psychological and physical benefits of circuit weight training in law enforcement personnel. Journal of Consulting and Clinical Psychology. 1993; 6(3): 520-527.
- Ungerlider, S., J.U. Golding and Porter, K;** Mood profile of masters track and field athletes. Perceptual Motor Skills. 1990; 68: 607-617.
- Pronk, N.P., Grouse S.F., and Rohack, J.J.;** Maximal exercise and acute mood response in women. Journal of: Physiological Behavior. 1995; 57(10): 1-4.
- McMahan, J.R.;** Psychological benefits of exercise and the treatment of delinquent adolescents. Sport Medicine. 1994; 25(3): 34-35.
- Nourbala, A. A., and Alipour A.;** Evaluating the validity and reliability of Oxford Happiness Inventory among students of Tehran University. Tehran, Journal of Thought and Behavior; 1999; Journal Number L- 2.

T  
f  
v  
L  
O  
S  
E  
c  
F  
s  
t  
t  
z  
z  
l  
l  
l  
u  
v  
s  
l  
l



## ANALYSIS OF SPRINT PERFORMANCE OF INDIAN VARSITY MALE ATHLETES

M.SANKAR\*, V.GOPINATH\*\*

\*Assistant Professor, \*\*Associate Professor

Department of Physical Education and Sports Sciences

Annamalai University, Tamilnadu - 608002

### ABSTRACT

The purpose of this study was to analysis the Indian university men sprint performance from 2004 to 2010. For the purpose of the study, All India Inter University men records were obtained from Acharya Nagarjuna University (2004-05), Manonmaniam Sundaranar University (2005-06), Bangalore University (2006-07), Annamalai University (2007-08), M.G. University (2008-09) and University of Madras (2009-10) respectively. The sprint performance of 100 m (N=48), 200 m (N=48) and 400 m (N=48) were taken as performance variable. In each event, top eight men performances were taken. The obtained data were statistically analysed by ANOVA, if the obtained 'F' ratio is significant, Scheffe's post hoc test was applied to know the mean difference between the performances for significance. The Level of confidence was fixed at 0.05. The results of the study shows that the 100 m performances on 2005-06 athletic meet were very poor with the rest of the years. In 200 m performance on 2007-08 athletic meet were poor than 2006-07, 2008-09 and 2009-10 athletic meet. Irrespective of years, there was no difference in 400 m sprint performance.

**Key words:** *Athletic, Sprint events, Performance, Men.*

### Introduction

In sports, those who compete or fans share a great passion for analysis. Running is more unique in that these factors are greatly restricted. In each event, athletes compete to see who can run faster or throw further or jump higher – a single measure decides the best. Since events are standardized, one need not compete directly against another to determine who performs the best (Alexander L. White, 2007). The field of running performance has become an obsession amongst many runners and analysts. There was a slope in the running records, extrapolated from mean running velocity plotted against historical time,

would eventually result in a performance intersection of the sexes across a variety of running distances. The Success in distance running and sprinting is determined largely by aerobic capacity and muscular strength, respectively. (Cheuvront, Samuel N, 2005).

Some authors have suggested that gender differences in race records may disappear other have studied physiological limits in sport with non linear models, but with limited data (Nevill and White, 2005). Over the modern Olympic era, the evolution of time, distance or height values of world records was shown to follow a piecewise exponential model (Berthelot et al., 2008). The purpose of the study was to analysis the Indian varsity men sprint performance from 2004 to 2010. Though many studies has been performed worldwide in this area, studies from India are limited.

**Methodology:**

For the purpose of the study, All India Inter university Athletic (AIUUA) meet records were obtained from 65<sup>th</sup> AIUUA meet organized by Acharya nagarjuna university (2004-05), 66<sup>th</sup> AIUUA meet organized by Manonmaniam Sundaranar University (2005-06), 67<sup>th</sup> AIUUA meet organized by Bangalore University (2006-07), 68<sup>th</sup> AIUUA meet organized by Annamalai University (2007-08), 69<sup>th</sup> AIUUA meet organized by M.G University (2008-09) and 70<sup>th</sup> AIUUA meet organized by University of Madras (2009-10) respectively. The sprint performance of 100 m (N=48), 200 m (N=48) and 400 m (N=48) were taken as performance variable. In each event, top eight men performances were taken. The obtained data were statistically analysed by ANOVA, if they obtained 'F' ratio is significant, Scheffe's post hoc test was applied to know the mean difference between the performances for significance. Level of confidence was fixed at 0.05.

Indian  
Result  
Table

Event
100 m
200 m
400 m

\*Sign

Graph

seconds



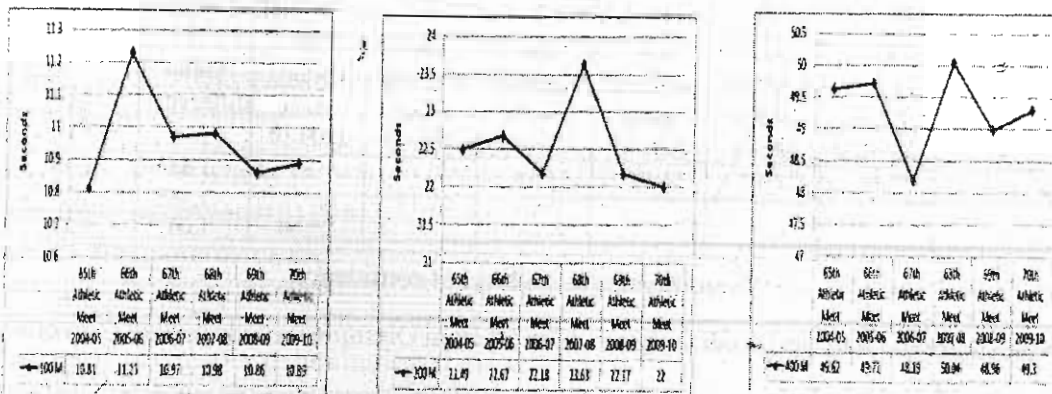
**Results:**

**Table - : I ANOVA FOR SPRINT PERFORMANCE OF INDIAN UNIVERSITY MEN ATHLETES FROM 2004 TO 2010**

Event		65 <sup>th</sup> Athletic Meet 2004-05	66 <sup>th</sup> Athletic Meet 2005-06	67 <sup>th</sup> Athletic Meet 2006-07	68 <sup>th</sup> Athletic Meet 2007-08	69 <sup>th</sup> Athletic Meet 2008-09	70 <sup>th</sup> Athletic Meet 2009-10	SOV	SS	df	Ms	Optioned 'F' ratio
100 m	X	10.81	11.23	10.97	10.98	10.86	10.89	B	0.88	5	0.18	7.12*
	ó	0.14	0.12	0.20	0.17	0.10	0.19	W	1.04	42	0.03	
200 m	X	22.49	22.67	22.18	23.63	22.17	22.00	B	14.05	5	2.81	2.73*
	ó	0.34	0.35	0.40	2.38	0.30	0.14	W	43.24	42	1.03	
400 m	X	49.62	49.71	48.19	50.04	48.98	49.30	B	17.24	5	3.48	1.51
	ó	1.27	0.71	0.59	1.16	2.99	1.55	W	96.19	42	2.29	

\*Significance at .05 level of confidence (The Table value required for significance at .05 level of confidence with df 5 and 42 was 2.42)

**Graph - 1: THE LINE DIAGRAM SHOWS THE 100 M, 200 M AND 400 M PERFORMANCES OF AIU ATHLETES FROM 2004 TO 2010**



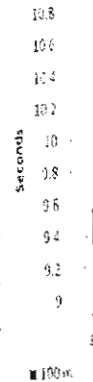
The result of the study shows that the 100 m sprint performances (time) on 66th athletic meet were significantly higher with rest of the years. In 200 m sprint performance (time) on 68<sup>th</sup> athletic meet were significantly higher than 67<sup>th</sup>, 69<sup>th</sup> and 70<sup>th</sup> athletic meet performance. There was no difference in 400 m sprint performance (time) among the years.

**Table – II : SCHEFFE'S POST HOC TEST FOR SPRINT PERFORMANCE OF INDIAN UNIVERSITY MEN ATHLETES FROM 2004 TO 2010**

Event	65 <sup>th</sup> Athletic Meet 2004-05	66 <sup>th</sup> Athletic Meet 2005-06	67 <sup>th</sup> Athletic Meet 2006-07	68 <sup>th</sup> Athletic Meet 2007-08	69 <sup>th</sup> Athletic Meet 2008-09	70 <sup>th</sup> Athletic Meet 2009-10	Mean difference	Class Interval
100m	10.81	11.23					0.42*	0.19
		11.23	10.97				0.26*	0.19
		11.23		10.98			0.25*	0.19
		11.23			10.86		0.37*	0.19
		11.23				10.89	0.34*	0.19
200m	65 <sup>th</sup> Athletic Meet 2004-05	66 <sup>th</sup> Athletic Meet 2005-06	67 <sup>th</sup> Athletic Meet 2006-07	68 <sup>th</sup> Athletic Meet 2007-08	69 <sup>th</sup> Athletic Meet 2008-09	70 <sup>th</sup> Athletic Meet 2009-10	Mean difference	Class Interval
	22.46	22.67	22.18	23.63			1.45*	1.15
				23.63	22.17		1.46*	1.15
				23.63		22.00	1.63*	1.15

\*Significance at .05 level of confidence

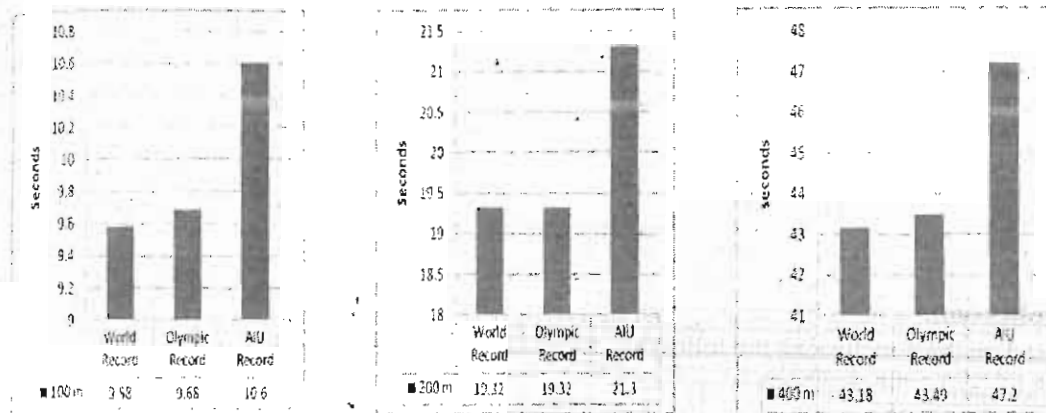
When compare with sprint performance of world and Olympic records, Indian University records were poor.



## Discussi

Sprint pe  
locomote  
character  
to the pe  
been we  
curve. A  
high ve  
perform  
stride fr

Sprint p  
of maxi  
adduct  
contrib  
100 m C  
has no  
speed.  
the pre  
perform

**Graph - II : Comparision of Sprint performance among olympic world and Alu athletes,****Discussion on Findings:**

Sprint performance requires the ability to generate a high velocity of shortening in the locomotors muscles. Muscle shortening velocity is determined by biochemical and architectural characteristics. Maximum running speed and 100-m sprint running performance are related to the percentage of fast-twitch muscle fibers (Schluter, J. M, 1994). Sprint technique has been well analysed during acceleration, constant velocity and deceleration of the velocity curve. At the beginning of the sprint run, it is important to produce great power and generate high velocity in the block and acceleration phases. (Mero A, 1992). In improve sprint performance, two fundamental parameters allow to emphasize either the stride length or the stride frequency in training.

Sprint performance will be viewed multidimensional as an initial acceleration phase, a phase of maximum running speed (36 to 100 m) and a transition phase in between. The hamstrings, adductor magnus and the gluteus maximus are considered to make the most important contribution in producing the highest levels of speed (Delecluse, Christophe, 1997). Men's 100 m Olympic performance is the most glamorous running event in the world. Sprint racing has no particular tactics to be employed, the running out for as long as they can maintain speed. The record is being improved in ever-decreasing changes. However, the result of the present investigation shows that, there was no remarkable improvement in sprint performance by Indian varsity athletes.

### Conclusions

Based on the result of the present study and within the limitation mentioned earlier, it may be concluded that, the progress of sprint performance (time) was poor at recent past years in Indian.

Varsity male athletes.

Mer

Nev

R. S

### Implication:

Based on the conclusions the following suggestions are made to improve the sprint performance of Indian varsity sprinters.

- Association of Indian university (AIU) sports board has to take some initiation to improve the performance of sprinters.
- AIU should have collaboration with SAI (Sports Authority of India) and introduce some new schemes or academy for sprinters.
- AIU, State Government, SAI, Human Resource Development and NGO's should come forward to promote special schemes to improve sprint performance.
- Special workshop should be organized for coaches to update their knowledge in coaching on sprint events.

Sch

var

Th

Wo

### References

- Alexander L White.** Running's log and Predictive performance Analytics. Major Qualifying Project Report. Faculty of The Worcester Polytechnic Institute June 1; 2007.
- Berthelot, G.,** Thibault, V., Tafflet, M., Escolano, S., El Helou, N., Jouven, X., Hermine, O. and Toussaint, J.F. The Citius End: World Records Progression Announces the Completion of Brief Ultra-Physiological Quest. PLoS ONE. 2008 3(2). Available from URL: <http://www.plosone.org>
- Chevront, Samuel N.** Robert Carter III, DeRuisseau, Keith C, Moffatt, Robert J. Running Performance Differences between Men and Women. Adis International publications. Sports Medicine. 2005 Volume 35: Number 12; 1017-1024.
- Delecluse, Christophe.** Influence of Strength Training on Sprint Running Performance: Current Findings and Implications for Training. Sports Medicine September 1997 Volume 24: Issue 3;
- Greene, P. R.** Running on Flat Turns: Experiments, Theory and Applications. Trans. ASME: J. Biomech. Eng. 1985 ; 107; 96-103.

- James R. Usherwood**, and Alan M. Wilson. Accounting for Elite Indoor 200 m Sprint Results, Structure and Motion Laboratory. The Royal Veterinary College. Hawkshead Lane. North Mymms AL9 7TA. 2005; UK.
- Mero A. Komi**, P.V, Gregor, R.J. Biomechanics of Sprint Running. Sports Medicine. June 1992 Volume 13: Issue 6;
- Nevill, A.M. and Whyte, G.P.** Are there Limits to Running World Records? Medicine and Science in Sports and Exercise. 2005; **37**: 1785-1788.
- R. Schuylenbergh**, B. Vanden Eynde and P. Hespel. Prediction of Sprint Triathlon Performance from Laboratory Tests. European Journal of Applied Physiology. 2004 Volume 91: Number 1.
- Schluter, J. M., and R. H. Fitts.** Shortening Velocity and ATPase Activity of Rat Skeletal Muscle Fibers: Effects of Endurance Exercise Training. Am. Journal of Physiol. Cell Physiol. 1994 266: 1699 – 1713.
- van Ingen Schenau**, Gerrit Jan, de Koning, Jos J, de Groot, Gert. Optimisation of Sprinting Performance in Running, Cycling and Speed Skating. Sports Medicine. April 1994 Volume 17: Issue 4.
- Thomas W. nesser**, Richard W. Latin, Kris Berg, and Ernest Prantise. Physiological Determination of 40 m Sprint Performance in Young Male Athletes. Journal of Strength and Conditioning Research. 1996 ;10(4): 263-267.
- Weyand, P. G.**, Sternlight, D. B., Bellizzi, M. J. & Wright, S. Faster Top Running Speeds are Achieved With Greater Ground Forces Not More Rapid Leg Movements. Journal of Appl. Physiol. 2000 ; 89; 1991–1999.

## A BIOMECHANICAL ANALYSIS OF PENALTY STROKE IN FIELD HOCKEY

**Ikram Hussain\***, **Arif Mohammad\*\***,  
**Asim Khan\*\***, **Mohd. Arshad Bari\*\***, **Saleem Ahmed\*\*\***

\*Professor, \*\*Research Scholar, \*\*\*Project Fellow  
Department of Physical Health and Sports Education  
Aligarh Muslim University, Aligarh, U.P.

### Abstract

*Present study was designed to reveal the biomechanical quantities of penalty stroke when it is executed at 90 degree stance position. For the purpose of this study six intervarsity level male hockey players were recruited using stratified random sampling method. Their mean age, height and weight were 20 yrs (SD 0.89), 169.67 cm (SD 5.68) and 59.5 kg (SD 4.63), respectively. A target (2×2) which is marked by a scale was placed at each critical corners of the goal post to determine the ball accuracy position. The subjects were asked to perform 3 penalty strokes, each for all four critical corners of the goal post only best of three were considered for biomechanical analysis. To acquire 2-D data one high speed Canon Legria HF S10 camcorder were used. The players and ball movement during the penalty stroke execution were recorded. After that recorded video footages were downloaded, slashed to desired footages and edited for biomechanical analysis. The ball velocity, acceleration, accuracy, stride length, contact time and length, were digitized with the help of Silicon Coach Pro7 motion analysis software. The acquired data of the variables were subjected to statistical analysis. The results showed in the table-1 indicated that at right top corner subjects gained 52.08 percent accuracy with 27.30 ms<sup>-1</sup> velocity which is higher than other three corners. Table-4 indicated when subjects increases velocity of the ball at 33.57 ms<sup>-1</sup> their accuracy decreases at 29.17 percent.*

Indian Jo  
Backgr  
field h  
highest  
differer  
One of:  
play oc  
succes:  
aspects  
aspects  
etc.

Physic:  
aspect:  
Conve  
is guar  
goal-k  
mover  
stroke  
ball ir  
match  
penalt  
are res  
of thre  
accur  
**Meth**  
Six ir  
meth  
and 5  
Cano  
place  
targe  
posit  
the g  
strok  
into j  
each  
velo



**Background:**

Field hockey is a sport which demands lots of physical as well as mental efforts at the highest level of participation. When a team competes with their counterparts vigorously different kind of foul means of play came into existence. For every foul there is a penalty. One of a kind of penalty is penalty stroke which is awarded when an extreme foul means of play occurred. Both psychological and biomechanical parameters play a decisive role in the successful conversion of penalty stroke into a goal. If we talk about the biomechanical aspects of penalty stroke, with all movements of players and ball there are some mechanical aspects are involved. Like speed, velocity, acceleration, stride length contact time and length etc.

As we know that hockey demands lots of physical as well as psychological qualities. Physical demands are governed by the laws of mechanics and it comes under biomechanical aspects of sports. In the game of hockey every team has one or two penalty stroke specialists. Conversion of a goal via penalty stroke is highly technical aspect. In a 12×7 feet goal which is guarded by a goal keeper it is difficult for penalty stroke specialist to score defeating the goal-keeper as demands quick deceiving qualities of the specialist alongwith speed of movement accuracy. Only four extreme corners of the goal- post are vacant when a penalty stroke is set into motion. Thus it is important for the striker to use proper skill and put the ball into the vacant space of the goal post to score a goal. As seen at the international matches every specialist uses their own specific stances when they are going to execute penalty stroke. Every movement is governed by the laws of biomechanics when some stances are resisted during execution. Thus, the present study was structured to explore fact that out of three pre-assigned stances what extent player's movements were resisted and how much accuracy one gets when performing a penalty stroke.

**Method and Procedure:**

Six intervarsity level male hockey players were recruited using stratified random sampling method. Their mean age, height and weight were 20 yrs (SD 0.89), 169.67 cm (SD 5.68) and 59.5 kg (SD 4.63), respectively. To acquire biomechanical quantities, one high speed Canon Legria HF S10 camcorder was used. The camcorder mounted at a height of 5 feet, placed at 8 meters away perpendicular to the penalty spot. The 2×2 feet marked scale targets were placed at each critical corner of the goal post to determine the ball accuracy position. The subjects were asked to perform 3 penalty stroke each for all four corners of the goal post with 90 degree stances. The players and ball movement during the penalty stroke execution were recorded. After recording all the video footages were downloaded into personal computer and slashed to desired footages that is only one (best of three) for each corner execution of penalty stroke were subjected to biomechanical analysis. The ball velocity, acceleration, accuracy, stride length, contact time and length, were taken as variables

and digitized with the help of Silicon Coach Pro7 motion analysis software. The acquired data of the variables were subjected to statistical analysis. The results have been presented in the following tables.

### Results and Discussion:

It is observed from table-1 that at right top corner at 90 degree stance position, subjects gained maximum accuracy of 52.08 percent with 27.30 ms<sup>-1</sup> velocity, Table-2, showed subjects gained 37.5 percent accuracy with 27.88 ms<sup>-1</sup> velocity at right ground corner, Similarly table-3 showed subjects gained 29.17 percent accuracy with 32.34 ms<sup>-1</sup> velocity at left top corner and according to table-4 subjects gained 29.17 percent accuracy with 33.57 ms<sup>-1</sup> velocity at left ground corner of the goal post that falls on the left side of the goal-keeper.

**Table - 1 : Mean value of selected variables at Right Top Corner**

	Accuracy (Percent)	Acceleration (ms <sup>-2</sup> )	Velocity (ms <sup>-1</sup> )	Stride Length(m)	Contact Time(sec)	Contact Length(m)
Mean	52.08	14.88	27.30	0.83	0.055	0.915
Standard Deviation	27.86	3.89	5.38	0.099	0.017	0.19

**Table - 2 : Mean value of selected variables at Right Ground Corner**

	Accuracy (Percent)	Acceleration (ms <sup>-2</sup> )	Velocity (ms <sup>-1</sup> )	Stride Length(m)	Contact Time(sec)	Contact Length(m)
Mean	37.5	18.84	27.89	0.87	0.051	0.94
Standard Deviation	25	3.80	5.84	0.20	0.011	0.09

Indi

Tab

Mea

Sta

Dev

Tab

Me

Sta

De

It is

cor

the

rec

per

Re

1.1

2.1

3.1

4.

**Table - 3 : Mean value of selected variables at Left Top Corner**

	Accuracy (Percent)	Acceleration (ms <sup>-2</sup> )	Velocity (ms <sup>-1</sup> )	Stride Length(m)	Contact Time(sec)	Contact Length(m)
Mean	29.17	17.92	32.34	1.021	0.05	0.89
Standard Deviation	23.27	1.56	8.09	0.146	0.0063	0.153

**Table - 4 : Mean value of selected variables at Left Ground Corner**

	Accuracy (Percent)	Acceleration (ms <sup>-2</sup> )	Velocity (ms <sup>-1</sup> )	Stride Length(m)	Contact Time(sec)	Contact Length(m)
Mean	29.17	21.26	33.57	1.09	0.06	1.08
Standard Deviation	15.14	11.94	5.22	0.133	0.0357	0.3815

It is evident from the above shown table that out of four pre-set critical targets, right top corner of the goal-post at the right side of the goal-keeper found to be most effective from the scoring point of view owing to the fact that the obtained accuracy at this angle has been recorded maximum (52.08 percent) which is a decisive factor for scoring goals through penalty stroke.

**References:**

1. Bretigny P., Seifert L., Leory D. and Chollet D. (2008): "Upper-Limb Kinematics and Coordination of Short Grip and Classic Drives in Field Hockey." *Journal of Applied Biomechanics*, Volume 24 (issue 3): pp.215: 23.
2. Kerr R. and Ness K. (2006): "A Three-Dimensional Kinematic Analysis of the Field Hockey Penalty Corner Push-In." *Journal of Sports Biomechanics*, Volume 5 (issue 1): pp.47-61 V.
3. Laird P. and Sutherland P. (2003): "Penalty Corners in Field Hockey: A guide to success" *International Journal of Performance Analysis in Sport*, Volume 3, Number 1, pp.19-26(8)
4. Sanders D., Gibson N. and Banks M. "Movement Analysis of Sporting Activities" <http://www.filter.ac.uk/database/getinsight.php?id=49&seq=12>

- 5. Sibella F., Crivellini M., and Galli M. (2004): "Biomechanical Model for Upper Limbs Movement Analysis: Application on Normal Subjects" Biomedical Engineering, Innsbruck, Austria.
- 6. Yusoff S., Hasan N. and Wilson B. (2008): "Three-Dimensional Biomechanical Analysis of the Hockey Drag Flick Performed in Competition" ISN Bulletin, Volume 1, Number 1.

IT

**Acknowledgement**

The present empirical research work has been undertaken under UGC-SAP (DRS-I) Programme, Department of Physical Health and Sports Education, Aligarh Muslim University, Aligarh.

\*Di  
C  
\*\*P  
\*\*\*

har  
as  
ed  
ha  
dit  
pl:  
TI  
of  
D  
(l  
F:  
d  
T  
th  
F

## IMPACT OF SOCIO ECONOMIC CONDITIONS ON WOMEN SPORTS PARTICIPATION IN DIFFERENT LEVELS IN TAMIL NADU AND PONDICHERRY

A. Muthu \*, V. Jayanthi\*\*, D. Sakthiganavel\*\*\*

\*Director of Physical Education, Krishnasamy College of Engineering & Technology, Cuddalore – 607 109. Tamil Nadu.

\*\*Professor, Department of Physical Education, Annamalai University, Tamil Nadu.

\*\*\*Professor, Department of Physical Education, Pondicherry University, Pondicherry.

### ABSTRACT

Socio-Economic status (SES) and health are closely related, and SES can often have profound effects on a person's health due to differences in ability to access health care as well as dietary and other lifestyle choices that are associated with both finance and education. This research is to examine whether the socio economic status of the women have any impact on women's participation in sports among Tamil Nadu and Pondicherry at different levels. The subjects were randomly selected from two colleges in Cuddalore (30 players), Tamil Nadu state and two colleges from Karaikal (30 players), Pondicherry state. The selected subjects were administered with two questionnaires, one to find out their level of sports participation, and another to find out their socio economic status by Agarwal. Data obtained were subjected to find out statistical significance among the means using 3 (levels - district, state and national participations) x 2 (states - Tamil Nadu and Pondicherry) Factorial analysis. The results proved that there were significant differences in SES of the different level of women players. There was no significant difference among the states, Tamil Nadu and Pondicherry. Further it was concluded that SES of players play vital role in the participation level of women players.

**Key Words:** Different Levels of Players, Tamil Nadu, Pondicherry, Socio Economic Status.

---

## Introduction

Socio-Economic Status is evaluated as a combination of factors including income, level of education and occupation. It is a way of looking at how individuals or families fit into society using economic and social measures that have been shown to impact individual's health and well being.

Socio-Economic status and health are closely related, and SES can often have profound effects on a person's health due to differences in ability to access health care as well as dietary and other lifestyle choices that are associated with both finances and education. Usually categorized into high SES, middle SES and low SES. (Elizabeth Boskay, 2009)

A number of studies show that social status has positive relationship with personality development, economic achievement and sports participation of students. In short, the importance of socio-economic status as a determinant has been emphasized by the findings of studies made in the western countries. (Mangayarkarasi, 1989, Yobu, 1993).

Until the independence of India, Tamil Nadu was under the rule of British and Pondicherry was under the rule of French, which resulted in cultural diversity, socio economic status and recognition for women participation in sports and similar other factors. It is important for physical education and sport professionals to understand how cultural and social factors of different groups of people, may influence a person from participating in sports. The aim of this research was to examine whether the socio economic status of the women have any impact on women's participation in sports among Tamil Nadu and Pondicherry at different levels.

Sharma et.al. (2009) identified pathways used by psychosocial factors to influence physical activity in middle-school girls and concluded psychosocial factors use to influence physical activity of school girls. Hurvitz M, Weiss R (2009) found participation of adolescents and young women in strenuous sports activity may lead to various metabolic changes. Joy EA, et.al.(2009) found exercise is beneficial for women of all ages and is associated with long-term health benefits and enhanced well-being. Cerin E, Leslie E, Owen N.(2009) identified potential mechanisms of influence (mediators) of socio-economic status (SES) and found walking may help to reduce SES inequalities in participation in physical activity. Jurj AL, et.al. (2007) found high socioeconomic status and small household were inversely associated with non-exercise activities. The review of related literature proved that there was further scope for research to examine whether the socio economic status of the women

Inc  
hav  
diff

Mu

pla  
Po  
Ne  
pa  
th  
pa  
sp  
th  
le  
st  
le  
pl  
U

a  
q  
o  
s  
s

/  
s  
e  
c

have any impact on women's participation in sports among Tamil Nadu and Pondicherry at different levels.

### Methodology

To achieve the purpose of this study, the investigator randomly selected 30 women players including athletes from Tamil Nadu and 30 women players including athletes from Pondicherry. The subjects were randomly selected from 2 colleges in Cuddalore, Tamil Nadu state and 2 Colleges from Karaikal, Pondicherry state. To determine the level of participation of the subjects, a brief questionnaire was administered among them, eliciting, their name, age, college studying, name of the sport / event involved, number of years participating, achievements at school, inter-school, district, state, national levels, present sports participation at inter-collegiate, zonal, inter-university. Based on the responses obtained, the selected subjects were divided into three categories, namely, district, state and national level players. The players who played up to district level and participated at inter-collegiate sports meets were considered as district level players. The players who played up to state level and participated at University zonal level competitions were considered as state level players. The players who played in National level competitions and participated at All India University competitions were considered national level players for this study.

To determine the socio economic status of the subjects, the questionnaire developed and validated by Agarwal and others (2005), which is a standardized socio economic questionnaire. The questionnaire consists of 22 questions seeking responses from the subjects on twenty two distinct socio economic factors. Based on the responses of the subjects, the scores were made out for the socio economic conditions of the subject. The score of the socio economic condition of the subject was the total score obtained for all the 22 statements.

The data collected from the subjects were treated statistically used 3 x 2 factorial Analysis of Variance through SPSS (Version 11.0). The socio economic status of the two states, namely, Tamil Nadu and Pondicherry at three different levels, namely, district, state and national levels were compared for significant differences. In all cases, 0.05 level confidences were fixed for the purpose of this study.

**Results**

**Table - 1: Descriptive Statistics on Socio Economic Status of the Subjects Studied**

LEVEL	STATE	Mean	Std. Deviation	N
DISTRICT	Tamil Nadu	53.69	4.366	13
	Pondicherry	53.38	4.538	13
	Total	53.54	4.366	26
STATE	Tamil Nadu	60.50	2.849	14
	Pondicherry	61.36	2.678	14
	Total	60.93	2.748	28
NATIONAL	Tamil Nadu	66.33	5.132	3
	Pondicherry	66.67	2.887	3
	Total	66.50	3.728	6
Total	Tamil Nadu	58.13	5.643	30
	Pondicherry	58.43	5.905	30
	Total	58.28	5.729	60

**Table - 3 : Subjects**

District
53.54
53.54

**Table - 2 : 3 x 2 Factorial Analyses on Socio Economic Status of the Subjects**

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
LEVEL	Hypothesis	1186.365	2	593.182	259.320*	0.004
	Error	4.575	2	2.287		
STATE	Hypothesis	0.809	1	.809	0.144	0.708
	Error	109.555	19.514	5.614		
LEVEL	Hypothesis	4.575	2	2.287	0.166	0.847
	Error	743.894	54	13.776		

**Discussion**

Of and 3 were the mean s Tamil Nadu were 60.50 women pla

The Analysis c significant 259.32 wa 0.05 level: value for i 0.847, whi the obtaine



**Table - 3 : Scheffe's Confidence Interval Test on Socio Economic Status of the Subjects**

MEANS			Mean Difference	Level of Significance
District	State	National		
53.54	60.93		7.39*	0.000
53.54		66.50	12.96*	0.000
	60.93	66.50	5.57*	0.006

\* Significant

**Discussions**

Of the 30 subjects studied, 13 were district level players, 14 were state level players and 3 were national level players both in Tamil Nadu and Pondicherry. As shown in Table 1, the mean socio economic status (SES) of the district level women players were 53.69 for Tamil Nadu, 53.38 for Pondicherry players. The mean SES of the state level women players were 60.50 for Tamil Nadu and 61.36 for Pondicherry. The mean SES of the national level women players were 66.33 for Tamil Nadu and 66.67 for Pondicherry.

The mean differences were subjected to test statistical significance using 3 x 2 Factorial Analysis of Variance and the results presented in Table 2. It was found that there was significant difference in SES of different levels of women players as the obtained F value of 259.32 was significant at 0.004, which was much higher than the level fixed for the study, 0.05 levels. The obtained F value for different states was 0.144. And they obtained F value for interaction (Level and State) was 0.166. These were significant at 0.708 and 0.847, which were much lower than the level fixed for this study, that is, 0.05 level. Hence, the obtained F values for State and Interaction (Level and State) were not significant.

Since significant mean differences were obtained among district level women players in their SES, the results were subjected to post hoc analysis using Scheffe's confidence interval and the results presented in Table 3 proved that there was significant differences between district and state, district and national and state and national level players. The means of SES proved that national level players have 66.50 followed by state players 60.93 and district players 53.54 and the mean differences were significant. It was found that the mean differences between states, Tamil Nadu 58.13 and Pondicherry 58.43 were not significant and the interaction between level and state was also no significant as the obtained F values were not significant. The findings of this study are in agreement with the findings of Sharma et.al. (2009) who identified pathways used by psychosocial factors to influence physical activity in middle-school girls and concluded psychosocial factors use to influence physical activity of school girls.

5. Jur  
St6. Me  
Sc7. Sh  
P  
S8. Y  
E  
S

### Conclusions

It was concluded that socio-economic status of players play vital role in the participation level of women players. Hence, spotting talented women players from low socio-economic status may be done at early stage and encourage them continuously so that there may not be any drop outs due to their socio economic status.

### References

1. Cerin E, et.al. (2009) "Explaining Socio-Economic Status Differences in Walking for Transport: An Ecological Analysis of Individual, Social and Environmental Factors" *Soc Sci Med.* 68(6):1013-20. Epub 2009.
2. Elizabeth Boskay, (2009) "Health's Disease and Condition Content is Reviewed" Medical Review Board.
3. Hurvitz M and Weiss R (2009) "The Young Female Athlete" *Pediatr Endocrinol Rev.* 7(2):123-9.
4. Joy EA, et.al. (2009) "Health-Related Concerns of the Female Athlete: A Lifespan Approach" *Am Fam Physician.* 15;79(6):489-95.

5. Jurj AL, et.al. (2007) "Patterns and Correlates of Physical Activity: A Cross-Sectional Study in Urban Chinese Women" *BMC Public Health*. 21; 7:213.
6. Mangayarkarasi. S (1989) "Analysis of Social Status and Athletic Ability of High School Girls". Doctoral Thesis, Annamalai University.
7. Sharma SV, et.al. (2009) "A Path Analysis to Identify the Psychosocial Factors Influencing Physical Activity and Bone Health In Middle-School Girls" *J Phys Act Health*. Sep; 6(5): 606-16.
8. Yobu, A. (1993), "Analysis of Selected Psychological Parameters and Socio-Economic Status High and Low Physical Fitness among University Male and Female Students", Doctoral Thesis, Annamalai University.

## AN ANALYTICAL SURVEY OF ESTABLISHING SOCCER PROFESSIONALISM IN MANIPUR STATE

*Ksh. Birbal Singh\*, S. Ranjit Singh\*, Y. Shantikumar Singh\*\*, L. Thambal Singh\*\**

*\* Sr. Lecturer,  
Dept. of Physical Edn. Health Edn. and Sports, DM College of Science, Imphal*

*\*\*Asst. Professor,  
Dept. of Physical Edn. and Sports Sc., Manipur University, Imphal*

### Abstract

**Background:** *The study was based on the high potentiality of soccer in the state with the wide range of contributions in the national and international arenas.*

**Purpose:** *The purpose of the study was to assess an analytical survey of establishing soccer professionalism in the state of Manipur.*

**Methods:** *Questionnaire method was employed in this study. By distributing thirty-one (31) questions to 60 subjects, the responses were analyzed by descriptive technique of percentage.*

**Results:** *Hundred percent of the respondents support professional soccer in Manipur. The study indicated that professional soccer will help to improve the standard of the game in the state can contribute more for the nation. Introduction of District and State level football league lead the state toward right direction for the game in the national and international level. The study had drawn concrete views on the entry of outside players and coaches, development of infrastructures, improvement of officiating, planning for talent identification from the grass root or school level, provision of talent scholarship, efficient media coverage and more publicity, cooperation of concerned organizations or govt. departments, proper reflection of AIFF and FIFA's calendar etc. for the establishment of soccer professionalism in Manipur.*

**Conclusion:** *The conclusion may be drawn as that after the introduction of the State and National football league in the country, the players' financial and social status has improved and satisfied with their salaries to support their families. The clubs are putting more efforts in building and maintaining their regular team and the players are working hard to maintain their professional status. The national league and the*

Indian  
stand  
impac

Intro

sport  
mark  
one i  
now  
conti

it sta  
beca  
start

Fuss  
gam  
dent  
or a  
or c  
Me:

It w  
soc  
stru  
of  
mo  
soc  
its

coi  
an

*standard of soccer in the country, and AFC's India Vision program influence a great impact on the development of state soccer professionalism in Manipur.*

## **Introduction**

The game Soccer is the most popular and dominant one in the present scenario of sports world. It is apparently one of the oldest ancient games and sports ever known to mankind. Now, in the International sports arena, soccer is becoming increasingly professional one in each passing day that attracts billion eyes and charms billion hearts of the world. We now come across experts of various kinds who unearth every parts of the game and this continues to grow in number and specificity.

No one can imagine exactly when the football began. However, people believe that it started in remote time when man began started kicking on objects by chance and then became purposefully. Since that time, he found some pleasure in kicking and the game started in its rudest form.

The game soccer might be pronounced as Association Football, Soccer, Calcio, Fussball, Futbol, Futebol or any of dozens of other linguistic variants; now this is greatest game in the world and much more. This is people's highest passion. It includes the common denominator between nations of political and armed antagonism and makes an alternative or an accompaniment to the smile which breaks down barriers. People with no other social or cultural connection may like- Pele, Maradona, Zidane, Beckham, Figo, Ronaldo, young Messi etc. who work a charm or spell any more.

The World Cup 2002 was held at Japan and South Korea for the first time in Asia. It was a symbolic moment of showing how our Continent has moved forward towards soccer professionalism. Now a day, soccer has undergone a sea change in terms of its fee structure for signing players and coaches. Even the clubs in India are investing huge amount of money for engaging players and coaches for a season or more. The fact of pouring money for players and coaches by different clubs in India is a great leap forward towards soccer professionalism in India. However, the phenomenon of soccer professionalism is in its infancy in our sub-continent.

If the clubs in Manipur are also ready to introduce soccer professionalism and commercial soccer marketing system in the line of other popular clubs like in Bengal, Goa and others they have to follow the trend as done by those big clubs in India and it is only at

that time, we can match those big clubs. If professionalism is started in Manipur, we will be in a position to retain our talented players and above all can maintain and improve the standard of soccer as expected by all the soccer lovers. However, the sad story is that there is a wide gap between actual position of standard of soccer and expected soccer professionalism in Manipur. To find out the reasons of poor quality of soccer in terms of professionalism in the state and to suggest remedies to improve the same, we have to look into the mindset of the players, coaches, sports personalities, sport lovers, etc.

### Purpose of the Study

The purpose of the study was to assess an analytical survey of establishing soccer professionalism in the state of Manipur.

### Procedure

For the purpose of the study, 60 subjects among the categories of current players, ex-players, personalities of associations and clubs, and qualified referees, who are primarily responsible for establishing soccer professionalism in Manipur, were selected.

### Development and administration of Questionnaire:

Thirty-one (31) questionnaires were framed and developed under the supervision and consultation of experts, available references, literatures and relevant websites. Attempts were made to make the statements clear, relevant, simple and free from any ambiguity. The responses of the questions were either YES or NO and provisions were made on the appropriate statements according to their choice. The Questionnaires were distributed to 60 subjects and received personally. All the 60 subjects had given their responses.

The responses performing to each of the question were analyzed on descriptive technique of percentage.

### Analysis of Data and Findings of the Study

The data were analyzed on the collected responses through the administration of questionnaires to find out the mindset of subjects on establishment of soccer professionalism in Manipur. The responses pertaining to each of the question are analyzed in the following table-I.

Table

Sl	
1	De
2	De the
3	De le in
4	D af
5	D D
6	I h:
7	D M /S
8	D tr
9	C p
10	I c
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

**Table – I : Percentage Analysis of Establishing of Soccer Professionalism in Manipur**

Sl	Questions	Yes	%	No	%
1	Do you favour Professional Soccer in Manipur?	60	100	0	0
2	Do you think that Professional Soccer will help to improve the standard of the game in Manipur?	60	100	0	0
3	Do you feel that introduction of District/State level Soccer league is the right step toward right direction for the game in Manipur and India?	60	100	0	0
4	Do you feel that people are attracted toward Manipur soccer after the introduction of District/State level league?	60	100	0	0
5	Do you see new talents coming up after the introduction of District/State level Soccer league?	60	100	0	0
6	Do you feel that the standard of soccer in the State of Manipur has improved after the introduction of District/State level league?	60	100	0	0
7	Do you see any positive changes in the functioning of the All Manipur Football Association after the introduction of District /State level league?	57	95	3	5
8	Do you feel that clubs are putting more effort in building better teams after the introduction of District/State level league?	59	98.33	1	1.67
9	Can you see any tactical and strategically changes in the teams' performance after the introduction of District/State level league?	58	96.07	2	23.33
10	Does the State/District Association award any prize to winning clubs?	60	100	0	0
11	Do you think that the players earning has been increased since the introduction of District/State level league?	59	98.33	1	1.67
12	Do you feel that media coverage has improved for the introduction of District/State level league?	5	8.34	95	91.66
13	Do you feel that important football matches in Manipur are well covered by print media?	60	100	0	0
14	Are you satisfied with the coverage of important Football matches In Manipur by DDK, Imphal?	2	3.34	58	96.67
15	Are you satisfied with the standard of referees at District /State Level League?	33	55	27	45
16	Do you feel that referees need proper training for improving their performance?	60	100	0	0
17	Do you feel that better coaches from outside the State must be engaged to train Club/District/State Teams?	30	50	30	50
18	Do you feel that the players from outside the State will help to improve the standard of Soccer in Manipur?	57	95	3	5
19	Do you feel that the presence of coaches from outside the State will help to improve the standard of Soccer in Manipur?	57	95	3	5
20	Do the AMFA and YAS regularly organize tournaments for junior and sub-junior boys and girls?	60	100	0	0

21	Do you feel that better coaches from outside the State must be engaged to train Club/District/State Teams?	57	95	3	5
22	Do you feel that the AMFA is fair in selection of team members for the various national level Football Championships?	57	95	3	5
23	Are you satisfied with the functioning of AMFA?	45	75	15	25
24	Do you think the politicians are interfering in the affairs of AMFA and District Football Association?	52	86.67	8	13.43
25	Do the AMFA and YAS regularly organize coaching camp for juniors?	60	100	0	0
26	Do the AMFA, YAS and District Association provide any scholarship to young players?	6	10	54	90
27	Are the District Associations satisfied with the efforts of AMFA in developing soccer in all parts of the Manipur?	30	50	30	50
28	Do you feel that the infrastructures available in the state are standard for organizing regular soccer league matches?	15	25	45	75
29	Is the AMFA planning for the development of infrastructures and facilities?	10	16.67	50	83.33
30	Is the state govt. planning to develop more infrastructures and facilities?	40	66.67	20	33.33
31	Do you feel that most of the clubs possess their own grounds?	15	25	45	75

### Discussion of Findings

The finding of the study indicated that hundred percent of the respondents support professional soccer in the Manipur. It indicates that professional soccer will help to improve the standard of the game in the state. Introduction of District and State level soccer league is the right step toward right direction for the game in India not only in Manipur, and more people are attracted toward the game. Players of different clubs put more efforts in practice and competition. The study reveals that the standard of soccer in the state of Manipur has improved after the introduction of District and State level leagues. By the standardization of different league competitions, more potential of talented players can be predicted. The study further reveals that the winners are awarded prizes and the players have been starting earning more money, name, reputation and facilities than before.

Bulk of respondents reported that there are more positive changes in the functioning of All Manipur Football Association (AMFA) after the introduction of the state football league. AMFA and YAS (Youth Affairs and Sports) organize the coaching camps and tournaments for junior and sub-junior levels of both boys and girls regularly and maintain the fair means of selection for the teams to participate in the national level competitions. But,

Indie

AMF  
of in  
assoFoot  
from  
Mar  
regio  
misc  
in th  
etc.  
pro  
withmat  
mat  
Foc  
bro  
prit  
to agiv  
ent  
nat  
Mc  
anc  
entfor  
to  
pre



AMFA and YAS need to put new programmes for functioning on the view of development of infrastructure, provision of talent scholarship etc. with the collaboration of district associations unless any political interference.

Most of the respondents feel that the standard of officiating is poor at the State Football League. It is a fact that selection and training of referees in Manipur is suffering from many loopholes and their exposure to high level competition is almost nil. Moreover, in Manipur, referees from all parts of the state do not get equal experience because only a few regions in the state play competitive soccer and referees from non-competitive regions fall miserably. It indicates that selection and training of referees should be reviewed in Manipur in the norms and standard of FIFA. To conduct the clinics, workshops, refresher courses etc. may help referees in updating knowledge and interpretation of laws of the game and providing more exposure to referees of all parts of the country would help them to be at par with other referees where competitive soccer is played regularly.

Most of the respondents have comments that the coverage of state football league matches by D.D.K. Imphal is not satisfied because, they use few cameras to cover the match, which fails to attract viewers. Most of the respondents have suggested that the State Football League should be telecast live and exclusive, which can be given to a competent broadcaster. But, most of the professionals reported that they get good coverage in the print media after the introduction of state football league as the coverage has improved due to attraction of public in the state.

With due introduction of district and state level football league, players should be given bulk amount for the contract season and allowed outside players and coaches to entertain in the state. As these outside players and coaches with better game ability, will naturally improve the standard of the league in general, and Manipur players in particular. Moreover, the Manipur players will get good exposure while playing with the outside players and the outside players will popularize the league. By the way, coaches are competent enough to handle professional teams.

Further, most of the respondents draw the attention to the state govt. planning for the development of infrastructure and encourage the clubs to possess their own grounds to nurse the soccer kids up from the grass root level under the proper talent identification program for potential champion of tomorrow.

In order to take Manipur soccer to National standard, a complete overhaul of the system is required. The All Manipur Football Association should make a desired and impressive policy in the line of advance soccer states and countries to uplift the standard of the game and should be honest in the implementation to get the desired result. If changes are brought about by All Manipur Football Association in cooperation with the Youth Affairs and Sports, District soccer Associations, reputed Clubs and the State Government, soccer standard of the state is going to improve in the near future.

### Conclusion

Within the limitation of the present study, the conclusion may be drawn as that after the introduction of the State and National football league in the country, most of the players' financial and social status has improved and satisfied with their salaries and they can support their families with the income earned from soccer playing. It may also be concluded that the clubs are putting more efforts in building and maintaining their regular team after the introduction of professional soccer in the state. Again, entry of outsider players and coaches will increase the soccer standard many folds in the state league. The players are working hard to maintain their position in the team because competition among players has increased a lot after the introduction of state/district league in the Manipur. The standard of soccer in the country has improved after the introduction of the state and national leagues. People are in favour of soccer professionalism in the state. It may also be concluded that outsider players playing in the Manipur are not much popular. There are different football coaching programmes are carried out by the clubs, state and district associations for different age categories. AFC's India Vision – soccer talent development programs are conducting in all the districts. With the introduction of the state and district leagues, the local print media and TV network coverage have been improving. Recently, FIFA's inspection committee approved for the construction of artificial turf field at Imphal.

In the light of the discussion of findings, it is recommended that the soccer development program should be planned academically from the grass root at school level with mass participation. Features of soccer players and talent identification programs should be formulated for younger generations earlier in different parameters such as physical abilities, skill abilities, psychological balance, physiological workout, anthropometrical and body somatotyping.

### Refer

1. Baicl  
Tim
2. Brur  
the f
3. Dan  
inv  
Dis:
4. Dhi
5. Eric
6. FIF
7. Her
8. J. T.  
Pro
9. Joh
10. Jo  
the
11. M.  
Ha
12. P  
Qu
13. P  
lea
14. F  
W  
B
15. F
16. S  
Ja
17. 1  
fc
18. ' 1

## References

1. Baichung Bhutia, "The media is only concerned when cricketers are injured", The Sunday Times, New Delhi, (11<sup>th</sup> October 1998).
2. Bruno Goveas, "The national league for football does not provide the ultimate solution to the problem of Indian football," The Pioneer Publication, Mumbai (1996).
3. Danial Lawrence Cicconeli, "A review of the historical and sociological perspectives involved in the acceptance of soccer as a professional sports in the United States," Dissertation Abstracts International, 45:3( September 1984): 784 A.
4. Dhiman Sarkar, "No Grooming of Youngsters," *Sports* (May 1997).
5. Eric Pharbhakar, The war to Athletic Gold, Madras, East- West Ltd. (1995).
6. FIFA Magazine, (September 1998).
7. Herald Sport Watch, Pnaji (12<sup>th</sup> Feb. 1998).
8. J. Thomas Jable, "The Birth of Professional Football: Athletic Clubs in Pittsburgh Ring in Professionals 1892-1893," Abstracts of Research Payers (1976):45.
9. John Palmer, Superstars of the World Cup, Great Britain, Paragon (1998).
10. John Ross Schleppling, "A History of Professional Association Football in England during the Second World War," Dissertation Abstract International, 33:8 (Feb. 1973): 4159-A.
11. Maurice Goals Worthy, The Encyclopedia of Association football, London, Robert Hale Ltd. (1959).
12. Poul Governail, "The Professional Football player; his vocation status," Research Quarterly, 23:1 (March 1952).
13. Prasant Benarjee, "Attitude of the Senior Division Football Players of Calcutta Football league toward Professional," Unpublished Thesis, L.N.I.P.E.
14. Rajib Kunmare Ghosh, "Indian Football towards a New Era," Unpublished Project Work of Rest Graduate Diploma in Mass Communication and Journalism, University of Burdwon, 1997.
15. Ralph Hickok, New Encyclopedia of Sports, S. V. Soccer (1977 Ed.).
16. S. R. Suryanarayan, "Professional and Indian Football," Cited in the Editorial, International Jawaharlal Nehru Football Gold Cup, Souvenir (1997).
17. Thomas Hay Burneth, "An Assessment of the vocation and social status of professional football player," Dissertation Abstracts International, 35: (8<sup>th</sup> Feb. 1975): 5088-A.
18. V. Srivastav, "The roots in India Soccer," The Sunday Times, New Delhi, (23<sup>rd</sup> March 1997).

## “AN INTRODUCTION TO TANNUDU BANTI: A NEW BALL GAME OF ANDHRA PRADESH”

N.G. Reddy\*

\*Senior Lecturer  
Rayalaseema College of Physical Education  
Proddatur-516560, Y.S.R., (A.P.)

### Introduction:

Ours dates back famous Indian indigenous games like Kabaddi, Kho- Kho, Ball- Badminton, Atya Patya attracts a lot of sports persons at international sports arena. Now, a new ball game named ‘Tannudubanti’ from Andhra Pradesh state in India, after its mighty success with coaching camps at high school level in native kadapa district, is ready to attract sports lovers around globe.

Nadamala Gangadhara Reddy, a Novelist, Sports books writer and Senior lecturer in Library science at Rayalaseema College of physical education, Proddatur framed rules and invented Tannudubanti game in the year 2008. Dr.B.Ravi Sankar, Principal Rayalaseema College of Physical Education inaugurated First Tannudubanti match which was held among physical education trainees of the college on 21st Sep, 2008.

Tannudubanti is a chasing type team ball game. It is simple and inexpensive game. By just having a ball, it entertain thirty players at a once. By playing this game one has get Physically fitness, Stamina, Endurance, Speed and posses discipline, leadership qualities, Obedience, Social mobility, Sportsmanship.

Tannudu banti game name is derived from the Telugu language of Andhra Pradesh. The word “Tannudu” means ‘kick with foot’ and “Banti” means ‘Ball’. So Tannudubanti means “Kick the ball with foot” or “Kickball” in English. In the inventory trail matches, while his new game in progress the inventor noticed that due to this game has four goal corners, the native telugu players are frequently hitting the ball by saying loudly ‘thannara banti’ in telugu language. On February 21<sup>st</sup>, 2010 on the eve of International Mother Language day a renowned Telugu scholar of Proddatur town Sri Ginka Subramanyam garu officially named this game in Telugu language as “Tannudu banti” game. Some may used to call this game in English as “kickball” or “kikbol”.

### 2. How to play Tannudu banti Game:

Tannudu banti game is a chasing type ball game like cricket. It is played by two teams of fifteen players (10 Players +5 Substitutes) each in a 52metre square shaped play field.

Indian  
There  
one in  
and se  
team.  
In the  
minu  
innin  
in the  
The s  
from  
playe  
Kick  
in th  
circl  
mor  
own  
If a  
awa  
goa  
the  
ma  
and  
hit  
goe  
per  
the  
Wi  
A  
se  
Ge  
sic  
the

There are four goal area corners, one each in a corner. A match will consist of two innings, one innings per team, and each inning being limited to 40 minutes duration. Between the first and second innings there is a 15 minutes interval. Each inning consists of goalling and stopping team.

In the toss, Goalling elected team has to score as many as goals as they can in their first 40 minutes inning time and the other team tries to prevent goals as stoppers. In the second inning first inning goallers play as Stopper and the stoppers of the first inning play as goallers in the second inning.

The Square shape Tannudu banti play field consists of a circle in the middle. Four players from each team should play the ball with hands only within the circle as 'circle players'. Six players from each team should play the ball with legs as 'field players' out side circle.

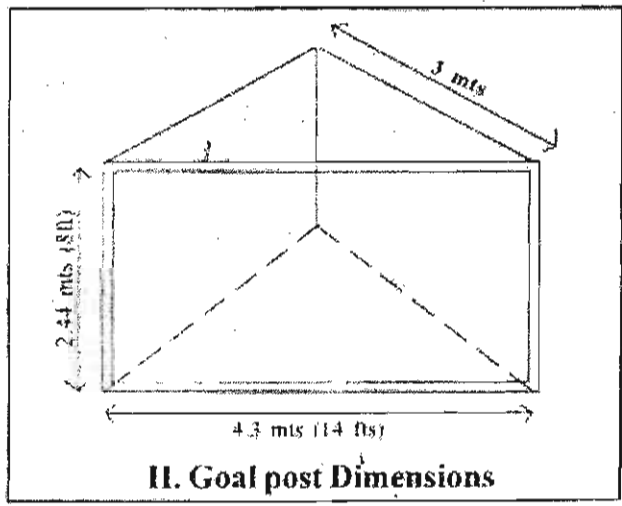
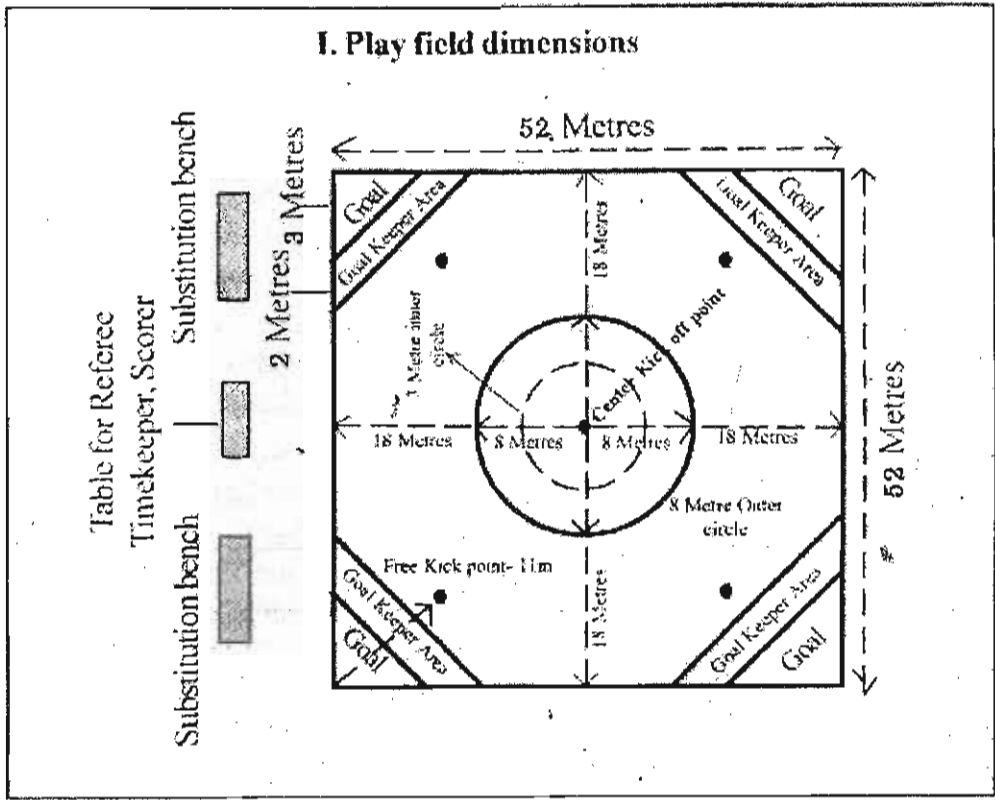
Kickoff will start at the center point of the circle by the one of the goaller among four goaller in the circle. At least one pass is needed among the circle goaller to send the ball out off the circle in to the hands of their field goaller. After catching the ball by any one field goaller not more than three seconds and not more than three steps he has to change the ball in to his own legs. Then he goes for goalling in any goal corner of play field.

If a single field goaller made a goal, it is called as Thrible goal score. For this three goals awarded for him and to the team score. If more than one field goaller involved in making a goal, it is called as Double goal score. For this two goals awarded for the final kicker and to the team score. If any field stopper involved in play the ball at any time before field goaller made a goal, it is called as Single goal. For this one goal score is awarded for final kicker and to the team score. Extra one goal score is awarded to the goaller team, if field stoppers hit the ball out side boundaries or in to the circle. One self goal score is awarded to the goaller team, if the field stoppers hit the goal by them self. It is treated as Self goal. For a penalty, a free kick is awarded to the goaller team from 11 meters, it fetches thrible goal to the goaller side if they convert in to goal.

#### **Winners:**

A match is won by the team which shall have scored a total of goals in excess of that goals scored by the opposing team in its completed innings. For Example, if A team choose Goalling in the toss and scored 38 goals in their respective 40 minutes first inning. The other side B teams in their second inning for win the match, they have to Score 39 goals otherwise they lost the match.

DEFINT



is a spc the sta oth wa Fra chu wit do the etc cu reg att or th

De

be m ar ou

## **DEMAND FOR FOOTBALL ATTENDANCE AND THE INTEREST OF THE STAKEHOLDER**

Asish Paul\*

\*Assistant Professor,  
State Institute of Physical Education for Women,  
Calcutta University  
Hastings House, Alipore, Kolkata- 700027, W.B.

### **ABSTRACT**

The demand of performance and the structure of the spectators is an ever-changing concept which ultimately affects the economy of sports. The different demand shifters and the alternatives influence the attendance in football field and control the interest of the stakeholders. Here in this study the attendance structure and several others related matters of East Bengal & Mohun Bagan club of India was discussed in comparison with the main five leagues of England, France, Italy, Germany and Spain. The Average attendance of different clubs of the said five countries and their performance were given with the two Indian club. Different demographical studies also were done. It has found that the no. of attendance and the performance of the clubs were related. The price, team performance, attendance etc. tends to reflect the interpretation of demand function. Social, cultural, ethnic and religious factors also play an important role regarding the supporters. Different facilities also influence the attendance. There were different demand shifters, the alternatives or substitutes. The standard of the performance can also be judged through the attendance structure.

### **Demand for Football attendance and the interest of the Stakeholder**

Professional football characteristics as a sport have always been linked inextricably with its attributes as a business, but never more so than at present. Complaints are aired regularly in the media and elsewhere that players are overpaid; that the transfer market is out of control; That shareholder's priorities are over-riding the

interests of supporters; that exorbitant ticket prices are driving long-standing spectators away from football; and that the priorities of televisions are dictating both the strategic and the operational decisions of football clubs and the sport's organizing bodies. Horton (1997) voice a typical supporter's concerns over a wide range of matters of this kind, all of which are essentially issues of economies, commerce or finance.

In South Asian countries especially in India till today it has remained in its amateurism concept in football. Although the cascading effect of Indian economy has engulfs the other sector except the sports. Indian football now a day is running with the help of donations, member's subscriptions, and gate sale and sometimes with the private / personal interest, as Vijay Malia donated East Bengal club & Mohun Bagan club 3 crore each. But there is no business in soccer. No marketing policy here today. We will concentrate our discussion with a comparison of East Bengal & Mohun Bagan, the two Kolkata giants of IFA, with the main five leagues in the world i.e., English Premier League, French league, Serie-A Italy, Bundeshliga and Spanish league in respect of the attendance structure and several others related matter

Now-a-days sports can be considered as a production sector where the products in the form of services are Beauty of Athletic Prowess, Commonality, Thrill of Victory and Absolute and relative team quality. Scarcity makes the economic world go round. Scarcity leads to rationing and rationing leads to competitions. Although the press usually portrays owners in pursuit of fan dollars, it actually is a two-way street; Sports fan demand the individual and team output and are willing to pay for it.

There are many rationing devices but the most prominent is price. If fans are willing to pay ticket prices, they get to see the sports event. The more fans in a given location that are willing to pay for quality, the higher quality of the team they will get to enjoy. Farther, as long as fans pay a price through product purchases, advertisers will give media providers (networks, cable and satellite stations) the financial incentive to put sports on television.

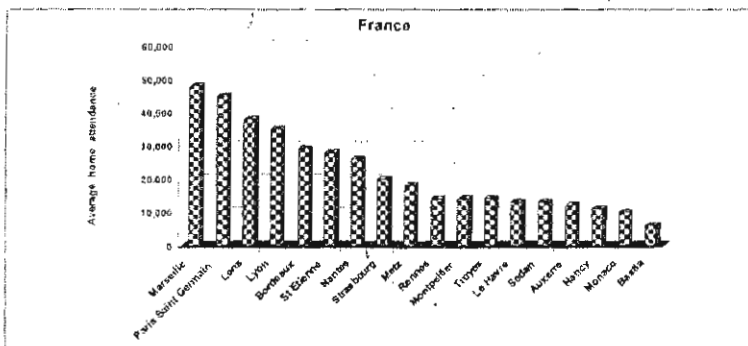


**The commercial attendance structure of Europe's "Big Five" football league.**

**FIGURE 1**



**Figure - 2**



**Figure-3**

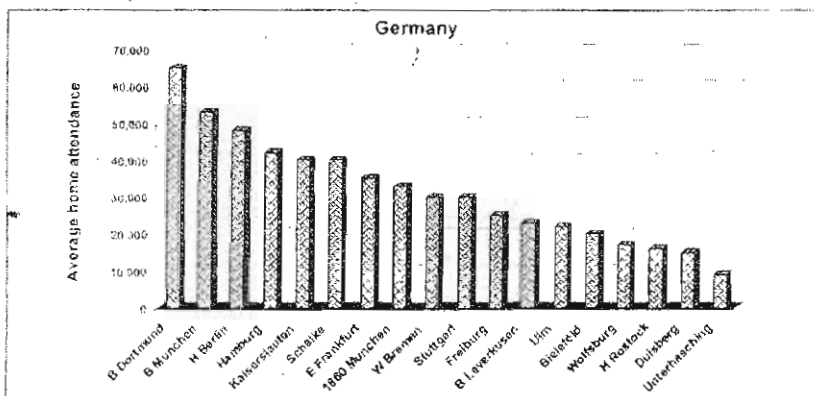


Figure -4

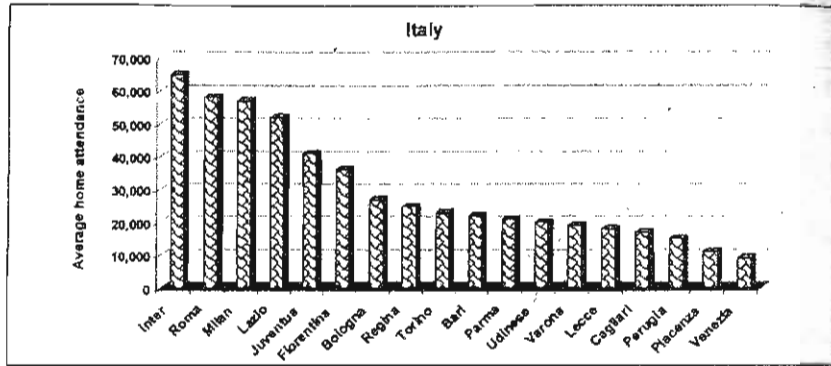


Figure -5

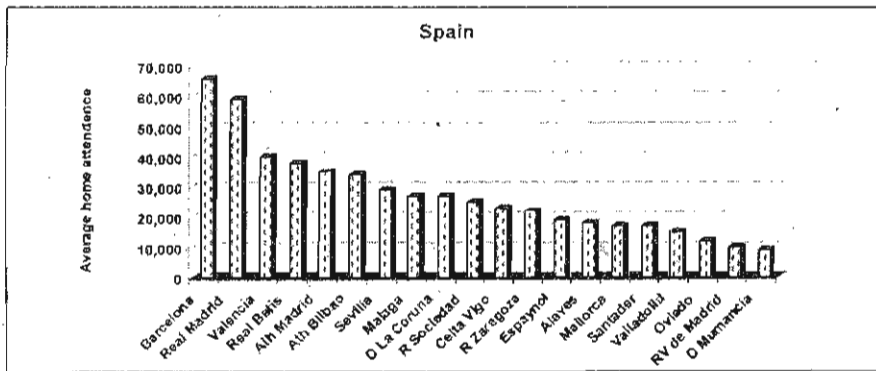


Fig. (1-5) shows the average home league attendance of top div. club in each country of England, France, Germany, Italy and Spain respectively for the last season (2006). Three clubs achieved average home attendance above 60,000: Internazionale (65,930), Barcelona (65,526) and Borussia Dortmund (64,535). Four more fell just short of the 60,000 mark: Real Madrid (59,316), Roma (58,915), Ac Milan (58,376) and Manchester United (58,017). Average attendances across all first div. clubs were very similar in Germany (31,882), England (30,707), and Italy (29,887) but were somewhat lower in Spain (26,984) and France (21,861). Beside this in second div. average were 14,149 (England), 12,165 (Germany), 8688 (Italy), 6,577 (Spain) and 5,692 (France).

Ta  
Fo

Ta  
K  
I  
I  
L  
6

**Table-1: The home league attendance of two soccer club of Kolkata in National Football League – 2007**

<b>EAST BENGAL</b>	<b>MOHUNBAGAN</b>
21/01/07- 1,859	20/11/07- 2,915
24/02/07- 4,095	18/02/07- 2,554
27/02/07- 15,710	23/02/07- 4,096
21/03/07- 2,270	24/03/07- 1,122
24/03/07- 573	29/03/07- 869
04/04/07- 404	02/04/07- 632
07/04/07- 1,941	05/04/07- 624
15/05/07- 208	15/04/07- 16,720

**Table-2: the average home league attendance in Indian Football Association League, Kolkata – 2007**

<b>EAST BENGAL</b>	<b>MOHUNBAGAN</b>
15,000(in Kolkata Maidan home ground)	22,000(in Kolkata Maidan home ground)
1,00,000(in Salt Lake Stadium)	1,00,000(in Salt Lake Stadium)
60,000(in Salt Lake Stadium)	70,000(in Salt Lake Stadium)

According to above picture depicted it is very clear that the products quality in India is very poor. As we can consider that the FIFA ranking of the said five European league countries almost ranging from 1 to 15 whereas the Indian position frequently moves around 150. Only the two Kolkata giant have taken into consideration. Besides these two there are several other clubs such as Mahindra in Mumbai, J.C.T. in Punjab, Dempo, Churchill Brothers, Vasco and Salgaoncar in Goa, Vive Keral in Kerala etc. But their attendance is also very poor in respect of East Bengal and Mohun Bagan.

Besides these there are specific demand shifters now a day such as, Preferences of sports fan tastes (especially for team qualities), Fans income, The price of other goods fan enjoy, Fan expectations about the future, Population in a team's city.

There is also no record system from where the specific conclusions may be done. According to data published by World screen (June 2000), the estimated total revenue of clubs in the English Premier league for the 2000 seasons was around £530 million (app). The others are as Italy - £430 million (app.), Spain - £380 million (app.), Germany- £360 million (app.), France - £230 million (app.), India- \$1.7 million (app.)

EPL is the wealthiest of the big five leagues.

All the European clubs are also some way ahead of most of their continental rivals in term of their ability to generate merchandising revenues, charging high ticket prices, promoting title sponsorship, co-sponsorship, asstt. Sponsorship, logo selling etc. Broadcasting is another area where the maximum revenue generates. Estimates of total television income for the 2000 season were £200 million (England), £210 million (France), £105 million (Germany), £260 million (Italy) and £190 million (Spain). Here in India it was almost \$ .1 million. Besides this the clubs also made an income according to their appearance in national league from the television right. In English premier league contract with BSKYB Per year £15 million depending to the no. of appearance of the premier league winner.

By allowing out-of-contract players complete freedom of movement within EU boundaries in the year 1995 was established and the clubs were able to fielding more than there foreign nationals in the same team at the same time. This change has enabled clubs to recruit players from beyond national boundaries to a far greater extent than ever before. In India only maximum three players can play from abroad (Max. Brazilian, Nigerian)

**Table 3: The team's performance (1960-2006)**

CLUBS	NATIONAL LEAGUE	LOCAL MAJOR LEAGUE
Manchester United, England	07	08
Liverpool, England	13	05
Arsenal, England	04	04
A.C.Milan, Italy	09	-
R. Madrid, Spain	21	-
East Bengal, India	03	25
Mohun Bagan, India	03	20

Hart, Hutton and Sharot (1975) published the first econometric analysis of patterns of attendance at English football matches. At the same time Demmert (1973) published an investigation of US baseball attendances while Noll (1974) compared the determinants of attendances at four US professional team sports: baseball, basketball, football and hockey.

Cairns (1990) have written a comprehensive review of the literature from the 1970s and 1980s, but in India this type of recordings or analysis never done.

Attendance data, usually announced by the home club while the match is in progress, published in the following days newspapers and subsequently collected in annual statistical publications. Unfortunately there is no scope in our country except only with the idea to count from the commentators or take the statistics of the daily newspaper. There are several sources of attendance in India such as the daily ticket holder, season ticket holder, club members, media members, police personnel, Govt. employees, Association donor member and other unauthorized person. In an important or significant match although it is not difficult to assess but in case of insignificant matches the attendance no. can no longer be interpreted as a meaningful measure of demand.

Demographic and geographic determinants of attendance are to be considered here. The geographical location and its population must influence in its home match such as the Manchester United, Barcelona, and A.C. Milan etc. In India the East Bengal club forms almost leading historical segmentation. They are changing the "psychological unification" of their supporters who have some same feeling as they suffer from Bangladesh after partition. Whereas the Mohun Bagan supporters are the inborn habitants of West Bengal. The river Ganges influence a lot in this mental partition. The geographical distance, conveyance, infrastructural facilities influence a lot to the supporters to attend a match. Hart, Hutton and Sharot (1975), and by most other researches, to allow for the positive local derby effect on attendances, and the negative effect of long distances on the propensity of away supports to attend.

The socio-economic and demographic factors such as the age structure, earnings and unemployment and the strength of club's historical record or traditions, its success over the long term in building up a base level of support in the local or wider community also influence a lot in case of the spectator attendance. Bainbridge, Cameron and Dawson (1996) include regional unemployment and linear and quadratic terms in earnings and admission price in an English Premier League match-attendance equation for the 1994 season. The said factors are very much applicable in case of Indian football as the poor socio-economic condition and unemployment expected that the local club matches in IFA premier league in Kolkata the attendance in club ground is far more than salt lake stadium. There are different other factor which influence on attendance such as the variations in the weather, the effect of team racial composition, the specific religion (such as Mohammedan Sporting), live broadcasts on television etc.

### Conclusions

Attendance data is a measure of demand which ultimately indicate the team's performance and vice versa. The possibility of multi-directional causality between variables such as price, team performance and attendance tend to reflect the interpretation of demand function. Broader social, cultural, ethnic and religions influences also play an important part in determining the size and composition of the crowds. The infrastructural facilities, the enjoyment facilities also influence the attendance. Different demand shifter, the alternatives or substitutes should be taken into considerations. The much higher no. of attendance in foreign league than India simply signifies their much better performance and vice versa. The Fiscal status also indicates the no. of fans / supporters and their involvement with their favorite club.

### References:

1. Atkinson, S.E., Stanley, L.R. and Tschirhart, J. (1988) Revenue sharing as an incentive in an agency problem: an example from the National Football League, RAND journal of Economics.
2. Carling Opta (1999) Football Yearbook 1999-2000, London: Carlton (2000) Football Yearbook 2000-2001, London: Carlton
3. Dobson, S. and Goddard, J. "The economics of Football".
4. India football Association, Kolkata.
5. The King Fisher East Bengal, Maidan, Kolkata.
6. The McDowell Mohunbagan, Maidan, Kolkata.
9. <http://www.football.sportsites.co.uk/>

Ed  
int  
Ex  
bia

Ph  
to  
the  
the  
cor

dat  
Inc  
Re

Su

Al  
the  
1.

A  
in  
cor  
cor  
and

2.  
M  
CI  
Ye

## GUIDELINES FOR CONTRIBUTORS

The Indian Journal of Yoga, Exercise & Sport Science and Physical Education (IJYESSPE) is a peer reviewed journal with national and international circulation. It publishes original communications of Yoga, Exercise & Sport Science and Physical Education research. It is issued biannually (May and November).

Manuscripts dealing with Yoga, Exercise & Sport Science and Physical Education area will be considered for publication. Articles need to be of general interest or are of sufficient novelty and importance that the journal's readers, whatever their speciality, should be made aware of the findings. Research papers reporting original research, review articles, correspondence on published articles will be considered.

The IJYESSPE strongly discourages duplication/reduplication of data already published in other journals IJYESSPE is mostly follow the Indian Journal of Medical Research(IJMR), Indian Council of Medical Research (ICMR) guidelines.

### Submission of manuscript

All manuscripts submitted for publication to the IJYESSPE should include the following:

#### 1. Covering letter

A covering letter which could explain why the paper should be published in the IJYESSPE. One of the authors could be identified as the corresponding author of the paper, who would be responsible for the contents of the paper as also answer. Corresponding author's phone no and email no should be included.

#### 2. MANUSCRIPT

Manuscripts can be submitted by e-mail. Typescripts in triplicate with CD should be sent to Dr. Samiran Mondal, Editor, The Indian Journal of Yoga, Exercise & Sport Science and Physical Education, Department of

Physical Education, Visva-Bharati University, Santiniketan-731235, West Bengal, India. Phone No: 09434220938(M), 03463-265070(R) Email – ijyesspe@gmail.com . Authors are advised to see a recent issue of the journal to get familiar with the format adopted on various elements of a paper.

Manuscripts should be presented in as concise a form as possible, typewritten in double space on one side of a good quality paper. Pages should be numbered consecutively and the contents arranged in the following order:- **Title; Name(s) of the author(s); Department(s) and Institution(s); Abstract; Key words; Introduction; Material & Methods; Results; Discussion; Acknowledgement; and References.**

#### **Title**

Title of the article should be short, continuous. Broken, abbreviated or hyphenated titles are *not* acceptable and yet sufficiently descriptive and informative so as to be useful in indexing and information retrieval. A short running title not exceeding 6-7 words may also be provided in every page.

#### **Abstract**

*All manuscripts should have a structured abstract (of about 250 words) with subheadings of background, aim, methods, results, interpretation and conclusions.* Abstract should be brief and indicate the scope and significant results of the paper. It should only highlight the principal findings and conclusions so that it can be used by abstracting services without modification. A set of suitable key words arranged alphabetically may be provided.

#### **Introduction**

Introduction should be brief and state precisely the scope of the paper. Review of the literature should be restricted to reasons for undertaking the present study and provide only the most essential background.

#### **Material & Methods**

The nomenclature, the source of material and equipment used, with the

Indian  
ma  
proc  
repr  
suff  
be j  
any  
on l  
proc  
by t  
  
finc  
nec  
stat  
con  
unc  
emj  
**Re**  
  
anc  
dat  
dev  
noi  
em  
in t  
on  
**Ta**  
  
nu  
be  
me  
St:



manufacturers details in parenthesis, should be clearly mentioned. The procedures adopted should be explicitly stated to enable other workers to reproduce the results, if necessary. New methods may be described in sufficient detail and indicating their limitations. Established methods can be just mentioned with authentic references and significant deviations, if any given, with reasons for adopting them. While reporting experiments on human subjects and animals, it should be clearly mentioned that procedures followed are in accordance with the ethical standards laid down by the national bodies or organizations of the particular country.

The statistical analysis done and statistical significance of the findings when appropriate, should be mentioned. Unless absolutely necessary for a clear understanding of the article, detailed description of statistical treatment may be avoided. Articles based heavily on statistical considerations, however, need to give details particularly when new or uncommon methods are employed. Standard and routine statistical methods employed need to give only authentic references.

### **Results**

Only such data as are essential for understanding the discussion and main conclusions emerging from the study should be included. The data should be arranged in unified and coherent sequence so that the report develops clearly and logically. Data presented in tables and figures should *not* be repeated in the text. Only important observations need to be emphasized or summarised. The same data should not be presented both in tabular and graphic forms. Interpretation of the data should be taken up only under the Discussion and *not* under Results.

### **Tables and Figure**

Tables and Figure should be presented in the appropriate place and numbered consecutively with Roman numerals (I, II, III, *etc*). They should bear brief title and column headings should also be short. Units of measurement should be abbreviated and placed below the headings. Statistical measurement variations such as SD and SE should be identified.

Inclusion of structural formulæ in Tables should be avoided. Also, Tables should not be submitted as photographs.

### Discussion

The discussion should deal with the interpretation of results without repeating information already presented under Results. It should relate new findings to the known ones and include logical deductions. It should also mention any weaknesses of the study.

The conclusions can be linked with the goals of the study but unqualified statements and conclusions not completely supported by the data should be avoided. Recommendations may be included as part of the Discussion, only when considered absolutely necessary and relevant.

### Acknowledgment

Acknowledgment should be brief and made for specific scientific/technical assistance and financial support only and *not* for providing routine departmental facilities and encouragement or for help in the preparation of the manuscripts (including typing or secretarial assistance etc.).

### References

The total number of References should normally be restricted to a maximum of 30. References to literature cited should be numbered consecutively and placed at the end of the manuscript. In the text they should be indicated above the line (superior). As far as possible mentioning names of author(s) under references should be avoided in text.

**Articles in Journals:** The titles of the journals should be abbreviated according to the style used by the *Index Medicus*. The list of journals indexed, published annually, in the January issue of the *Index Medicus* may be consulted.

#### 1. *Standard journal article*

List the first six authors followed by et al.

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. *N Engl J Med.* 2002;347:284-7.

More than six authors:

2.

3.

4.

6.

7.

8.

9.

Rose ME, Huerbin MB, Melick J, Marion DW, Palmer AM, Schiding JK, et al. Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. *Brain Res.* 2002;935(1-2):40-6.

2. *Organization as author*

Diabetes Prevention Program Research Group. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. *Hypertension.* 2002;40(5):679-86.

3. *Both personal authors and an organization as author*

Vallancien G, Emberton M, Harving N, van Moorselaar RJ; Alf-One Study Group. Sexual dysfunction in 1,274 European men suffering from lower urinary tract symptoms. *J Urol.* 2003;169(6):2257-61.

4. *No author given*

21st century heart solution may have a sting in the tail. *BMJ.* 2002;325(7357):184.

5. *Article not in English*

Ellingsen AE, Wilhelmsen I. Sykdomsangst blant medisins- og jusstudenter. *Tidsskr Nor Laegeforen.* 2002;122(8):785-7.

6. *Volume with supplement*

Geraud G, Spierings EL, Keywood C. Tolerability and safety of frovatriptan with short- and long-term use for treatment of migraine and in comparison with sumatriptan. *Headache.* 2002;42 Suppl 2:S93-9.

7. *Issue with supplement*

Glauser TA. Integrating clinical trial data into clinical practice. *Neurology.* 2002;58(12 Suppl 7):S6-12.

8. *Volume with part*

Abend SM, Kulish N. The psychoanalytic method from an epistemological viewpoint. *Int J Psychoanal.* 2002;83(Pt 2):491-5.

9. *Issue with part*

Ahrar K, Madoff DC, Gupta S, Wallace MJ, Price RE, Wright KC. Development of a large animal model for lung tumors. *J Vasc Interv Radiol.* 2002;13(9 Pt 1):923-8.

- |     |   |                    |
|-----|---|--------------------|
| 10. | <i>Issue with no volume</i><br>Banit DM, Kaufer H, Hartford JM. Intraoperative frozen section analysis in revision total joint arthroplasty. Clin Orthop. 2002;(401):230-8.   | 18.                |
| 11. | <i>No volume or issue</i><br>Outreach: bringing HIV-positive individuals into care. HRSA Careaction. 2002 Jun:1-6.  |                    |
| 12. | <i>Pagination in roman numerals</i><br>Chadwick R, Schuklenk U. The politics of ethical consensus finding. Bioethics. 2002;16(2):iii-v.   | <b>Book</b><br>19. |
| 13. | <i>Type of article indicated as needed</i><br>Tor M, Turker H. International approaches to the prescription of long-term oxygen therapy [letter]. Eur Respir J. 2002;20(1):242.<br>Lofwall MR, Strain EC, Brooner RK, Kindbom KA, Bigelow GE. Characteristics of older methadone maintenance (MM) patients [abstract]. Drug Alcohol Depend. 2002;66 Suppl 1:S105. | 20.<br>21.         |
| 14. | <i>Article containing retraction</i><br>Feifel D, Moutier CY, Perry W. Safety and tolerability of a rapidly escalating dose-loading regimen for risperidone. J Clin Psychiatry. 2002;63(2):169. Retraction of: Feifel D, Moutier CY, Perry W. J Clin Psychiatry. 2000;61(12):909-11.  | 22.                |
| 15. | <i>Article retracted</i><br>Feifel D, Moutier CY, Perry W. Safety and tolerability of a rapidly escalating dose-loading regimen for risperidone. J Clin Psychiatry. 2000;61(12):909-11. Retraction in: Feifel D, Moutier CY, Perry W. J Clin Psychiatry. 2002;63(2):169.  | 23.                |
| 16. | <i>Article republished with corrections</i><br>Mansharamani M, Chilton BS. The reproductive importance of P-type ATPases. Mol Cell Endocrinol. 2002;188(1-2):22-5. Corrected and republished from: Mol Cell Endocrinol. 2001;183(1-2):123-6.  | 24.                |
| 17. | <i>Article with published erratum</i>   | 25.                |

Malinowski JM, Bolesta S. Rosiglitazone in the treatment of type 2 diabetes mellitus: a critical review. Clin Ther. 2000; 22(10):1151-68; discussion 1149-50. Erratum in: Clin Ther 2001;23(2):309.

18. *Article published electronically ahead of the print version*

Yu WM, Hawley TS, Hawley RG, Qu CK. Immortalization of yolk sac-derived precursor cells. Blood. 2002 Nov 15;100(10):3828-31. Epub 2002 Jul 5.

**Books and Other Monographs**

19. *Personal author(s)*

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

20. *Editor(s), compiler(s) as author*

Gilstrap LC 3rd, Cunningham FG, VanDorsten JP, editors. Operative obstetrics. 2nd ed. New York: McGraw-Hill; 2002.

21. *Author(s) and editor(s)*

Breedlove GK, Schorfheide AM. Adolescent pregnancy. 2nd ed. Wiecezorek RR, editor. White Plains (NY): March of Dimes Education Services; 2001.

22. *Organization(s) as author*

Royal Adelaide Hospital; University of Adelaide, Department of Clinical Nursing. Compendium of nursing research and practice development, 1999-2000. Adelaide (Australia): Adelaide University; 2001.

23. *Chapter in a book*

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

24. *Conference proceedings*

Harnden P, Joffe JK, Jones WG, editors. Germ cell tumours V. Proceedings of the 5th Germ Cell Tumour Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer; 2002.

25. *Conference paper*

Christensen S, Oppacher F. An analysis of Koza's computational

effort statistic for genetic programming. In: Foster JA, Lutton E, Miller J, Ryan C, Tettamanzi AG, editors. Genetic programming. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3-5; Kinsdale, Ireland. Berlin: Springer; 2002. p. 182-91.

30.

26. *Scientific or technical report*

31.

Issued by funding/sponsoring agency:

Yen GG (Oklahoma State University, School of Electrical and Computer Engineering, Stillwater, OK). Health monitoring on vibration signatures. Final report. Arlington (VA): Air Force Office of Scientific Research (US), Air Force Research Laboratory; 2002 Feb. Report No.: AFRLSRBLTR020123. Contract No.: F496209810049.

Issued by performing agency:

Russell ML, Goth-Goldstein R, Apte MG, Fisk WJ. Method for measuring the size distribution of airborne Rhinovirus. Berkeley (CA): Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division; 2002 Jan. Report No.: LBNL49574. Contract No.: DEAC0376SF00098. Sponsored by the Department of Energy.

27. *Dissertation*

32.

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertation]. Mount Pleasant (MI): Central Michigan University; 2002.

28. *Patent*

33.

Pagedas AC, inventor; Ancel Surgical R&D Inc., assignee. Flexible endoscopic grasping and cutting device and positioning tool assembly. United States patent US 20020103498. 2002 Aug 1.

Un

34.

**Other Published Material**29. *Newspaper article*

Tynan T. Medical improvements lower homicide rate: study sees drop in assault rate. The Washington Post. 2002 Aug 12;Sect. A:2 (col. 4).

30. *Audiovisual material*

Chason KW, Sallustio S. Hospital preparedness for bioterrorism [videocassette]. Secaucus (NJ): Network for Continuing Medical Education; 2002.

31. *Legal Material*

Public law:

Veterans Hearing Loss Compensation Act of 2002, Pub. L. No. 107-9, 115 Stat. 11 (May 24, 2001).

Unenacted bill:

Healthy Children Learn Act, S. 1012, 107th Cong., 1st Sess. (2001).

Code of Federal Regulations:

Cardiopulmonary Bypass Intracardiac Suction Control, 21 C.F.R. Sect. 870.4430 (2002).

Hearing:

Arsenic in Drinking Water: An Update on the Science, Benefits and Cost: Hearing Before the Subcomm. on Environment, Technology and Standards of the House Comm. on Science, 107th Cong., 1st Sess. (Oct. 4, 2001).

32. *Map*

Pratt B, Flick P, Vynne C, cartographers. Biodiversity hotspots [map]. Washington: Conservation International; 2000.

33. *Dictionary and similar references*

Dorland's illustrated medical dictionary. 29th ed. Philadelphia: W.B. Saunders; 2000. Filamin; p. 675.

**Unpublished Material**34. *In press*

(Note: NLM prefers "forthcoming" because not all items will be printed.)

Tian D, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. Proc Natl Acad Sci U S A. In press 2002.

**Electronic Material**35. *CD-ROM*

Anderson SC, Poulsen KB. Anderson's electronic atlas of hematology [CD-ROM]. Philadelphia: Lippincott Williams & Wilkins; 2002.

36. *Journal article on the Internet*

Aboud S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs [serial on the Internet]. 2002 Jun [cited 2002 Aug 12];102(6):[about 3 p.]. Available from: <http://www.nursingworld.org/AJN/2002/june/Wawatch.htm>

37. *Monograph on the Internet*

Foley KM, Gelband H, editors. Improving palliative care for cancer [monograph on the Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9]. Available from: <http://www.nap.edu/books/0309074029/html/>.

38. *Homepage/Web site*

Cancer-Pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources, Inc.; c2000-01 [updated 2002 May 16; cited 2002 Jul 9]. Available from: <http://www.cancer-pain.org/>.

39. *Part of a homepage/Web site*

American Medical Association [homepage on the Internet]. Chicago: The Association; c1995-2002 [updated 2001 Aug 23; cited 2002 Aug 12]. AMA Office of Group Practice Liaison; [about 2 screens]. Available from: <http://www.ama-assn.org/ama/pub/category/1736.html>

40. *Database on the Internet*

Open database: Who's Certified [database on the Internet]. Evanston (IL): The American Board of Medical Specialists. c2000 - [cited 2001 Mar 8]. Available from: <http://www.abms.org/newsearch.asp>  
 Closed database: Jablonski S. Online Multiple Congenital Anomaly/Mental Retardation (MCA/MR) Syndromes [database on the Internet]. Bethesda (MD): National Library of Medicine (US). c1999 [updated 2001 Nov 20; cited 2002 Aug 12]. Available from: <http://www.nlm.nih.gov/mesh/>

41.

3. AU

at the  
not p  
Partic  
does  
also r  
concl

4. UN

speci  
sequē  
name  
was c  
and  
Unde  
and v  
with  
respc  
recog



jablonski/syndrome\_title.html

41. *Part of a database on the Internet*

MeSH Browser [database on the Internet]. Bethesda (MD): National Library of Medicine (US); 2002 - [cited 2003 Jun 10]. Meta-analysis; unique ID: D015201; [about 3 p.]. Available from: <http://www.nlm.nih.gov/mesh/MBrowser.html> Files updated weekly.

MeSH Browser [database on the Internet]. Bethesda (MD): National Library of Medicine (US); 2002 - [cited 2003 Jun 10]. Meta-analysis; unique ID: D015201; [about 3 p.]. Available from: <http://www.nlm.nih.gov/mesh/MBrowser.html> Files updated weekly.

### 3. **AUTHORS' CONTRIBUTIONS**

All authors are encouraged to specify their individual contributions at the bottom of the title page or on a separate page. The IJYESSPE will not publish an item unless it has the signatures of all the authors. Participation solely in the acquisition of funding or the collection of data does not justify authorship. General supervision of the research group is also not sufficient for authorship. Any part of an article critical to its main conclusions must be the responsibility of at least one author.

### 4. **UNDERTAKING BY AUTHOR(S)**

It is necessary that all the authors give an undertaking (in the format specified by the journal) indicating their consent to be co-authors in the sequence indicated on the title page. Each author should give his or her names as well as the address and appointment current at the time the work was done, plus a current address for correspondence including telephone and fax numbers and email address. A senior author may sign the Undertaking by Authors for a junior author who has left the institution and whose whereabouts are not known and take the responsibility. A paper with corporate (collective) authorship must specify the key persons responsible for the article; others contributing to the work should be recognized separately.

### Undertaking by Authors

We, the undersigned, give an undertaking to the following effect with regard to our article entitled “

6. \_

7. \_

8. \_

Imp

(i).

submitted for publication in the **Indian Journal of Yoga, Exercise & Sport Science and Physical Education :-**

1. The article mentioned above has not been published or submitted to or accepted for publication in any form, in any other journal.

(ii).

2. We also vouchsafe that the authorship of this article will *not* be contested by anyone whose name(s) is/are not listed by us here.

(iii)

3. I/We declare that I/We contributed significantly towards the research study *i.e.*, (a) conception, design and/or analysis and interpretation of data and to (b) drafting the article or revising it critically for important intellectual content and on (c) final approval of the version to be published.

5. C

4. I/We hereby acknowledge IJYESSPs **conflict of interest** policy requirement to scrupulously avoid direct and indirect conflicts of interest and, accordingly, hereby agree to promptly inform the editor or editor’s designee of any business, commercial, or other proprietary support, relationships, or interests that I/We may have which relate directly or indirectly to the subject of the work.

wh  
hav  
cor  
eac

5. I/We also agree to the authorship of the article in the following sequence:-

Th  
ma

Authors’ Names (in sequence)

Signature of Authors

CC

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_

\_\_\_\_\_

5. \_\_\_\_\_

\_\_\_\_\_

Ed  
De  
73

6. \_\_\_\_\_  
7. \_\_\_\_\_  
8. \_\_\_\_\_

**Important**

- (i). All the authors are required to sign **independently** in this form in the **sequence** given above. In case an author has left the institution/country and whose whereabouts are not known, the senior author may sign on his/her behalf taking the responsibility.
- (ii). **No addition/deletion/** or any **change** in the sequence of the authorship will be permissible at a later stage, **without** valid reasons and permission of the **Editor**.
- (iii). **If the authorship is contested at any stage, the article will be either returned or will not be processed for publication till the issue is solved.**

**5. COPYRIGHT TRANSFER AGREEMENT**

Author(s) will be asked to sign a transfer of copyright agreement, which recognizes the common interest that both journal and author(s) have in the protection of copyright. It will also allow us to tackle copyright infringements ourselves without having to go back to authors each time.

**Copyright Transfer Agreement Form**

**This document must be signed by all authors and submitted with the manuscript.**

**COPYRIGHT TRANSFER AGREEMENT**

The Indian Journal of Yoga, Exercise & Sport Science and Physical Education (IJYESSPE) is published biannually by the Dr.Samiran Mondal, Department of Physical Education, Visva-Bharati University, Santiniketan-731235, West Bengal, India.

The IJYESSPE and Authors hereby agree as follows: In consideration of IJYESSPE reviewing and editing the following described work for first publication on an exclusive basis:

Title of manuscript: \_\_\_\_\_

The undersigned author(s) hereby assigns, conveys, and otherwise transfers all rights, title, interest, and copyright ownership of said work for publication. Work includes the material submitted for publication and any other related material submitted to IJYESSPE. In the event that IJYESSPE does not publish said work, the author(s) will be so notified and all rights assigned hereunder will revert to the author(s).

The assignment of rights to IJYESSPE includes but is not expressly limited to rights to edit, publish, reproduce, distribute copies, include in indexes or search databases in print, electronic, or other media, whether or not in use at the time of execution of this agreement, and claim copyright in said work throughout the world for the full duration of the copyright and any renewals or extensions thereof.

All accepted works become the property of IJYESSPE and may not be published elsewhere without prior written permission from IJYESSPE. The author(s) hereby represents and warrants that they are sole author(s) of the work, that all authors have participated in and agree with the content and conclusions of the work, that the work is original, and does not infringe upon any copyright, propriety, or personal right of any third party, and that no part of it nor any work based on substantially similar data has been submitted to another publication.

Authors' Names (in sequence)	Signature of Authors
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

**6. PI**

e-ma  
only  
the na  
at the  
accep

**7. M**

1.

2.

3.

4.

5.

6.

7.

8.

9.

5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

## 6. PROOFS

Authors of accepted articles are supplied of printer's proofs through e-mail. Corrections on the proof should be restricted to printer's errors only and no substantial additions/deletions should be made. No change in the names of the authors (by way of additions and deletions) is permissible at the proof stage. If there are valid reasons for such a change, after acceptance of a paper, the permission of the Editor must be sought.

## 7. Manuscript Submission Check List

1. Covering letter with telephone no and email no
2. Undertaking by Authors signed by all authors
3. Copyright Transfer Agreement Form signed by all authors
4. Three copies of manuscript with CD
5. Title page
  - Title of manuscript
  - Full name(s) and affiliations of author(s); institution(s) and city(ies) from which work originated
  - Name, address, telephone, fax numbers and e-mail address of the corresponding author.
  - Running title
6. Abstract in structured format along with key words
7. Article
8. Acknowledgment
9. References

*Send your paper to the  
Indian Journal of Yoga  
Exercise & Sport Science  
And  
Physical Education  
one of the best Journal in India.*



*Send your bio-data with area of  
specialization & list of publications  
to join in our elite reviewers panel*

Ev  
Dr.  
INL  
(IJ  
Dej  
Vis  
Sal  
E-r  
Ph

**INDIAN JOURNAL OF YOGA  
EXERCISE & SPORT SCIENCE  
AND PHYSICAL EDUCATION**

**Volume: IV**

**Number: 1&2**

**2010**

**HINTS TO CONTRIBUTORS**

1. This journal publishes original exclusive research and review articles in the area of Yoga, Exercise & Sport Science and Physical Education.
2. Review of new books and research studies in Yoga, Exercise & Sport Science and Physical Education.
3. Outstanding research abstract.
4. Articles about scientific instruments related to Yoga, Exercise and Sport Science research.
5. Professional National and International News's like scientific seminar/ workshop/ conference etc.
6. Any other matter, suitable to fulfill the objectives of Yoga, Exercise & Sport Science and Physical Education will be cordially welcome.
7. Please follow our "Guidelines for contributors" or "Indian Journal of Medical Research Guidelines."
8. Please send soft copy by Email or by CD along with a hard copy by post. Without soft copy no paper / matter will be accepted.
9. Subscription Rate Rs. 150.00 (One hundred and fifty Rs. Only)/ for each issue including postal charges. Please send Demand Draft of Rs.150/- (One hundred & fifty Rs. only) in favor of "Editor, Indian Journal of Yoga, Exercise & Sport Science and Physical Education" payable at State Bank of India (SBI), Santiniketan (2121) West Bengal, India. You may get your copy by post immediately after releasing our journal.

*Every literature and other matters please address to:*

**Dr. Samiran Mondal, Editor**

**INDIAN JOURNAL OF YOGA, EXERCISE & SPORT SCIENCE AND PHYSICAL EDUCATION  
(IJYESSPE)**

**Deptt. Of Physical Education**

**Visva-Bharati University,**

**Santiniketan-731235, West Bengal, India.**

**E-mail : [ljyesspe@gmail.com](mailto:ljyesspe@gmail.com)**

**Ph. No. 09434220938 (Mob), 03463 265070 (R).**

*Send your paper to the  
Indian Journal  
of  
yoga  
Exercise & Sport Science  
And  
Physical Education  
One of the best Journal in India*

\*\*\*\*\*

*Send your bio-data with area of  
specialization & list of publications  
to join in our elite reviewers panel*