



**A COMPARATIVE STUDY OF NARCISSISM BETWEEN ELITE AND  
SUB-ELITE SOCCER PLAYERS**

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**ABSTRACT**

The present study was aimed to compare narcissism between elite and sub-elite soccer players. 50 male football players, representing the teams who have ranked in top three positions in a national level tournament were selected and group in as elite soccer players. Another set of 50 intercollegiate male football players were also selected and grouped in as sub-elite male soccer players. The age range of selected subjects was 18 to 28 years. Random sampling method was used for selection of sample in the present study. To assess narcissism, Hindi version of Raskin and Hall's Narcissistic Personality Inventory (NPI) prepared by Helode, Hasan and Helode (2002) was used. It was found that elite male soccer players have more magnitude of narcissistic tendencies as compared to sub-elite male soccer players at .01 level of statistical significance. On the basis of results and associated discussion it was concluded that elite male soccer players possess more magnitude of narcissism as compared to sub elite male soccer players..

**Keywords :** Narcissism, elite, sub-elite, soccer

## 1. INTRODUCTION

Self-importance, superiority, entitlement, exploitativeness, authroity, arrogance and lack of empathy respectively make narcissism. Freud (1914) thought of narcissism as the "Love of the self", in terms of the libidinal drive. Modern day sportsperson possess full of exhibitionism. Satellite viewership also make sportspersons more popular. In sports narcissistic tendencies are on the rise.

Emmons (1987) opined that narcissism develops as a response to over evaluation, a player's ego may be boosted by fan adulation and publicity. Players report that one of the rewards for playing is a good self-image, part of which is feeling a "big shot" and even male high school students obtain high social status from sports (Figler, 1981). In this context it would be worthwhile to assess narcissism in elite male soccer players because in terms of popularity, money and exhibitionism soccer do not come second to any sport. Surprisingly narcissism has been studied extensively by researchers such as Porcerelli and Sandler (1995), Foster (2003), Rubinston (2003), Mirsafian, H.R. (2008), Tazegul and Aytakin (2013), Matosic (2016) but not specifically in a population of elite sportspersons of one of the most popular sports in the world. Hence the researcher decided to assess narcissism in elite male soccer players.

The present study was aimed to compare narcissism between elite and sub-elite soccer players. It was also hypothesized that elite male soccer players will show more magnitude of narcissistic tendencies as compared to sub-elite male soccer players.

## 2. METHODOLOGY

### 2.1 Sample :

For present study, 50 male soccer players, representing the teams who have ranked in top three positions in a national level tournament were selected and group in as elite soccer players. To fulfill the objectives of the present study, 50 intercollegiate male soccer players were also selected and grouped in as sub-elite male soccer players. The age range of selected subjects was 18 to 28 years. Random sampling method was used for selection of sample in the present study.

### 2.2 Tool Used:

For measuring narcissism as a psychological trait Hindi version of Raskin and Hall's Narcissistic Personality Inventory (NPI) prepared by Helode, Hasan and Helode (2002) was used. It consists of 50 items in Hindi for measuring components of narcissism i.e. authority, self-sufficiency, superiority, exhibitionism, exploitativeness, vanity and entitlement. It's split-half (odd-even method) reliability coefficient for female subjects is 0.84.

### 2.3 Procedure:

The printed instructions given on the cover page of the Narcissism scale was explained to the subjects before the administration and then asked to give their response. After this, the scoring was completed according to the scoring system prescribed by the author of this scale. After scoring, the data was tabulated according to their groups. Independent sample 't' test was used to analyse the data. Results shown in table 1.

### 3. RESULTS & DISCUSSION

To find out the significant difference between elite and sub-elite soccer players on narcissism, mean, SD and t-ratio were computed and data pertaining to this has been presented in Table1

**TABLE 1**  
**COMPARISON OF NARCISSISM BETWEEN ELITE AND SUB-ELITE MALE SOCCER PLAYERS**

Groups	Elite Male Soccer Players (N=50)		Sub-Elite Male Soccer Players (N=50)		Mean Diff.	't'
	Mean	S.D.	Mean	S.D.		
Narcissism	153.00	16.69	133.00	17.72	20.00	5.80**

\*\* Significant at .01 level

Perusal of statistical entries reported in table 1 reveal significant difference in narcissism in elite and sub-elite male soccer players. Calculated  $t=5.80$  depicted in table 1 indicate that elite male soccer players possesses more magnitude of narcissistic tendencies ( $M=153.00$ ) as compared to sub-elite male soccer players ( $M=133.00$ ) at .01 level of statistical significance. As per social learning hypothesis, narcissism develops as a response to over evaluation (Emmons, 1987), a player's ego may be boosted by fan adulation and publicity. Since elite male soccer players get more adulation from fans and media, this has reflected in their significantly higher narcissistic tendency as compared to sub-elite male soccer players.

### 4. CONCLUSION

On the basis of results and associated discussion it was concluded that elite male soccer players possess more magnitude of narcissism as compared to sub elite male soccer players.

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**A COMPARATIVE STUDY OF POSITIVE MENTAL HEALTH AMONG FEMALE VOLLEYBALL PLAYERS: WITH REFERENCE TO URBAN-RURAL SETTINGS**

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**ABSTRACT**

The present study was carried out to assess the differences in positive mental health of female volleyball players hailing from urban and rural settings. To conduct the study 120 female intercollegiate volleyball players were selected. Out of these, 60 female intercollegiate volleyball players (Average age 20.22 yrs.) came from urban background and the remaining 60 female intercollegiate volleyball players (Average age 21.92 yrs) came from rural background. Three dimensional positive mental health inventory prepared by Agashe and Helode (2007) was used to assess positive mental health of selected subjects. The result reveals that urban female volleyball players possess more magnitude of positive mental health as compared to rural female volleyball players. It was concluded that positive mental health of female volleyball players may be predicted by their urban-rural belongingness.

**Keywords :** Positive mental health, urban, rural, female volleyball players

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## 1. INTRODUCTION

Positive aspect of mental health exists since ages. It has been propagated by Chaplin in 1975. In general terms mental health is associated with mental illness but Schneiders (1965), while accepting the views of the World Federation for Mental Health that “not merely the absence of mental disorders, but a state in which the individual live harmoniously with himself and others, adopting to and participating in an ever changing social setting and with the people that he is achieving self realization through satisfaction of his basic needs (Annual Report, 1950) and that of the Expert Committee on Mental Health of the WHO that mental health is a condition subject to fluctuation due to biological and social factors, which enable the individual to achieve the satisfactory synthesis of his own potentially conflicting instinctive drives, to form and maintain harmonious relations with others and to participate in constructive changes in his social and physical environment.” The psychological potentiality of sportspersons has always been linked with his/her performance. In this connection positive mental health has also been found to influence sports performance. A study conducted by Tiwari and Agashe (2016) reported that elite kho-kho players possessed more magnitude of positive mental health as compared to sub-elite sportspersons.

In India majority of our population resides in rural areas and it is natural that quite a few sportspersons also come from rural sector. It is equally applicable in a sport like volleyball where participation of sportspersons from rural areas is quite high. Since volleyball is popular sports all round the world, quite a few researchers namely Kamlesh (1988), Singh and Singh (1998), Hatzigeorgiadis (2002), Khetmalis (2012), have carried out studies on volleyball players. It has also been noticed that positive mental health of female volleyball players has not been studied in the light of their urban-rural belongingness. Taking all these factors into account, the present piece of work is carried out.

The present study was carried out to assess the differences in positive mental health of female volleyball players hailing from urban and rural settings. It was also hypothesized that urban female volleyball players will show more magnitude of positive mental health as compared to rural female volleyball players.

## 2. METHODOLOGY

The following methodological steps were taken in order to conduct the present study.

### 2.1 Sample:

To conduct the study 120 female intercollegiate volleyball players were selected. Out of these, 60 female intercollegiate volleyball players (Average age 20.22 yrs.) came from urban background and the remaining 60 female intercollegiate volleyball players (Average age 21.92 yrs) came from rural background. The sample is collected from the state of Chhattisgarh. The sample was collected through convenience sampling method.

### 2.2 Tool Used:

Positive Mental Health Inventory : To measure positive aspects of mental health, three dimensional positive mental health inventory (namely self acceptance, ego strength and philosophy of life) prepared by Agashe and Helode (2007) was used. It consists of 36 questions. The test-retest reliability coefficient of this inventory was 0.723.

**2.3 Procedure:**

The urban and rural origin female intercollegiate volleyball players selected for the present study were subjected to the aforementioned tools in a laboratory like condition. They were assured of the fact that responses given by them would only be used for research purpose only and it will be treated as confidential otherwise.

Three dimensional positive mental health inventory prepared by Agashe and Helode (2007) was administered to each subject. The response given by the subjects were scored as per the manual. Afterwards all the scores on positive mental health in case of each member of sample of 120 cases were segregated in their respective groups.

**4. RESULT & DISCUSSION**

To compare the collected data, independent sample ‘t’ test was used. The statistical results are presented in Table 1.

**TABLE 1  
COMPARISON OF POSITIVE MENTAL HEALTH BETWEEN URBAN AND RURAL FEMALE VOLLEYBALL PLAYERS**

Groups	Urban Female Volleyball Players (N=60)		Rural Female Volleyball Players (N=60)		Mean Diff.	‘t’
	Mean	S.D.	Mean	S.D.		
Positive Mental Health	21.31	4.00	17.80	4.94	3.51	4.28*

\* Significant at .01 level

Perusal of statistical entries reported in table 1 reveal significant difference in positive mental health of intercollegiate female volleyball players on the basis of their urban-rural belongingness. Calculated  $t=4.28$  depicted in table 1 indicate that female volleyball players with urban background ( $M=21.31$ ) possess significantly superior positive mental health as compared to intercollegiate female volleyball players with rural background ( $M=17.80$ ) at .01 level of significance. Result clearly indicates that urban female volleyball possesses more magnitude of positive mental health as compared to rural female volleyball players. The results indicate that female volleyball players from rural area are yet to come to terms with self acceptance and lack ego strength which shows in their inferior positive mental health as compared to female volleyball players with urban background.

**5. CONCLUSION**

On the basis of results and associated discussion it was concluded that urban-rural belongingness has significant bearing on positive mental health of female volleyball players.

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**EFFECT OF YOGIC EXERCISES FOR DEVELOPMENT OF AEROBIC CAPACITY AMONG COLLEGE MALE STUDENTS OF DISTRICT SITAPUR, UTTAR PRADESH, INDIA**  
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**ABSTRACT**

Background: Yoga is a very ancient exercise that originated in India. Yoga is viewed as a Physical, Mental and Spiritual discipline that confers a sound body and a sound mind. Regular practice of the yoga positions can result in plenty of benefits, including stimulation of the internal organs and improving blood circulation. Yogic activities provide benefits to the mind and body and bring about balanced energy flow. Many studies are conducted by various researches on yogic exercises and its effects on physical function and mental functions. The objective of the study is to improve the Aerobic capacity through yogic activities among college male students. It was hypothesized that yogic exercises would be development of Aerobic capacity. Materials and Methods: The purpose of the present study to find out the effect of yogic exercises for the development of Aerobic capacity among college male students of Mahmudabad, district sitapur. The sample for the present study consists of 40 male students of Maulana Azad Institute of Humanities Science & Technology, Mahmudabad, Sitapur. Out of which 20 are experimental group and 20 are controlled group. Their age ranged between 18 to 25 years. Yogic exercises were given to experimental group on alternate days i.e. three sessions per week and controlled group were given the general training of Physical exercises for six weeks. To assess the Aerobic capacity Pre-Test and Post-Test were conducted in Cooper's 12-Minute Run Test to both groups. Results: It has been observed from the analysis of data that Aerobic capacity was improved within the experimental group.

**Keywords:** Yogic Exercises, Aerobic capacity and Physical Exercises.

## 1. INTRODUCTION

Yoga is essentially a spiritual discipline based on an extremely subtle science, which focuses on bringing harmony between mind and body. It is an art and science of healthy living. The word 'Yoga' is derived from the Sanskrit root 'Yuj', meaning 'to join' or 'to yoke' or 'to unite'. As per Yogic scriptures the practice of Yoga leads to the union of individual consciousness with that of the Universal Consciousness, indicating a perfect harmony between the mind and body, Man & Nature.

Yoga asanas is a body positions that has something to do with the sequence of sitting, standing and balancing postures to increase the body flexibility. Yoga asanas provide the individual with multifold benefits physically, mentally and also spiritually. It keeps us physically fit, reduces weight, normalizes blood pressure, controls stress and cholesterol level and improves overall performance of the body and mind.

Pranayamas or breathing exercises are an integral feature of any yoga practice. These breathing techniques are designed to give us greater control over the respiratory function, which for most of us is simply a reflex. The practice of breathing exercises or pranayamas helps to enhance and build lung capacity, improving oxygenation, circulation and energizing your body. Breathing exercises have a tremendous calming and relaxing effect on the body and are also essential to meditation. Breathing exercises are practiced in synchronization with yoga poses.

Aerobic capacity has been defined as the ability of the lungs, heart, and blood vessels to deliver adequate amount of oxygen and nutrients to the cells to meet the demands of prolonged activity. Aerobic capacity is usually assessed by measuring maximal oxygen consumption (VO<sub>2</sub> max). The oxygen required for the break down of carbohydrate and fat comes from air we breathe.

The main objective of study was to find out the effect of Yogic Exercises for development of Aerobic Capacity among College Male students of District Sitapur, Uttar Pradesh, India.

## 2. METHODOLOGY

### 2.1 Sample:

The sample for the present study is 40 male students of Maulana Azad Institute of Humanities Science & Technology, Mahmudabad, Sitapur. Out of which 20 are Experimental group and 20 are Controlled group. Their age ranged between 18 to 25 years.

### 2.2 Tool Used:

Cooper's 12-Minute Run Test was used for collection of data.

### 2.3 Procedure:

The 12- Minute Cooper's Test were for Pre Test for experimental group as well as for Control group. The result was recorded. The six weeks Yogic exercises were provided to experimental group. The experimental group consists of Yogic exercises alternately. All kinds of Yogic exercises are being included in this yogic exercises like Asanas and Pranayama. The Controlled group was given the general training. After six weeks training the post test were conducted on both groups. The subjects generally come from different socio-economic status, different dietary habits and different life style which would have an effect on the performance of both groups can not be controlled.

### 3. RESULTS AND DISCUSSION

To find out the significance of difference between experimental and control group on aerobic capacity of male students, mean , SD and t-ratio were computed an data pertaining to this, has been presented in Table 1 and 2.

**TABLE 1**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN MEAN SCORES OF AEROBIC CAPACITY ON PRE-TEST OF EXPERIMENTAL AND CONTROL OF MALE STUDENTS**

Pre Test	N	Mean	MD	$\sigma_{DM}$	t-ratio
Experimental Group	20	3450.00	95.75	56.42	1.77*
Control Group	20	3354.25			

\*Significant at .05 level  
t.05 (38)=1.68

Table 1 reveals that the statistically significant difference was found between experimental and control in pre-test on aerobic capacity measured by Cooper's 12-Minute Run Test , as the obtained t-value of 1.77 was higher than the required t .05 (38)=1.68

**TABLE 2**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN MEAN SCORES OF AEROBIC CAPACITY ON POST-TEST OF EXPERIMENTAL AND CONTROL OF MALE STUDENTS**

Pre Test	N	Mean	MD	$\sigma_{DM}$	t-ratio
Experimental Group	20	3730	400	109.89	3.64*
Control Group	20	3330			

\*Significant at .05 level  
t.05 (38)=1.68

Table 2 reveals that the statistically significant difference was found between experimental and control in Post-test on aerobic capacity measured by Cooper's 12-Minute Run Test , as the obtained t-value of 3.64 was higher than the required t .05 (38)=1.68

### 4. CONCLUSION

The present study concludes that the yogic exercises imparted in this study for a period of six weeks useful in improving of aerobic capacity among college male students and also it has been observed that the analysis of data that aerobic capacity were improved within the experimental group.

### 5. RECOMMENDATIONS

1. The coaches, trainers and teachers must include yogic exercises in training programmes for development of aerobic capacity and physical fitness.
2. A comparative study may be conducted on different Games and Sports.
3. The study may be extended to find out the Aerobic capacity and general Physical Fitness in different Games and Sports.

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## EFFECT OF CYCLIC MEDITATION ON PHYSICAL AND MENTAL STRESS IN HIGH SCHOOL ATHLETES- PRE-POST CONTROLLED STUDY

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### ABSTRACT

The aim of present study was to find the effect of cyclic meditation on high school athletes. A total of forty six students (male=26, female=20) who belongs to Track and Field team were enrolled for the study and completed the pre, mid and post parameters, and answered questionnaire before and after study, and twenty three yoga group students out of total students have done 35 days Cyclic Meditation (CM) program. Immediately effect of CM on 35<sup>th</sup> day showed many (following detail) significant changes and larger difference between both groups than 14<sup>th</sup> day. Yoga group Salivary Amylase (SA) was decreased significantly by 12.1 point (-44%, 0.04, 2-tail), Blood Oxygen Level (BOL) was increased significantly by 0.5 point (1%, 0.04, 2-tail) and Pulse Rate (PR) was decreased significantly by 15.1 point (-18%, 0.00, 2-tail) as against Control group SA was increased significantly by 8.2 point (14%, 0.04, 2-tail), BOL was increased by 0.6 point and PR was decreased significantly by 10.8 point (-15%, 0.00, 2-tail). Decreased SA and PR, and increased BOL indicate improvement in terms of reduced stress levels after CA because of practice of CM. In addition, Yoga group Tension-Anxiety, Depression-Dejection and Confusion were decreased significantly, and rest of negative emotions were also decreased after 35 days due to continuous CM practice. Control group showed only decrease in Confusion but this decrease was less than Yoga group. Moreover, the positive emotion namely6 Vigor, was increased in Yoga group, more than Control group. All Yoga group scores ware superior to Control group in psychological part. This result indicates that Yoga can statistically reduce physical and mental stress which means Yoga helps to thin out stresses, and proved why ancient Yogi Patañjali has used the term thinning .Present author suggest that Yoga, especially CM, is suitable relaxation technique for high school athletes.

**Keywords:** sports, athletes, yoga, high school student, physical stress, mental stress, relaxation technique, cyclic meditation

## 1. INTRODUCTION

Japanese high school athletes' ability is regarded as the high level in the world class match. This evaluation shows that how hard training they do in the high school and on the one hand some of them get good result, and on the other hand some of them are exhausted by hard training. The problem seems to lie in the fact that physical fatigue can affect mental condition such as you may have experienced in your past. The same with the converse, mental condition can affect physical.

There has been a great discussion about the stress in (senior) high school especially in Japan because Japanese minors<sup>1</sup> who decides to die by one's own hand are not rare<sup>2</sup>. This case is eccentric aspect of a serious social problem, of course, actually there many causes related refusal to attend school or mental diseases. Junior and senior high school student are always surrounded by many factors which are like study, examination, teachers, friends and club activities etc. Although these factor help forming their character, these can be negative stressors at the same time. One of Japanese city's survey which object is senior high school and high school student has revealed that students "feel stress all of the time"(12.6%), "feel stress some of the time"(50.2%), total 62.8% of them feel the stress in daily life, and they answered that its cause is "about study"(66.7%), "about school"(52.0%). In addition, proportion of students who has "satisfying sleep" was limited 21.3%. ([www.city.chofu.tokyo.jp](http://www.city.chofu.tokyo.jp))

At this period of students are considered to be susceptible and adolescence, furthermore they usually start caring about a distinction between others, a one's of identity, cooperation with co-students and one's evaluation from surrounding others.

Apart from these, teenager athletes show natural tendency toward insistence on competition result and they are often expected to win. This kind of tendency can be good motivation, but at the same time it easily can change into impatience or pressure which makes them train too hard or feel anxiety. They are considered to be in circumstance where they are liable to feel physical stress or mental stress or both compared with normal students.

Burnout syndrome is grasped as result of miss-adaptation to athletic stress of athletes (Smith, 1986) and unsuitable approaches or challenging of sport's activities links to an eating disorder, a depression and an overuse syndrome (Nagashima, 2002). Aoki (2003), Aoki and Matsumoto (1997), Asakura and Mori (2004) have pointed out that the ability of adapt to club activity is profound related mental stress for teenager athletes. Study of Kogayashi, Idemura, and etc. (2005) showed significant relation between "Club Activity", "Schoolwork" and "Fatigue (indicated by scales of Difficult concentration, Laziness, Decrease in vigor, Decrease in motivation and Physical strange feeling)" in high school students by questionnaire; SFS-Y (Subjective Fatigue Scale for the Young adults). Researchers have proved relationship between mental stress and school environment and discussed connection between high school students and their environment. Therefore what should we do next is to find effective manner of coping with mental stress for them.

The present author agree with Bethany's (2015) in that school-based yoga may be advantageous for stress management and behavior. I believe that yoga, especially yoga-

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<sup>1</sup> under 20 years old

<sup>2</sup> 538 minors died by one's own hand in 2014. (Sause: The breakdown of suicide in 2014. Cabinet Office Government of Japan,2014)

based relaxation technique, can good influence teenagers. For example, the following show strong possibility of it.

Rabindra, Pradhan and Nagendra (2014) have conducted study of stress management following yoga based SMET (Self-Management of Excessive Tension) program. It has revealed that the negative moods sub-scale of Profile of Mood States (POMS) was significantly reduced by SMET program. In mental disorders field, Hiramoto, Yoshihara and Kubo (2009) have revealed that Cyclic Meditation (CM) can effectively reduce stress-related symptoms of 20~50-year-old women and that these effects could maintain for 12 weeks. Furthermore they have suggested that CM can be a countermeasure of mental health and improve tolerance to stress.

CM's effect is not limited in improvement of mental health. Practicing cyclic meditation twice a day has appeared to improve the objective and subjective quality of sleep on the following night (Snjib and Shirley, 2009), and it reduces physiological arousal, simultaneously improving performance on tasks requiring attention (Balaram and Nagendra, 2010). In addition, Pailoor and Shirley (2009) have advocated that cyclic meditation improved memory scores immediately after practice and decreased state anxiety more than rest in a classical yoga relaxation posture<sup>3</sup>.

As above-mentioned, CM is regarded as suitable manner of coping with mental stress for high school athletes. Little attention has been given to effect of CM on physical aspect. Hence the present study will be undertaken in order to prove an effectiveness of CM on mental stress and recovery of physical fatigue in high school athletes. It was also hypothesised that the cyclic meditation may effect physical and mental stress in high school athletes.

## **2. METHODOLOGY**

### **2.1 Sample size:**

46 high school students (male=26, female=20, average age 16.1±0.9 years) who belongs to Track and Field team.

### **2.2 Design:**

This study was used for two group pre-post controlled study.

### **2.3 Methods:**

They were classified male and female group at first. After that, they classified again randomly into experimental group and control group.

*Experimental group* received instruction of cyclic meditation after their club activities when author could go to their school, and did self-practice of cyclic meditation after their daily works before having dinner every day.

*Control group* students' environment was same as experimental group except what they did not learn cyclic meditation technique.

### **2.4 Operational Definitions:**

#### **2.4.1 Physical stress**

Physical stress is defined by increase of Salivary Amylase or Pulse Rate, decrease of Blood Oxygen Level due to Club Activity, sports training, in this study.

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<sup>3</sup> classical yoga relaxation posture: Shavasana

### 2.4.2 Mental stress

Mental stress in this study is defined by increase of stressed score which is indicated by Profile of Mood States questions and answered by high school athlete who joined this study.

### 2.5 Intervention

#### *Cyclic Meditation*

Steps of Cyclic Meditation	Duration (min)	Rounds
1: STRTING PRAYER	1	1
2: INSTANT RELAXATION TECHNIQUE (IRT)	2-3	1
3: CENTERING	5	1
4: STANDING ASANAS <sup>4</sup>		
i ) ARDHAKATI CAKRASANA – RIGHT SIDE	3	1
ii ) ARDHAKATI CAKRASANA – LEFT SIDE	3	1
5: QUICK RELAXATION TECHNIQUE (QRT)	5-7	1
6: SITTING ASANAS		1
i ) VAJRASANA	1	
ii ) SASANKASANA	1	
iii) USTRASANA	1	
7: DEEP RELAXATION TECHNIQUE (DRT)	10-15	1
8: CLOSING PRAYER	1	1
Total	33-41	8

*Total duration of a session – 33min to 41min.*

*Total times of sessions – 28 sessions.*

*Frequency of session – 1 time in a day. 7 times in a week.*

### 2.6. Primary outcome measurement

#### 2.6.1 Salivary Amylase (SA)

Salivary Amylase (SA) is reflection of mental stress and physical stress because it reflects sympathetic nerve activity. It is secreted by direct nerve action and *norepinephrine's control* of a sympathetic nerve, and concentration of amylase in saliva is increased by stress. Since its reaction time of super-secretion by direct nerve action is within few minutes, it is considered that its response is earlier than cortisol. Nakano and Suzuki (2009) revealed that concentration of Salivary Amylase is increased statistically by fatigue condition or subjective symptoms of fatigue.

*Salivary Amylase Monitor* – To collect saliva with a test-strip (small paper chip) and its amylase will be measured by Salivary Amylase Monitor©. It can collect data immediately and non-invasive. Yamaguchi and etc.<sup>5</sup> (2001) have revealed that the change of salivary amylase activity was confirmed as being originated from stress. Hence results suggest that the monitoring of salivary amylase could be used as a non-invasive indicator of stress reaction. In addition, Nakano and Yamaguchi (2011) have advocated that it was considered that the score of SAA<sup>6</sup> between before and after the stressor might be useful to distinguish the eustress and the distress. Additionally, it was suggested that the SAA is a better index of acute stress. The SAA biosensor realizes to analyze the human stress in real time and noninvasive, making multiple sampling easy and stress free.

<sup>4</sup> ASANA: Yoga posture

<sup>5</sup> Masaki Yamaguchi, Takahiro Kanemori, Masashi Kanemaru, Hirofumi Mizuno and Hiroshi Yoshida. Salivary α-amylase activity



### 2.6.2 Profile of Mood States (POMS)

Profile of Mood States (POMS) is a standard validated psychological test formulated by McNair et al. (1971). The questionnaire contains 65 words/statements (fatigued, tense, miserable, confused, active and relaxed, etc.) that describe feelings people have. Analysis of the result is by comparing it with the results of previous tests. It is expected that, with appropriate training between each test, the analysis would indicate an improvement. Rabindra, Pradhan and Nagendra (2014) have conducted yoga based stress management study with POMS and the result has showed that profile of mood in manages was enhanced by yoga based SMET (Self-Management of Excessive Tension).

## 2.7 Secondary outcome measurement

### 2.7.1 Blood Oxygen Level (BOL/SpO2)

Biologically active substance like oxygen or vitamin B1 are needed as energy for physical and mental activity. The cause of occurrence of harmful fatigue substance is consumption of energy source. When enough oxygen level is supplied, aerobic energy production occur and fatigue substance is converted into carbon dioxide and water.

*Pulse oximeter* – Many researchers have evaluated the muscle fatigue by expiration gas of metabolism and imaging of biological tissue, but these ways are invasive, high-priced and need large-scaled measuring device which is Expiration gas analyzers and MRS. Pulse oximeter can collect data which is indicator of physical fatigue immediately and non-invasive.

The study of relation between yoga and oxygen saturation has been researching especially in respiratory disorders field. Judith M, Jean E and Hossein N (2013) have reported that oxygen saturation remained high and vital signs stable; forced expiratory volume in 1 second values increased significantly by Viniyoga (Hatha).

### 2.7.2 Pulse Rate (PR)

Pulse rate (PR) is commonly reported in studies of the relationship between fatigue and cardiac functioning. Rapid pulse rate often shows that physical fatigue or a sign of medical conditions. This measurement is also measured by pulse oximeter.

## 2.8 Data analysis

The data was analyzed by the statistician using SPSS. Shapiro wilk test was used to check normality of base line data. Although the data from vital (Salivary Amylase) parameter was not normally distributed, it was regarded as characteristic of measurement. Thus independent sample t-test and paired sample t-test was used for further analyses with SPSS and Excel.

## 3. RESULTS

Total seven times parameters in physiological part were conducted at first day before and after Club Activity (Measurement1&2), 14<sup>th</sup> day before (after CA) and after CM (Measurement3&4), last day before and after CA (Measurement5&6) and after CM (Measurement7). In this part, following outcomes has been found by various combination of each measurement depended on object; Physiological Part, in the measurement of stress level measured by the Salivary Amylase, Blood Oxygen Level and Pulse Rate (**Table6-1, 6-2**).

### Objects

- i ) Immediate effect of CM on 35th day - Measurement 6 vs 7*
- ii ) Immediate effect of CM on 14th day- Measurement 3 vs 4*
- iii) Long term effect of CM for before CA- Measurement 1 vs 5*
- iv) Long term effect of CM on effect of CA- Measurement 1-2 vs Measurement 5-6*

In addition, two times questionnaire, Profile of Mood States (POMS), were conducted before and after study; Psychological Part (table 2).

3.1 Result of Physiological Part

TABLE I  
RESULTS OF SALIVARY AMYLASE (SA), BLOOD OXYGEN LEVEL (BOL), PULSE RATE (PR) FOR OBJECTIVES.

	<u>YOGA</u>						<u>CONTROL</u>					
<i>Immediate effect of CM on 35<sup>th</sup> day</i>												
	Before CM		After CM		Changes		Before CM		After CM		Changes	
		±		±		%		±		±		%
SA	39.9	36.0	27.8	22.4	-12.1	-44*	52.1	30.3	60.3	31.6	8.2	14*
BOL	96.7	1.0	97.2	0.8	0.5	1*	96.6	1.3	97.2	0.8	0.6	1
PR	100.5	12.6	85.4	14.4	-15.1	-18**	84.2	17.0	73.4	12.3	-10.8	-15**
<i>Immediate effect of CM on 14<sup>th</sup> day</i>												
	Before CM		After CM		Changes		Before CM		After CM		Changes	
		±		±		%		±		±		%
SA	34.7	22.7	25.1	19.6	-9.6	-38	36.0	24.3	41.3	29.6	5.3	13**
BOL	97.0	1.3	97.6	0.7	0.6	1*	96.6	1.7	97.1	1.0	0.5	1*
PR	91.2	17.9	76.5	13.5	-14.7	-19**	76.6	18.0	69.3	10.3	-7.3	-11**
<i>Long term effect of CM for Before CA</i>												
	1 <sup>st</sup> day		35 <sup>st</sup> day		Changes		1 <sup>st</sup> day		35 <sup>st</sup> day		Changes	
	Before CA		Before CA				Before CA		Before CA			
		±		±		%		±		±		%
SA	40.5	48.9	25.7	19.9	-12.8	-46	48.8	31.0	41.3	28.4	-4.1	9
BOL	97.3	1.0	97.7	0.5	0.4	0	97.2	1.0	97.2	0.8	0	0
PR	73.9	8.5	71.0	6.1	-2.9	-4	68.4	12.9	67.6	8.3	-0.8	-1*
<i>Long term effect of CM on effect of CA</i>												
	M1-2 changes		M5-6 changes		Changes		M1-2 changes		M5-6 changes		Changes	
		±		±		%		±		±		%
SA	1.7	49.4	12.1	31.2	10.4	86	0.83	39.9	7.39	40.9	6.6	89
BOL	0.1	1.3	0.9	1.0	0.8	86	0.13	0.6	0.57	1.5	0.4	77
PR	26.4	16.2	29.5	11.1	3.1	11	16.9	15.9	16.6	13.3	-0.3	-2

[CM: Cyclic Meditation, CA: Club Activity] \*p>0.05, \*\*p>0.01 T test, f=22, 2tail

3.1.1 Immediate effect of CM on 35th day-Measurement 6 vs 7 showed many significant changes and larger difference between both groups than 14<sup>th</sup> day. Yoga group Salivary Amylase (SA) was decreased significantly by 12.1 point (-44%, 0.04, 2-tail), Blood Oxygen Level (BOL) was increased significantly by 0.5 point (1%, 0.04, 2-tail) and Pulse Rate (PR) was decreased significantly by 15.1 point (-18%, 0.00, 2-tail) as against Control group SA was increased significantly by 8.2 point (14%, 0.04, 2-tail), BOL was increased by 0.6 point and PR was decreased significantly by 10.8 point (-15%, 0.00, 2-tail). Decreased SA and PR, and increased BOL indicate improvement in terms of reduced stress levels after CA because of practice of CM.

3.1.2 Immediate effect of CM on 14th day-Measurement 3 vs 4 showed that Yoga group SA was decreased by 9.6 point (-38%), BOL was increased by 0.6 (1%) and PR was decreased significantly by 14.7 point (-19%, 0.01, 2-tail) indicating increased reduction of stress levels due to practice of CM as against Control group SA was increased significantly by 5.3 point (13%. 0.01, 2-tail), BOL was increased significantly by 0.5 point (1%, 0.09, 2-tail) and PR was decreased significantly by 7.3 point (-11%, 0.00, 2-tail).

**3.1.3** Long term effect of CM for before CA- In measurement 1 vs 5, Yoga group SA was decreased by 12.8 point (-46%), BOL was increased by 0.4 point (0%) and PR was decreased by 2.9 point (-4%) compared with Control group SA was decreased by 12.8 point (-46%), BOL was increased by 0.4 point (0%) and PR was decreased by 2.9 point (-4%). Although there was no significant change in Yoga group, decreased SA and PR in Yoga group were larger than Control group and its result indicate that continuous CM practice has reduced stress levels before CA, it also mean that student became to show the less stress scores after schoolwork through 5weeks CM practice.

**3.1.4** Long term effect of CM on effect of CA- Measurement 1-2 vs Measurement 5-6 showed no significant changes but Yoga group showed decrease in PR as against Control group PR was increased. Yoga group SA change was increased by 6.6 point, BOL change was decreased by 0.5 point and PR change was decreased by 0.4 point compared to Control group SA change was increased by 10.4 point, BOL change was decreased by 0.5 point and PR change was increased by 3.1 point. This indicates that both Yoga and Control groups show almost same immediate effect for Club Activity (sports training), although Cyclic Meditation (CM) practice can reduce increase in PR by effect of CA.

**3.2 Result of Psychological Part**

**TABLE- II  
RESULTS OF PROFILE OF MOOD STATES (POMS).**

Psychological Part												
	YOGA						CONTROL					
	Pre		Post		Changes		Pre		Post		Changes	
		±		±		%		±		±		%
T-A	58.8	9.7	54.7	10.6	-4.1	-7*	55.2	9.8	57.0	10.2	1.8	3
D	60.4	12.3	55.8	10.1	-4.6	-8**	56.9	10.5	57.8	12.2	0.9	2
A-H	53.0	9.6	49.6	8.7	-3.4	-7	51.0	9.2	55.0	11.6	4.0	7*
V	53.2	9.2	56.1	10.0	2.9	5	51.8	9.4	53.1	8.2	1.3	2
F	57.6	11.3	55.3	9.6	-2.3	-4	55.4	8.4	56.3	9.8	0.9	2
C	62.7	12.7	55.7	11.0	-7.0	-13**	58.3	9.9	57.7	10.2	-1.0	-1

\*p>0.05, \*\*p>0.01T test, f=22, 2tail

T-A: Tension-Anxiety, D: Depression-Dejection, A-H: Anger-Hostility, V: Vigor, F: Fatigue and C: Confusion

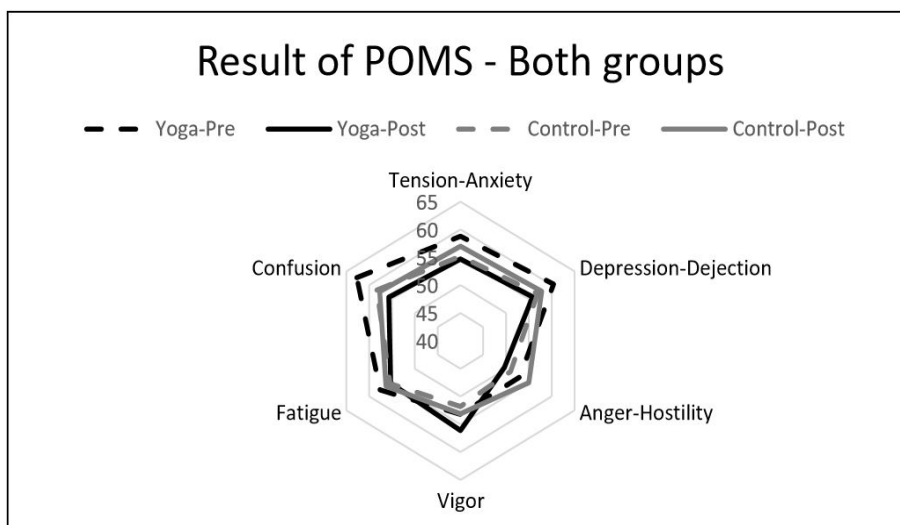
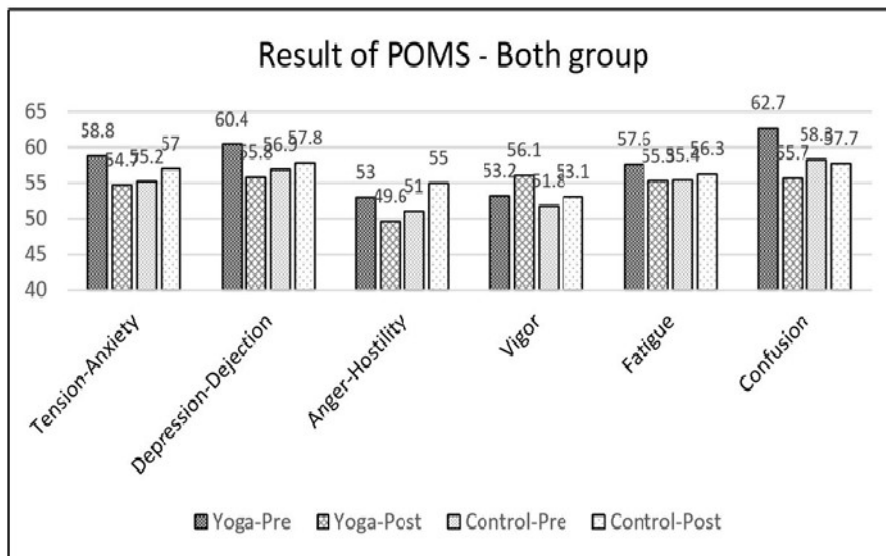
Profile of Mood States (POMS) was taken in terms of “Tension-Anxiety”, “Depression-Dejection”, “Anger-Hostility”, “Vigor”, “Fatigue” and “Confusion” defined by answering 65 words/statements (fatigued, tense, miserable, confused, active and relaxed, etc.) that describe feelings people have, and its result is following.

**Tension-Anxiety (T-A)-** Yoga group Tension-Anxiety was decreased significantly by 4.1 point (-7%, 0.03, 2-tail) compared with Control group Tension-Anxiety was increased by 1.8 point (3%).

**Depression-Dejection-** Yoga group Depression-Dejection was decreased significantly by 4.6 point (-8%, 0.00, 2-tail) compared with Control group Depression-Dejection was increased by 0.9 point (2%).

**Anger-Hostility-** Yoga group Anger-Hostility was decreased by 3.4 point (-7%) compared with Control group Anger-Hostility was increased significantly by 4 point (7%, 0.03, 2-tail).

**Vigor-** Yoga group Vigor was increased by 2.9 point (5%) compared with Control group Vigor was



## 4. DISCUSSION

### 4.1 Physiological Parameters Results

#### 4.1.1 Immediate effect of CM on 35th day

Measurement 6 vs 7:-Significant decrease of Salivary Amylase (SA) and Pulse Rate (PR), and significant increase of Blood Oxygen Level (BOL) in Yoga group indicate significant reduction of stress levels due to CM practice compared to Control group without CM practice.

This 35<sup>th</sup> result showed effect of long term CM practice. Yoga group SA was decreased significantly by 12.1 point (-44%, 0.04, 2-tail) as against Control group SA was increased significantly by 8.2 point (14%, 0.04, 2-tail) on 35<sup>th</sup> day. This difference of SA changes (difference is 20.3 point) between both groups was larger than result on 14<sup>th</sup> day; it was increased by 5.4 point from 14.9 point on 14<sup>th</sup> day. In addition, Yoga group SA

and PR were more decreased from its result of 14<sup>th</sup> day, it indicates that long term (more than 5 weeks) CM practice has more effectiveness of immediate relaxation as well as immediate cooling down than short term (less than 2 weeks) CM practice.

As mentioned in ancient literature review, continuous practice of CM is considered that it can reduce physical fatigue or stress efficiently after sports training. Ancient Yogi Patanjali has already said that “Resort to yoga for thinning of the kleśās<sup>7</sup> and achieving higher states of consciousness featured by lesser stresses and emergence of greater capacities.”

This object result indicate that Yoga helps to thin out stresses, and proved why ancient Yogi Patañjali has used the term thinning. It is considered that stress is not eliminated suddenly, hence we should reduce it gradually and systematically. Systematic practice of relaxation technique can improve the ability to reduce physical stress or cope with its stress, and it may have immediate effect of physical rest also.

#### 4.1.2 Immediate effect of CM on 14th day

Measurement 3 vs 4- Measurement 1 vs 5:-Although there were no significant change of SA in Yoga group, its SA showed decrease of 9.6 point (-38%) as against Control group SA was increased significantly by 5.3 point (13%, 0.01, 2-tail). This difference indicated that CM practitioner feel less stress after CM practice immediately, but participants who spent time with normal cooling down exercise after some time of CA feel more stress than after CA soon.

In addition, Yoga group has showed more decrease of PRscore (14.7 point, -19%) than decreased Control group PR score (7.3, -11%). This difference between both groups can be considered that CM practice help to calm down excessive body activity or fatigue after sports training immediately toward body relaxation or taking rest.

There can be correlation between SA and PR, decreased SA can lead to reduce excessive PR and the same with the converse. Moreover, Control group result showed that PR is decreased naturally without any special relaxation technique, but it is necessary for decrease of SA to do some relaxation technique after CA, sports training.

#### 4.1.3 Long term effect of CM for before CA

Measurement 1 vs 5:- Yoga group SA was decreased by 12.8 point (-46%) but Control group SA was decreased by just short of 0.8 point (-9%), and Yoga group PR was also decreased 2.9 point (-4%) compared with significant decrease of Control group PR 0.8 point, (-1%).

Above Yoga group changes showed that there was more improvement in terms of reduced stress levels than Control group, and those indicate that participant who practice CM continuously became to feel less stress before CA as well as after schoolwork. Its condition, less stress levels before CA, can be expected to do more high quality of CA (sports training) and it can lead more efficient effect of CA for practitioner. Moreover, it can be considered that CM practice or immediate relaxation after CA can help to reduce schoolwork stress levels also.

#### 4.1.4 Long term effect of CM on effect of CA

Measurement 1-2 vs Measurement:- Test of difference of both groups' changes have not showed any significant change, but Yoga group showed decrease in PR (-0.4, -2%) as

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<sup>7</sup> The great sage Patañjali uses Kleśā which aptly describes stress.

against Control group PR was increased (3.1, 11%). Although it is hard to consider that effect of CA can be affected by CM practice, CM practice can reduce increase in PR by effect of CA. In addition, this result is related mental condition indicated by POMS result. All participants equally got effect of CA such as increase of SA or PR.

There are some reasons can be considered that mentioned in limitations on this study, or is an athletic tendency such as "CA itself can be an opportunity to emit stress for some of them." Some participants' SA showed decrease indicating reduction of stress levels after CA in both groups. High school athletes who have joined this study have sports experience at least a year, maximum 8 years. Almost of all them are not beginners, thus CA (sports training) has already became their habit. CA itself can be an opportunity to emit stress, such as caused by schoolwork, for some of them.

#### **4.2 Psychological Questionnaire Results**

Yoga group showed significant decreases in "Tension-Anxiety", "Depression-Dejection" and "Confusion" as against Control group showed increases in those, though did not show significant change. This result indicate significant reduction of mental stress levels due to CM practice in Yoga group.

Control group "Anger-Hostility" was increased significantly by 4 point (7%, 0.03, 2-tail), "Fatigue" was increased by 0.9 point (2%) compared to Yoga group "Anger-Hostility" was decreased by 3.4 point (-7%), "Fatigue" was decreased by 2.3 (-4%). This result also indicate reduction of mental stress levels due to CM practice in Yoga group.

In addition, Yoga group "Vigor" showed larger increase (5%) than Control group (2%). This result showed that effect of CM practice can be regarded as not only reduction of mental stress but also increase in energy, or reduction of mental stress levels enables energy to be increased.

Although they have done not only CA but also schoolwork, private-tutoring school, housework and so on for the duration of this study, POMS result showed significant reduction of mental stress levels only in Yoga group. It strongly indicates that effect of CM practice helps to cope with stress in daily activities also. Conversely, effect of long term (more than 35 days) CA with general cooling down exercise can make mental stress levels increased.

#### **4.3 Overall Effect**

There is a correlation between physiological reaction and emotions. Yoga group "Tension-Anxiety", "Depression-Dejection" and "Confusion" scores were decreased significantly as well as SA and PR were decreased significantly. Control group "Anger - Hostility" was increased significantly as SA was increased significantly. In addition, decrease in Yoga group SA can be regarded as cause of increase in "Vigor" also. Thus there is considered strong correlation between physiological stress level and mental stress level. Body reaction can affect mental condition and the same with the converse.

#### **4.4 Sports, Schoolwork, Stress and Yoga**

Competitive anxiety and tension/anxiety mood states are statistically related to injury frequency, and that tension/anxiety, anger/hostility, and total negative mood state (indicated by Profile of Mood States [POMS]) are statistically related to injury severity (Lavalley and Flint, 1996). McLeod, Curtis Bay, and etc. (2009) suggested in their study that clinicians need to recognize the full spectrum of negative influences that injuries may have on Health-related quality of life (HRQOL) in adolescent athletes. HRQOL is a global concept

that takes into account the physical, psychological, and social domains of health. Reduction of physical and mental stress helps to reduce the injury opportunity or its severity.

In addition, less feelings of “negative emotion in daily activity” and “anxiety” are regarded as factors in high adaptability for high school athletic clubs (Aoki and Matsumoto, 1997), and “adjustment to athletic clubs”, “self-efficacy” and “coping skills” are significantly related to adjustment to school (Aoki, 2003).

Yoga, Cyclic Meditation (CM), can reduce athletic injury opportunity or severity by reduction of physical and mental stress, and improve “adjustment to athletic clubs”, “coping skills” and “adjustment to school” also. Thus Yoga, especially CM, is suitable relaxation technique for high school athletes.

#### **4. SUMMARY**

Physiological measurement showed significant reduction of physical stress levels (indicated by significant decrease in Salivary Amylase (SA) ( $p=0.04$ , 2-tail) and Pulse Rate (PR) ( $p=0.04$ , 2-tail), and significant increase in Blood Oxygen Level (BOL) ( $p=0.00$ , 2-tail) due to Cyclic Meditation (CM) practice in Yoga group on 35<sup>th</sup> day, as immediate effect of CM on 35<sup>th</sup> day, and it was larger than immediate effect of CM on 14<sup>th</sup> day. This difference indicate that Yoga helps to thin out stresses, and proved why ancient Yogi Patañjali has used the term thinning. It is considered that stress is not eliminated suddenly, hence we should reduce it gradually and systematically by use of techniques such as CM.

In addition, psychological questionnaire (Profile of Mood States [POMS]) result indicate significant reduction of mental stress levels indicated by significant decreases in "Tension-Anxiety ( $p=0.03$ , 2-tail)", "Depression-Dejection ( $p=0.00$ , 2-tail)" and "Confusion ( $p=0.01$ , 2-tail)" due to CM practice in Yoga group. It strongly indicates that effect of CM practice helps to cope with stress in daily activities also because participants have done not only CA but also schoolwork, private-tutoring school, housework and so on for the duration of this study. Conversely, effect of long term (more than 35 days) CA with general cooling down exercise can make mental stress levels increased.

There is a correlation between physiological reaction and emotions. Yoga group "Tension-Anxiety", "Depression-Dejection" and "Confusion" scores were decreased significantly as well as SA and PR were decreased significantly. Control group "Anger - Hostility" was increased significantly as SA was increased significantly. Moreover, decrease in Yoga group SA can be regarded as cause of increase in “Vigor” also. Thus there is considered strong correlation between physiological stress level and mental stress level. Body reaction can affect mental condition and the same with the converse.

#### **5. CONCLUSION**

The study indicates that 35 days of regular practice of Cyclic Meditation (CM) leads to significant immediate effect of CM in reduction of stress levels in high school athletes who practice sports 4hrs /day. Also long term (35days) practice of CM decreases stress levels (as can be seen by Salivary Amylase [SA], Pulse Rate [PR] and Blood Oxygen Level [BOL] in Measurements 1 and 5) compared to the control group. This is also supported by the Psychological parameters as felt by the participants and measured through Profile of Mood States (POMS). This result encourages those who are into sports to adopt CM as a part of their daily schedule to reduce the stress levels. This also encourages a longer duration study such as 2 months intervention would have given a significant effect on long term effect of CM on SA, BOL and PR.

## 6. SUGGESION

Thus this study suggested that Yoga, especially CM, is suitable relaxation technique for high school athletes.

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## TREATMENT OF ADHESIVE CAPSULITIS OF SHOULDER JOINT BY INTRA-ARTICULAR HYDROCORTISONE INJECTION.

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### ABSTRACT

Treatment of Adhesive capsulitis of shoulder joint still remains controversial. This study includes intra-articular corticosteroid injection in early stages of idiopathic adhesive capsulitis will leads to early resolution of stiffness and symptoms. This study is done only in stage-I and Stage-II adhesive capsulities. The diagnosis was done by history and physical examination. Other causes of pain & stiffness were eliminated. I defined stage-I where complete improvement of pain and regaining of normal motion after infra articular injection. State-II is defined, who has significant improvement of pain and partial improvement of motion following injection. I had selected 14 cases of stage-I and 40 cases of stage-II. The mean age was 51 years (range 33 years to 69 years). Female patient was 37 and male 17. Six patient had diabetes mellitus. Physical examination of patient as well as symptoms and disability measured. Criteria for remedy were defined by forward flexion and external rotation to within 15° of the contralateral side and internal rotation to within five spinal levels of the contralateral side. Forty of the patients out of fifty four met the criteria for recovery at a mean of 6 months.

The mean time of recovery for stage-I patient was 5 weeks (2 weeks to 10 weeks) and for stage-II it was 5 months (range : 3 weeks to 18 months). Stage-III was excluded from my study. Early recognition of stage-I and stage-II idiopathic adhesive capsulitis and early injection of corticosteroid with local anaesthesia may be both diagnostic and therapeutic.

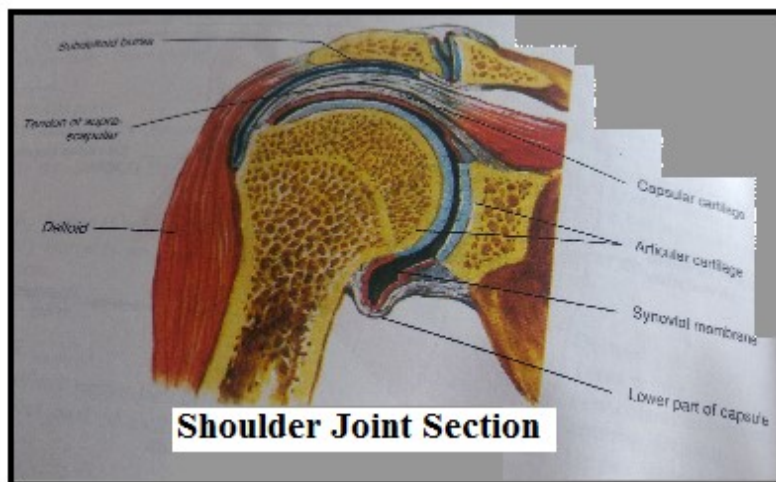
**Key Words:-** Intraarticular corticosteroid, associated diabetes mellitus.

## 1. INTRODUCTION

The treatment of idiopathic adhesive capsulitis of shoulder joint is controversial. Several methods of treatment exists for adhesive capsulitis as active and supervised exercises of shoulder joint, non-steroidal anti-inflammatory drugs (NSAIDS), Oral corticosteroids, Intra articular hydrocortisone injection, closed manipulation, open surgical release and arthroscopic capsular release. Some said that it is self-resolving. Some said that patient may not fully recover from pain and disability of adhesive capsulitis in long term follow-up. Some were treated with physiotherapy.

Surgery may shorten the time of disability, but the complications but the complications associated with surgery and anesthesia may have to consider.

Glenohumeral joint: Corticosteroid injection reduce synovial inflammation and decrease capsular fibrosis, thereby improve shoulder motion to reduce time of functional recovery. In stage-I and Stage-II idiopathic adhesive capsulitis, local hydrocortisone injection leads to diminish stiffness and symptoms.



## 2. MATERIALS AND METHODS

All patients were identified with stage-I and stage-II idiopathic adhesive capsulitis over 4 ½ years.

The diagnosis of adhesive capsulitis was made on history and clinical examination and confirmed by infra articular hydrocortisone injection. Other cause of pain and motion loss were eliminated.

Rotator cuff tendinopathy, Osteo arthritis of joint, neoplasm, Acromio-clavicular joint pain etc. was ruled out by physical findings as normal strength, impingement signs, radiographs and tenderness on palpation. M.R.I. not done routinely as it is a clinical diagnosis.

Intra articular hydrocortisone injection with local anaesthesia was used to confirm stages. The patients were instructed to perform simple flexion & extension exercise initially and reexamined after 30 minutes.

If the patient has improvement in pain and normalization of motion within 30 minutes. after injection, then it is confirmed as stage-I. If gross improvement of pain with partial improvement of motion, a stage-II diagnosis is made.

All patients had pain on palpation in both anterior & posterior capsule. Active & passive forward flexion, abduction, internal rotation and external rotation in neutral

abduction were measured. All patients had a restriction of motion compared to the contralateral side.

Routine radiograph was done. Radiograph was negative except diffuse osteopenia in some cases. Patients with pre-existing shoulder pathology were excluded.

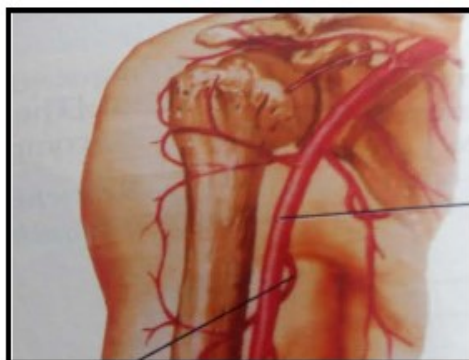
In all patients glenohumeral joint was injected through anterior approach in supine position with upper limb by the side of the body with external rotation of the limb.

Before injection always reassure the patients. We have used 5ml or 10ml syringe with 18 or 19 gauge needle and 1' or 1½' length needle.

In some cases skin was anaesthetized with xylocaine spray (10%). The solution injected (40mg of Inj. Depo Medrol) mixed with 1 ml. of Xylocaine 2% soln. Some patients are allergic to Xylocaine solution. So skin tests are done with Xylocaine soln. I normally used anterior approach for local hydrocortisone injections.

#### **Anterior Approach :**

The needle is inserted medial to the head of the humerus and lateral to the coracoid process by 1 cm and directed posteriorly at a slight superior and lateral angle. Again an 18 or 19 gauge needle should slip into the joint completely and the injection have no resistance



### **3. DISCUSSION**

Adhesive capsulitis is mainly classified into two types – Primary and Secondary.

Primary or Idiopathic adhesive capsulitis occurs spontaneously without a specific precipitating event. It may result from chronic inflammatory response with fibroblastic proliferation which may actually be an abnormal response from immune system.

Secondary Adhesive capsulitis occurs often after a shoulder injury or surgery or may be associated with other conditions such as diabetes, rotator cuff injury, autoimmune disease, cerebro-vascular or cardiovascular disease.

External shoulder rotation being the most limited, followed closely by shoulder abduction and internal rotation.

Loss of passive external rotation is single most important finding on physical examination which distinguishes from rotator cuff problem.

Multiple interventions have been described for the treatment of Adhesive capsulitis such as corticosteroid injections, patient reassurance, TENS, U.S.T., S.W.D., Cryotherapy, Joint mobilization, Manipulation under anaesthesia, Stretching exercises, Pendular exercises, Scapula-thoracic strengthening exercises etc. These data and literature support that Adhesive.

Capsulitis is both inflammatory and a fibrotic condition. In the early stage it is hyper-vascular synovitis and subsequent fibrosis of the synovium and capsule. Sustained production of cytokines has been shown to result in tissue fibrosis.

Early treatment with intra articular corticosteroid works by chemical ablation of the synovitis, thus limiting the subsequent development of fibrosis and shortens the natural history of the disease. With resolution of the synovitis and termination of capsular scar formation, capsular remodeling and recovery of ROM occurs. This is supported by the orthopaedic and rheumatologic literature.

Gam et al treats patients with adhesive capsulitis with either steroid injections or steroid injection and distension with 19 cm<sup>3</sup> of Lidocaine. The visual analog pain scores for the groups were similar.

Bulgen et al randomized patients to treatment with steroid, physical therapy, ice, or benign neglect. He found positive response to treatment was most marked in patients treated with steroid; however, no significant difference in final long term outcome was reported.

Hazleman summarized numerous studies on the use of intra-articular corticosteroid and reported that success of treatment is dependent on the duration of symptom. Early onset of symptoms recovers early. In our study we found that stage-I disease resolve more rapidly than the stage-II patients. In our study it was shown that early in the course of adhesive capsulitis, synovitis is present without capsular fibrosis.

#### **4. CONCLUSION**

In summary, corticosteroid injection in the early stages of adhesive capsulitis allows the patient to regain motion prior to developing severe fibrosis in many cases. Patients who were treated in stage-I recovers more rapidly than those in stage-II.

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**COMPARATIVE STUDY BETWEEN CRYOSTRETCH AND LIGHT  
CONCENTRIC EXERCISE ON DELAYED ONSET  
MUSCLE SORENESS**

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**ABSTRACT**

**BACKGROUND:** Several studies suggested the role of cryotherapy and stretching in DOMS. However there is only few documented research which found the effectiveness of light concentric exercises on DOMS. **OBJECTIVE:** This study proposes were to determine the effectiveness of light concentric exercise and to compare the effect of light concentric exercise and cryostretch on DOMS. **Study Design:** Experimental design **Methods:** 30 subjects fulfilled the inclusion criteria, were taken for the study and randomly assigned in two groups: Group 1 received cryostretching, Group 2 received light concentric exercises using metronome. First of all, DOMS was induced in quadriceps muscles in each subjects using the exercise protocol. The treatment was given for 4 days. Outcome measures of VAS and ROM were evaluated before and after treatment each day for 4 days **Results:** The result of this study showed that light concentric exercise is significantly more effective in improving delayed onset muscle soreness than cryostretch. However there was no significant improvement in range of motion in both the group and only VAS decreased in both groups. **Conclusion:** Light concentric exercises were found to be more effective than cryostretch in treatment of exercise induced DOMS in quadriceps muscle group. Both could be used in management of pain as both were found to be significantly effective in treatment of DOMS.

**Key words:** DOMS, light concentric exercises, cryostretch, metronome.

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## 1. INTRODUCTION

DOMS is described as an unpleasant sensation or pain after unaccustomed strenuous exercise (Murase, et.al 2010). Theodore Hough gives first detailed description of delayed onset of muscle soreness (DOMS) in 1902 who concluded that this kind of soreness is "fundamentally the result of ruptures within the muscle". Major function of pain is to protect the organism from injurious stimuli (Zainuddin, 2006). There are two types of muscle soreness associated with exercise: acute soreness and delayed onset muscle soreness. Acute soreness occurs during or immediately after exercise while delayed muscle soreness occurs 24 to 72 hours after exercise is completed. Acute soreness usually results from muscle fatigue secondary to a buildup of normal by-products produced during exercise. Delayed onset muscle soreness (DOMS) is muscle pain and discomfort experienced approximately one to three days after eccentric exercise. Acute muscle soreness occurs during exercise and may last up to 4 to 6 hours before subsiding. Delayed onset muscle soreness peaking 24 to 48 hours post-exercise and subsides within 96 hours (Declan, et. al. 2003).

### 1.1 Quadriceps Muscle and DOMS:

The quadriceps are "anti-gravity" muscles when contracting concentrically, extending the knee powerfully to lift one up. But when step down, the knee starts straight and then bends like a spring as the body follows: the quadriceps contract eccentrically to keep the knee from collapsing too fast or too far.

The eccentric contraction phase that causes muscle damage during normal level running since the highest tension in the leg extensor muscles are produced whilst the muscles are lengthening after the foot touches the ground and the centre of mass is decelerating. In downhill running the knee extensor muscle group is worked over a greater length.

During downhill running the overall change in knee angle from foot strike to peak flexion angle is much greater than in level running. In downhill running, the knee extensor muscle group is being actively strained to a greater degree than in level running while undergoing a simultaneous contraction.

The degree of active strain on a contracting muscle produces characterized signs and symptoms of muscle damage. Following downhill running, greater DOMS is produced in the gluteal muscles, the quadriceps, and the anterior and posterior tibial muscles than for an equivalent bout of level running (Eston, et.al. 1995) .

### 1.2 Cryostretch:

Cryostretching is the technique of applying cryotherapy while stretching the soft tissue. This form of stretching is used specifically to increase flexibility that is limited due to muscle spasm. Similar to PNF stretching, cryostretch has the added advantage that affected muscle is numbed prior to stretch, making use of anesthetic effects of the ice to reduce the spasm and improve pain free range of motion (Taylor, 2009).

Its purpose is to decrease muscle spasm and allow increased flexibility by diminishing the pain and muscle spasm.

### 1.3 Light Concentric Contraction:

It is a type of muscle contraction in which the muscles generate enough force to overcome the resistance to joint movement so it shortens as it contracts (Maclatchy, 1993). It has been documented that exercise increases pain threshold and pain tolerance, a phenomenon often referred to as exercise-induced analgesia (Zainuddin, 2006).

The aim of the study was to find out the effectiveness of cryostretch and light concentric exercise in treatment of delayed onset muscle soreness. Further, the purpose of the present investigation was to find out the comparison between cryostretch and light concentric exercise in treatment of delayed onset muscle soreness.

## 2. METHODOLOGY

### 2.1 Sample:

30 subjects were selected for the purpose of investigation. Random sampling method was used to select the sample. The age of the subjects was between 18 to 30 years. Only those subjects were included in this study who were taking medicine to remove the pain and inflammation and not performing the resistance training on the regular basis. The athletes suffering from cardiac diseases, trauma, cold urticaria, cold induced, cryohemoglobinemia, compromised sensation, emotional and psychological disorder were not considered for this investigation.

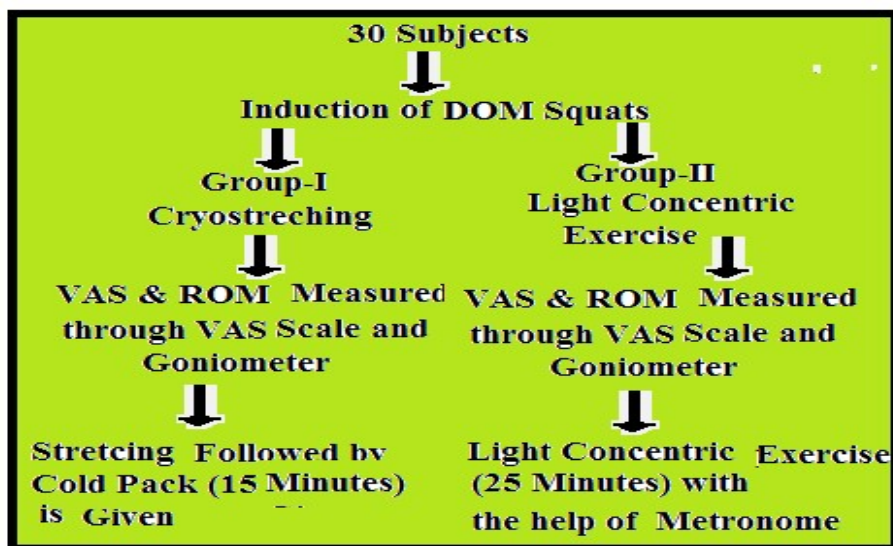
### 2.2 Research Design:

Experimental research design was employed in this study

### 2.3 Instruments and Tools Used:

1. Electronic metronome
2. Cold packs
3. Goniometry

### 2.4 Protocol



### 2.5 PROCEDURE:

The subjects have been randomly allocated in two groups: Group1 - Cryo-stretching and Group 2 -light concentric exercise

#### 2.5.1 DOMS Induction:

Exercise protocol has been used to induce DOMS that consisted of 100 squats for girls and 150 squats for boys. Every day measurements of visual analog scale (VAS) and range of motion (ROM) has been taken before and after the treatment.

#### 2.5.2 Cryostretch:

Cryostretch consisted of a cold pack for 15 minutes for the numbness and then passive static stretch was given to the subject in prone lying as per patient tolerance. Stretching was given for 20 second hold time then 5 seconds maximal isometric



contraction (hold-relax) of quadriceps and then again stretch for 20 seconds by taking the slack from previous contraction. This protocol has been repeated for 3 times .

### 2.5.3 Light Concentric Exercise:

Light concentric exercises consisted of 10 sets of 60 continuous knee flexion movements on the electric metronome (60beats/min) with a 30 second rest between sets. Exercise took approximately 25 minutes to complete, but the actual muscle working time has been approximately 20 minutes (2 second: flexion/extension × 60 contraction / set × 10 sets = 1,200 seconds). The subject has been asked to perform this exercise as comfortable as possible (i.e. with minimal effort). During the interval between sets, subject's arms has been in a relaxed position for 30 seconds (Zainuddin, 2006).



Figure 1: Subject performing LCE with metronome

### 2.6 Statistical Analysis

To find out the significant differences between group1 and group2 in their mean scores of all the selected variables, means, standard deviations and t-ratio with the help of SPSS 16 for window version were calculated.

Comparison of effect of treatment within the group on day 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> for all the variables was done using repeated measures ANOVA followed by post hoc analysis. The significance level was set at 95% ( $p < 0.05$ )

### 3. RESULT

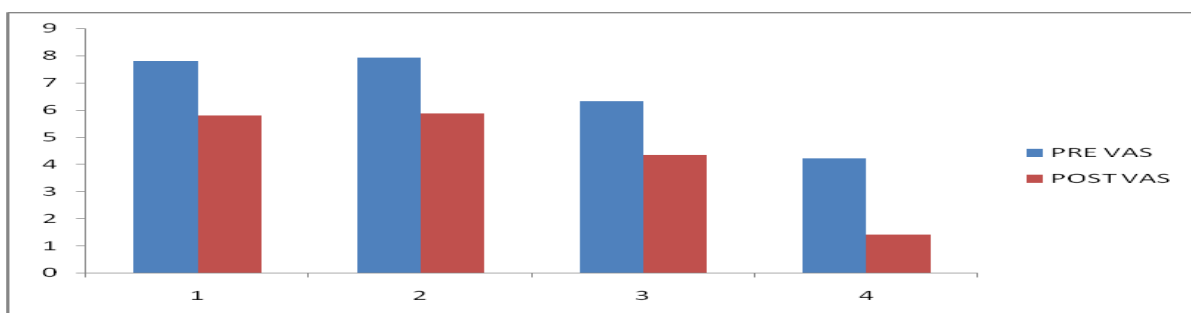
To assess and compare the effect of cryostretch and light concentric exercise on delayed onset muscle soreness of athletes means, standard deviations and t-ratio with the help of SPSS 16 for window version were calculated and data pertaining to this has been presented in Table 1 to 7 .

On Day 1 the pre-treatment values there is no significant difference between both the groups (group1, group2) on VAS scale as well as range of motion (ROM). On other hand in the post-treatment values only VAS shows significant difference in both the groups but no significant difference between ROM.

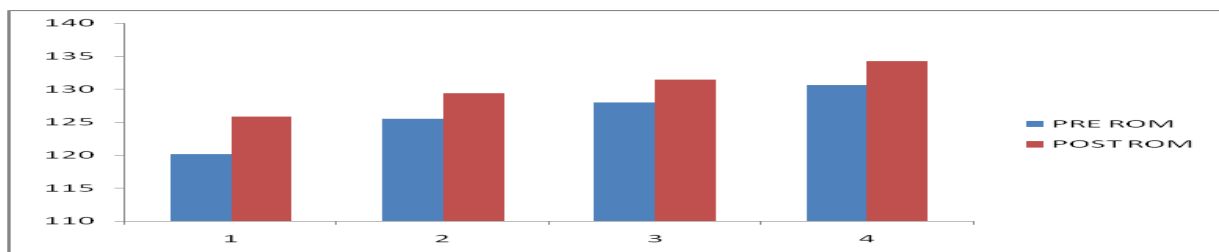
**TABLE 1**  
**MEANS AND STANDARD DEVIATIONS OF PRE -TEST & POST-TEST OF VAS AND ROM**  
**OF CRYOSTRETCH GROUP FROM DAY FIRST TO FOURTH**

Day	Pre VAS	Post VAS	D VAS	Pre ROM	Post ROM	D ROM
1	7.80 <sup>a</sup> ±0.77	5.80 <sup>a</sup> ±0.94	2.00 <sup>a</sup> ±0.65	120.13 <sup>a</sup> ±8.15	125.86 <sup>a</sup> ±6.15	5.73 <sup>a</sup> ±5.76
2	7.93 <sup>a</sup> ±0.88	5.86 <sup>a</sup> ±1.18	2.06 <sup>a</sup> ±1.03	125.53 <sup>ab</sup> ±6.35	129.40 <sup>ab</sup> ±5.61	3.86 <sup>ab</sup> ±2.44
3	6.33 <sup>b</sup> ±0.90	4.33 <sup>b</sup> ±1.75	2.00 <sup>a</sup> ±0.75	128 <sup>b</sup> ±5.01	131.46 <sup>bc</sup> ±4.30	2.66 <sup>ab</sup> ±1.83
4	4.20 <sup>c</sup> ±1.20	1.40 <sup>c</sup> ±1.05	2.80 <sup>b</sup> ±0.86	130.60 <sup>c</sup> ±3.75	134.20 <sup>c</sup> ±3.20	3.60 <sup>b</sup> ±1.84

The mean scores on pre-test and post-test of VAS and ROM of cryostretch group from day first to fourth have been depicted in figure 1 and 2.



**Figure 1: Mean Score of pre-test and post-test of VAS of cryostretch group from day first to fourth**

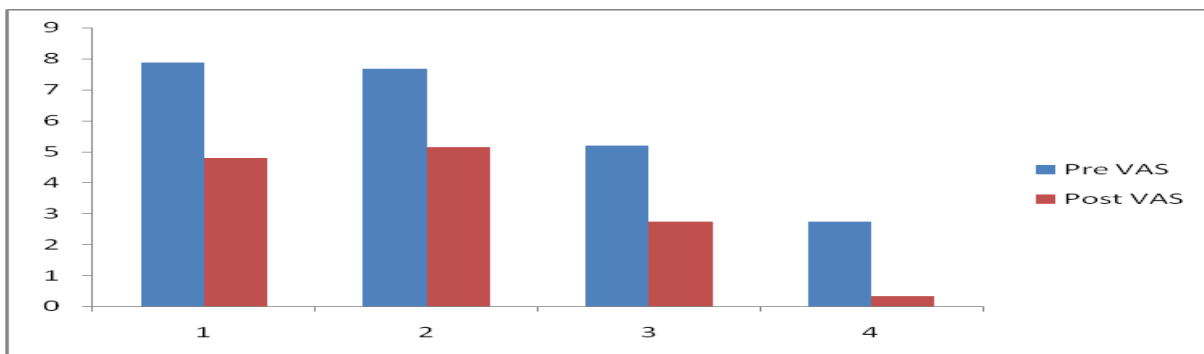


**Figure 2: Mean Score of pre-test and post-test of ROM of cryostretch group from day first to fourth**

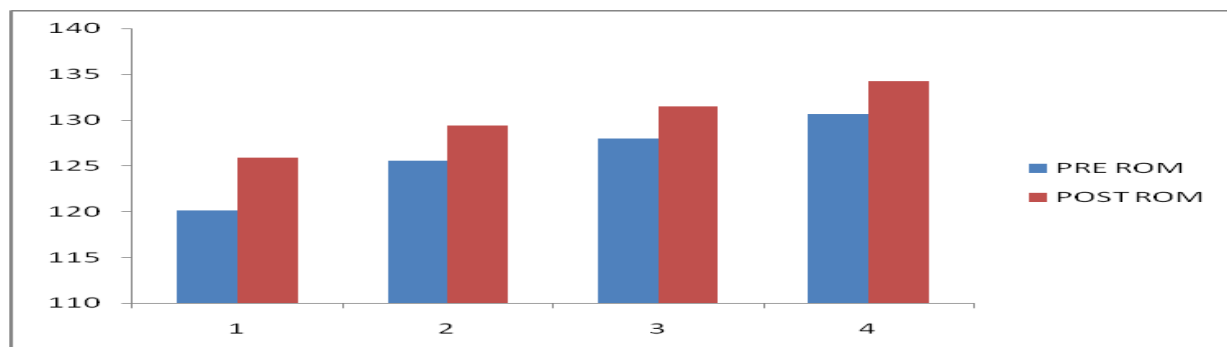
**TABLE 2**  
**MEANS AND STANDARD DEVIATIONS OF PRE -TEST & POST-TEST OF VAS AND ROM**  
**OF LIGHT CONCENTRIC EXERCISE GROUP FROM DAY FIRST TO FOURTH**

Day	Pre VAS	Post VAS	D VAS	Pre ROM	Post ROM	D ROM
1	7.86 <sup>a</sup> ±0.74	4.80 <sup>a</sup> ±1.08	3.06 <sup>a</sup> ±1.09	119.86 <sup>c</sup> ±4.91	125.60 <sup>c</sup> ±4.93	5.73 <sup>a</sup> ±3.21
2	7.66 <sup>a</sup> ±1.29	5.13 <sup>a</sup> ±1.30	2.53 <sup>a</sup> ±0.74	125.66 <sup>b</sup> ±5.65	129.40 <sup>ab</sup> ±5.06	3.73 <sup>b</sup> ±2.40
3	5.20 <sup>b</sup> ±1.26	2.73 <sup>b</sup> ±1.33	2.46 <sup>a</sup> ±0.74	131.13 <sup>a</sup> ±2.95	131.46 <sup>a</sup> ±2.94	0.33 <sup>c</sup> ±2.94
4	2.73 <sup>c</sup> ±1.57	0.33 <sup>c</sup> ±0.48	2.40 <sup>a</sup> ±1.29	132.26 <sup>a</sup> ±2.93	134.40 <sup>a</sup> ±2.77	2.13 <sup>bc</sup> ±1.50

The mean scores on pre-test and post-test of VAS and ROM of light concentric exercise group from day first to fourth have been depicted in figure 3 and 4



**Figure 3: Mean Score of pre-test and post-test of VAS of light concentric exercise group from day first to fourth**



**Figure 4: Mean Score of pre-test and post-test of ROM of light concentric exercise group from day first to fourth**

**TABLE 3**

**SIGNIFICANCE OF DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEAN SCORES OF GROUP 1 AND 2 ATHLETES ON VISUAL ANALOG SCALE VALUE AND RANGE OF MOTION AT FIRST DAY**

Variables	Cryostretch Group1	Light concentric exercise Group2	MD	$\sigma$ DM	t- value
Pre Visual analog scale (VAS)	7.80±0.77	7.86±0.74	0.06	0.25	0.24
Post Visual analog scale ( VAS)	5.80±0.94	4.80±1.80	1.00	0.37	<b>2.70*</b>
D Visual analog scale (VAS)	2.00±0.65	3.06±1.09	1.06	0.33	<b>3.23*</b>
Pre Range of Motion (ROM)	120.13±8.15	119.86±4.41	0.27	2.45	0.11
Post Range of Motion (ROM)	125.86±6.15	125.60±4.94	0.26	2.00	0.13
Difference of Range of Motion (ROM)	5.73±5.76	5.73±3.21	0.00	0.00	0.00

\*Significant at .05 level,  $t_{.05}(28)=2.05$

It is clearly evident from Table 3 that the significant difference was found between recorded mean scores of Group 1 and Group 2 in their Post Visual analog scale (VAS) and D Visual analog scale (VAS), as the obtained t-value of 2.70 and 3.23 were higher than the required  $t_{.05}(28)=2.05$ . But they had no significant differences between recorded mean scores of Group 1 and Group 2 in their Pre Visual analog scale (VAS), Pre Range of Motion (ROM), Post Range of Motion (ROM) and D Range of Motion (ROM), as the obtained t-values of 0.24, 0.11, 0.13 and 0.00 respectively were lesser than the required  $t_{.05}(28)=2.05$ .

**TABLE 4**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEAN SCORES OF GROUP 1 AND 2 ATHLETES ON VISUAL ANALOG SCALE VALUE AND RANGE OF MOTION AT SECOND DAY**

Variables	Cryostretch Group1	Light concentric exercise Group2	MD	$\sigma_{DM}$	t- value
Pre Visual analog scale (VAS)	7.93±0.88	7.66±1.29	0.27	0.41	0.66
Post Visual analog scale ( VAS)	5.86±1.18	5.13±1.30	0.73	0.45	1.61
Difference of Visual analog scale (VAS)	2.06±1.03	2.53±0.74	0.47	0.33	1.42
Pre Range of Motion (ROM)	125.53±6.35	125.66±5.65	0.13	2.16	0.06
Post Range of Motion (ROM)	129.40±5.61	129.40±5.06	0.00	0.00	0.00
Difference of Range of Motion (ROM)	3.86±2.44	3.37±2.40	0.49	3.26	0.15

Non-significant at .05 level

Table 4 indicates that there was no significant difference between recorded mean scores of Group 1 and Group 2 on Pre Visual analog scale (VAS), Post Visual analog scale ( VAS), Difference of pre and post test Visual analog scale (VAS), as well as in Pre Range of Motion (ROM), Post Range of Motion (ROM) and Difference of pre & post test Range of Motion (ROM), as the obtained t-values of 0.66, 1.61, 1.42, 0.06, 0.00 and 0.15 were lesser than the required t-05 (28)=2.05.

**TABLE 5**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEAN SCORES OF GROUP 1 AND 2 ATHLETES ON VISUAL ANALOG SCALE VALUE AND RANGE OF MOTION AT THIRD DAY**

Variable	Cryostretch Group1	Light concentric exercise Group2	MD	$\sigma_{DM}$	t- value
Pre Visual analog scale (VAS)	6.33±0.90	5.20±1.26	0.13	0.05	<b>2.60*</b>
Post Visual analog scale ( VAS)	4.33±1.75	2.73±1.33	1.60	0.46	<b>3.48*</b>
D Visual analog scale (VAS)	2.00±0.75	2.46±0.74	0.46	0.27	1.70
Pre Range of Motion (ROM)	128.80±5.01	131.46±2.95	2.66	1.72	1.55
Post Range of Motion (ROM)	131.46±4.30	131.46±2.95	0.00	0.00	0.00
D Range of Motion (ROM)	2.66±1.84	0.33±2.94	2.33	0.89	<b>2.61*</b>

\*Significant at .05 level, t.05 (28)=2.05

Table 5 reveals that there were significant differences between recorded mean scores of Group 1 and Group 2 on Pre -test and post-test values of Visual analog scale (VAS) and D Range of Motion (ROM), as the obtained t-values of 2.60, 3.48, and 2.61 were higher than the required t-05 (28)=2.05.

But they had no significant differences between recorded mean scores of Group 1 and Group 2 in their D Visual analog scale (VAS), Pre-test Range of Motion (ROM) and Post-test Range of Motion (ROM) and D Range of Motion (ROM), as the obtained t-values of 1.70, 1.55 and 0.00 were lesser than the required t-05 (28)=2.05.

**TABLE 6**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEAN SCORES OF GROUP 1 AND 2 ATHLETES ON VISUAL ANALOG SCALE VALUE AND RANGE OF MOTION AT FOURTH DAY**

Variable	Cryostretch Group1	Light concentric exercise Group2	MD	$\sigma_{DM}$	t value
Pre Visual analog scale (VAS)	4.20±1.20	2.73±1.58	2.53	0.88	2.85*
Post Visual analog scale ( VAS)	1.40±1.05	0.33±0.48	1.07	0.30	3.55*
Difference of Visual analog scale (VAS)	2.80±0.86	2.40±1.29	0.40	0.40	1.00
Pre Range of Motion (ROM)	130.60±3.75	132.26±2.94	2.34	1.73	1.35
Post Range of Motion (ROM)	134.20±3.23	134.40±2.77	0.20	1.11	0.18
Difference of Range of Motion (ROM)	3.60±1.84	2.13±1.50	1.47	0.62	2.37*

\*Significant at .05 level, t.05 (28)=2.05

Table 6 reveals that there were significant differences between recorded mean scores of Group 1 and Group 2 on Pre -test and post-test values of Visual analog scale (VAS) and D Range of Motion (ROM), as the obtained t-values of 2.85, 3.55, and 2.37 were higher than the required t-05 (28)=2.05. But they had no significant differences between recorded mean scores of Group 1 and Group 2 in their D Visual analog scale (VAS) , Pre-test Range of Motion (ROM) and Post-test Range of Motion (ROM), as the obtained t-values of 0.99, 1.35 and 0.18 were lesser than the required t-05 (28)=2.05.

The mean scores of cryostretch and light concentric exercise groups athletes on VAS and Rom from day first to fourth have been depicted in figure 5 & 6

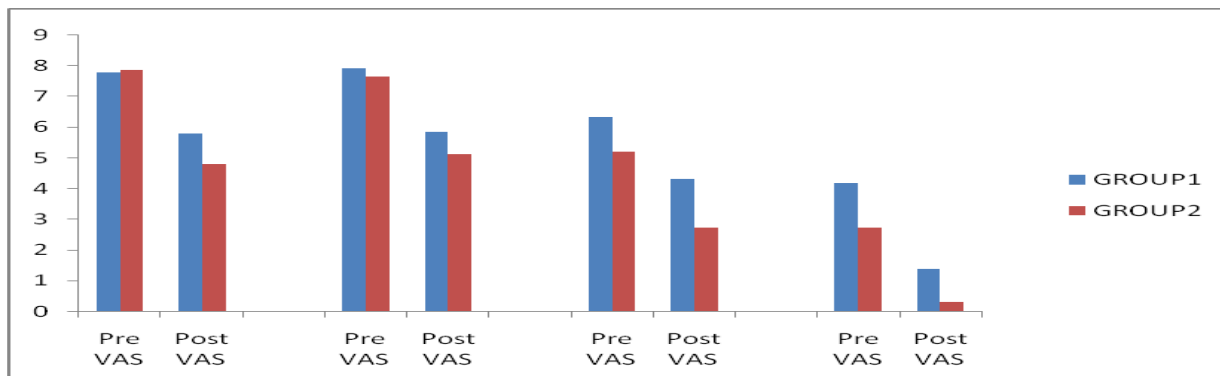


Figure 5: Comparison of VAS in group 1 and group 2 on 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> day

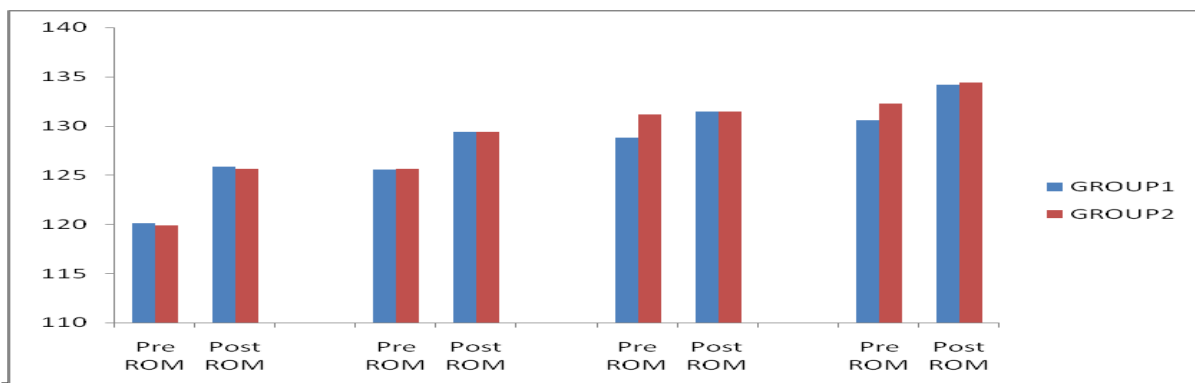


Figure 6: Comparison of ROM in group 1 and group 2 on 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> day

TABLE 7

SIGNIFICANCE OF DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEAN SCORES OF GROUP 1 AND 2 ATHLETES ON DIFFERENCE IN VALUES OF VISUAL ANALOG SCALE VALUE AND RANGE OF MOTION

GROUPS	N	Variables	Test	Mean	MD	$\sigma_{DM}$	t- value
Group1	15	Difference in VAS	Pre-test	6.56	2.21	0.114	19.40*
			Post-test	4.35			
Group2	15	Difference in ROM	Pre-test	125.07	3.96	0.45	8.80*
			Post-test	130.23			
Group1	15	Difference in VAS	Pre-test	5.86	2.61	0.13	20.07*
			Post-test	3.25			
Group2	15	Difference in ROM	Pre-test	127.23	2.99	0.42	7.14*
			Post-test	130.22			

\*Significant at .05 level, t.05 (28)=2.05

Table 7 reveals that there were significant differences between recorded mean scores of difference values on Visual analog scale (VAS) and Range of Motion (ROM) of Group 1 athletes, as the obtained t-values of 19.40 and 8.80 respectively were higher than the required  $t_{05}(28)=2.05$ . Group 2 athletes also had significant differences between recorded mean scores of difference values on Visual analog scale (VAS) and Range of Motion (ROM), as the obtained t-values of 20.07 and 7.14 respectively were higher than the required  $t_{05}(28)=2.05$ .

#### 4. DISCUSSION

The four day concentric training program resulted in decrease in pain and increase in range of motion. The result of this study shows that light concentric exercise is significantly more effective in improving delayed onset muscle soreness than cryostretch. In addition, results indicate that there is no more effect in range of motion only pain scale is decreased during treatment.

The concept of dabbing used during treatment with cold pack was supported by Sidhu et al who submitted that the dabbing procedure produces a quicker means to anaesthetize an area and augment another intervention, such as stretching or myofascial release technique in specific patient populations, such as those with delayed onset muscle soreness or an acute musculoskeletal injury (Sidhu, Lantell, and Pettitt, 2008).

Another study proved that stretching is helpful in treatment of DOMS. Stretching before or after physical activity can be observed daily in the clinical setting and in the community, as clinicians and patients use stretching to prevent injury, decrease soreness, and improve performance. Muscle tissue compliance at rest and during activity is unrelated. This observation, in conjunction with the belief that injuries occur when a muscle is active, indicates that stretching, which increases compliance at rest, does not support the concept of decreased injury risk when the muscle is active. The basic science literature has also been shown that stretching muscle as little as 20% of its resting length, which can occur during correct stretching techniques, can produce damage in isolated preparations. These findings indicate that it may be difficult to define the correct stretching techniques to reduce injury risk. The final argument is based on the observation that increased range of motion occurring with stretching may be in part a result of an increase in stretch tolerance. That is, stretching does not improve tissue compliance; rather, the stretching exercises increase stretch tolerance (i.e. reduce pain) during the stretching procedure (Cleary. Et. al., 2002).

Zainuddin et al demonstrated a clear analgesic effect of LCE on DOMS by showing a 40-45% reduction in muscle soreness and tenderness immediately after LCE. This suggests the exercise-induced analgesia. However, the analgesic effect did not appear to last long, and there was no significant difference in muscle soreness and tenderness after maximum eccentric contraction. It was concluded that LCE has a temporarily analgesic effect on DOMS but no effect on recovery from eccentric exercise (Zainuddin, 2006). It has been observed that soreness is most severe after eccentric contractions which was supported by Rodenburg et al who found that short, intense, exhaustive, eccentric exercise produces physiological changes in muscle that are distinct from exercise involving mixed types of contraction taking place with less intensity over a greater period of time (Jalalvand, et. al., 2011).

This study hypothesized that the LCE performed 1-4 days after maximum eccentric contraction would alleviate DOMS and enhance recovery from muscle damage. Similar changes in work and torque have occurred with light concentric exercise as a cure for DOMS and symptom of muscle damage during eccentric contraction. Moreover, the changes in muscle strength, ROM and limb circumference were comparable between conditions immediately and 1 day after maximum eccentric contraction (i.e. prior to the first LCE). The results showed that the LCE had a short-lived palliative effect on DOMS, but no sustained therapeutic effect on either DOMS.

It was found that cold and stretching and exercise were very effective for relieving painful spasms and myofascial pain. Studies indicated that cold could influence muscle performance, often causing decreased immediate post-treatment strength and delayed post-treatment strength increases. Few studies indicated that heat and light load worked to increase length, while cold applied in the stretched position helped to maintain length increases.

## 5. CONCLUSION

Based on results and discussion, our study concludes that Cryostretch and Light concentric exercises both are effective in treatment of DOMS. However based on inter group analysis, Light concentric exercises is found to be more effective than cryostretch in treatment of exercise induced DOMS in quadriceps muscle group.

## 6. LIMITATIONS

Sample size was small. Gender distribution was not taken in account

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**THE EFFECT OF DIFFERENT GEOGRAPHICAL CONDITION ON SELECTED  
PHYSICAL VARIABLES ON BADMINTON  
PLAYERS**

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**ABSTRACT**

The objective of the study was to investigate the effect of different geographical condition on selected physical variables on badminton players. Another purpose of the study was to find out the relationship of different geographical among physical variables of badminton players. The subjects for the study were selected from the ninety badminton players who have participated in national level badminton tournament. Thirty subjects were selected from Karla, Tamilnadu and Andhra Pradesh (Coastal area). Thirty subjects were selected from Uttar Pradesh, Haryana and Punjab (Non-coastal area) and thirty were selected from Uttarakhand, Himachal Pradesh and Jammu and Kashmir (hill area). The age level of subjects ranged from 15 to 18 years. All the subjects were residing at different geographical conditions. Stand and progressive matrices organizational selected physical variable is (speed, endurance, leg strength and abdominal strength). To find out significant effect of different geographical conditions on selected physical variable of badminton players, the one-way analysis of variance was used. To find out the relationship among physical variable, the Pearson's Product moment correlation was computed. The level of significance was set at .05 levels. The result reveals the one-way analysis of variance that there was insignificant ( $p > .05$ ) the effect of different geographical conditions on selected physical variables (Leg strength and abdominal strength) of badminton players and significant ( $p < .05$ ) deference of physical variables (Speed and Endurance) of badminton players. The result also reveals that there was insignificant ( $p > .05$ ) the effect of different geographical conditions on selected physical variable (Endurance, Leg strength and abdominal strength) of badminton players and significant ( $p < .05$ ) deference of physical variable (Speed) of badminton players.

**Keywords:** Geographical Conditions, Physical Variable, Badminton, Players

## 1 INTRODUCTION

In India the effect of environment and ecology on sports need to be emphasized more and its needs to be taken care of because geographically India is a unique country where we have tropical and sub tropical rain/deciduous forest, arid and semi arid tropics, Alpine forest, Tundra's and the desert. The total geographical area accounting for 19.44 percentage of the total area. Of this eastern hilly regions ( eastern Himalayas) account for 70-90 percentage of actual forest cover followed by Madhya Pradesh, Haryana, Himachal Pradesh, Kerala, Orissa with 20-30 percentage forest cover. Other states including Gujarat (6.0 %) have bare minimum of forest cover (1.2 to 4.4 percentages). The forest survey of India estimates that out of a total forest cover only 50 percentage is of adequate density. The effective forest cover, therefore, is just 10 percentage of the geographical area of the country (<https://visionias.files.wordpress.com>).

Badminton is a sports branch which can be played easily and savorily by all people from several ages, which does not drives the player to violence, which also can be used for a recreation and fitness purposes (R. C. Memedov and R. Kale, 1994). On the other hand tennis is not only a sports branch which is so popular but also has new point of views. On one hand it is a kind of sport which is a popular spare time activity and many people can exercise and this sport also became a remarkable revenue source provider (P. Unierzyski, 1995).

The performances and physical characteristics of elite sportsmen which perform in different sports branches may vary and as well anthropometric and basic motoric differences may be distinctive for branches in talent identification (Australian Sports Commission, 1998). The studies which seek for how the structural features affect the performance in the selected sports branch are limited (B. Durmaz et al., 1995; A. Farkas et al., 1989; J. A. Mazza et al., 1992).

The world's top most badminton playing nations, especially China, Indonesia, Malaysia and Korea are very much aware of these and concentrate on the development of basic physical fitness variables and related aspects. They start training a child , concentration of those fitness factors which are supposed to play a significant role in the future performance of a player such as flexibility, agility, balance, cardio-vascular endurance, strength, reaction time, power etc. ( general motor ability qualities) which are appropriate for a specific age group.

Stamina, speed, strength, skill and strategy are essential ingredients of all sports disciplines. A variation in degree in which these ingredients are present marks out special feature of any particular sports. Badminton at its best is a game of swift and graceful movement, a power play contrastingly highlighted by delicacy of touch, of wrong, footing deception, of incredible retrieving and lighting interception, and of varied chess-like tactics of singles, doubles and mixed doubles each an absorbing and different game on its own. (Devis, 1984)

Sports performance is frequently regarded as a function of genetic endowment, training and health status, and athlete skill, in various combinations. Sport scientists and trainers are often tasked with maximizing physical performance with the aim of improving competition success. Indeed, some authors have recommended that, at least in European leagues, more focus be directed towards the effective training of players' physical abilities. The extent to which technical/tactical versus physical fitness interventions are required

remains a difficult question to answer in practice. More specifically, the question of whether physical fitness of players is a contributing factor to the difference between successful and less-successful teams should be addressed.

## 2. METHODS

The subjects for the study were selected from the ninety badminton players who have participated in national level badminton tournament. Thirty subjects were selected from Karla, Tamilnadu and Andhra Pradesh (Coastal area). Thirty subjects were selected from Uttar Pradesh, Haryana and Punjab (Non-coastal area) and thirty were selected from Uttarakhand, Himachal Pradesh and Jammu and Kashmir (hill area). The age level of subjects ranged from 15 to 18 years. All the subjects were residing at different geographical conditions. Stand and progressive matrices organizational selected physical variable is (speed, endurance, leg strength and abdominal strength). To find out significant effect of different geographical conditions on selected physical variable of badminton players, the one-way analysis of variance was used. To find out the relationship among physical variable, the Pearson's Product moment correlation was computed. The level of significance was set at .05 levels.

## 3. RESULTS

**TABLE 1**  
**ANALYSIS OF VARIANCE IN SPEEDS AMONG HILL AREA, COASTAL AND NON-COASTAL PLAYERS**

Source of Variance	d.f	SS	MSS	F-ratio
Between Group	2	11.509	5.754	42.133*
Within Group	87	11.882	.137	

\*Significant at .05 level  $F_{.05}(2, 87) = 4.92$

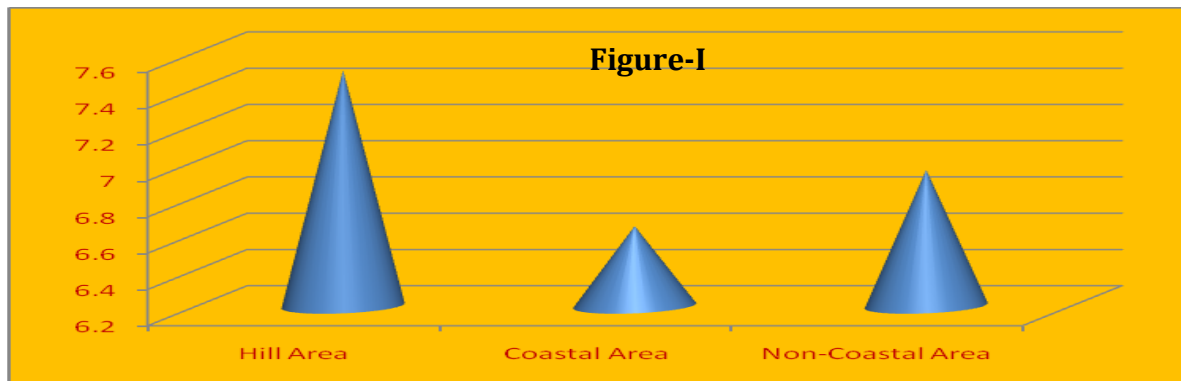
The value shown in table-1 clearly indicates that the F-Value calculated is much higher than the required value to be significant. Further the mean difference among coastal, non-coastal and hill area players through post hoc test was computed which are presented in the following tables and also are represented by figure I.

**TABLE 2**  
**COMPARISON OF SPEEDS AMONG HILL AREA, COASTAL AND NON-COASTAL PLAYERS**

Hill Area	Coastal Area	Non-Coastal Area	M.D	C.D
7.50	6.64		.86	.28
7.50		6.95	.55	
	6.64	6.95	.31	

\*Significant at .05 level  $F_{.05}(2, 87) = 4.92$

The post hoc test to compare the speeds among hill area, coastal area and non-coastal area players has clearly revealed the insignificant difference among the badminton players of hill area and coastal area where the calculated mean difference found (.86), hill area and non-coastal area where the calculated mean difference found (.55) and coastal area and non-coastal area where the calculated mean difference found (.31) was lower than the required value 4.92. The required value was much lower than the calculated value at .05 level of significant. The scores are also illustrated in the figure-I



**TABLE-3**

**Analysis of variance in endurance among hill area, coastal and non-coastal players**

Source of Variance	d.f	SS	MSS	F-ratio
Between Group	2	7840446.67	3920223.34	25.25*
Within Group	87	13505808.34	155239.12	

\*Significant at .05 level,  $F_{.05}(2, 87) = 4.92$

The value shown in table-3 clearly indicates that the F-Value calculated is much higher than the required value to be significant. Further, the mean difference among coastal, non-coastal and hill area players through post hoc test was computed, which are presented in the following tables and also are represented by figure II.

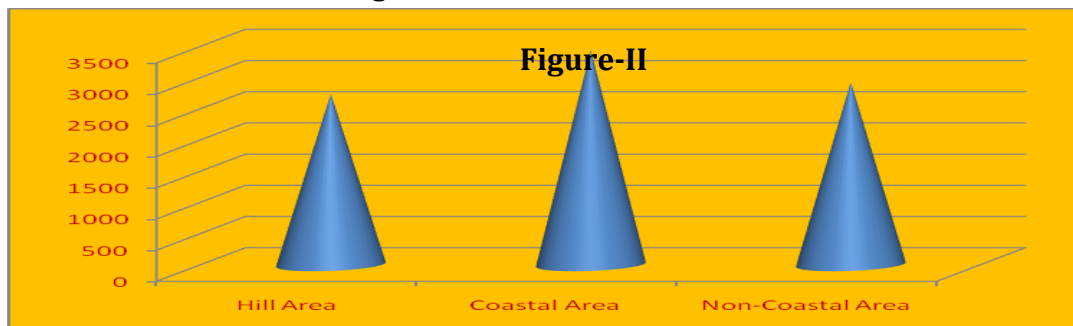
**TABLE-4**

**Comparison of endurance among hill area, coastal and non-coastal players**

Hill Area	Coastal Area	Non-Coastal Area	M.D	C.D
2737	3434.67		697.67*	284.87
2737		2924.33	187.33	
	3434.67	2924.33	510.34*	

Significant at .05 level.

The post hoc test to compare the endurance between hill area, coastal area and non-coastal area players has clearly revealed the insignificant difference between the badminton players of hill area and coastal area where the calculated mean difference was found (697.67) and coastal area and non-coastal area where the calculated mean difference was found (510.34). Whereas the score did not reveal any significant difference between the badminton players of hill area and non-coastal area. The calculated value also did not reveal any significant difference between the players of hill area to that of non-coastal area as the required value was much higher than the calculated value at .05 level of significance. The scores are also illustrated in figure-II



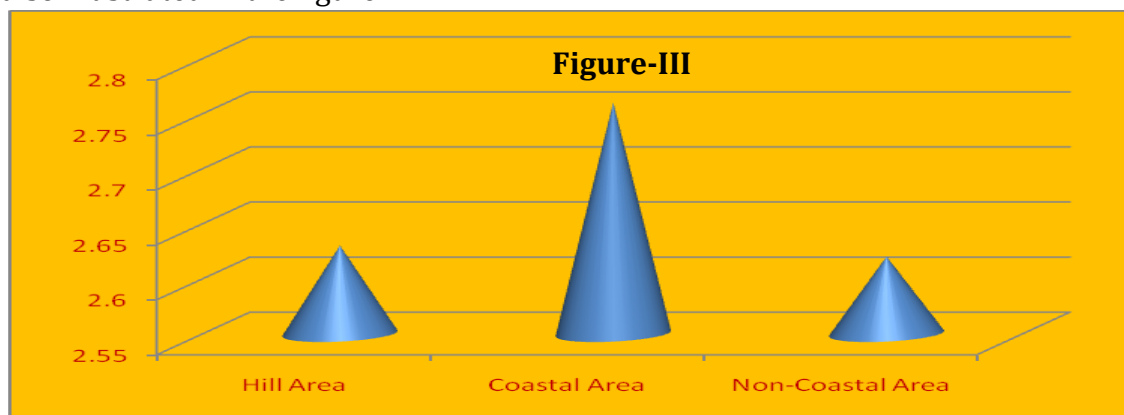
**TABLE-5**

**Analysis of variance in leg strength among hill area, coastal and non-coastal players**

Source of Variance	d.f	SS	MSS	F-ratio
Between Group	2	.359	.180	4.039
Within Group	87	3.867	.044	

Insignificant at .05 level,  $F_{.05}(2, 87) = 4.92$

The value shown in table-5 clearly indicates that the F-Value calculated is much lower than the required value to be significant. Hence it is stated that, no significant relationship exist among the means of hill area, coastal and non-coastal players. The scores are also illustrated in the figure-III



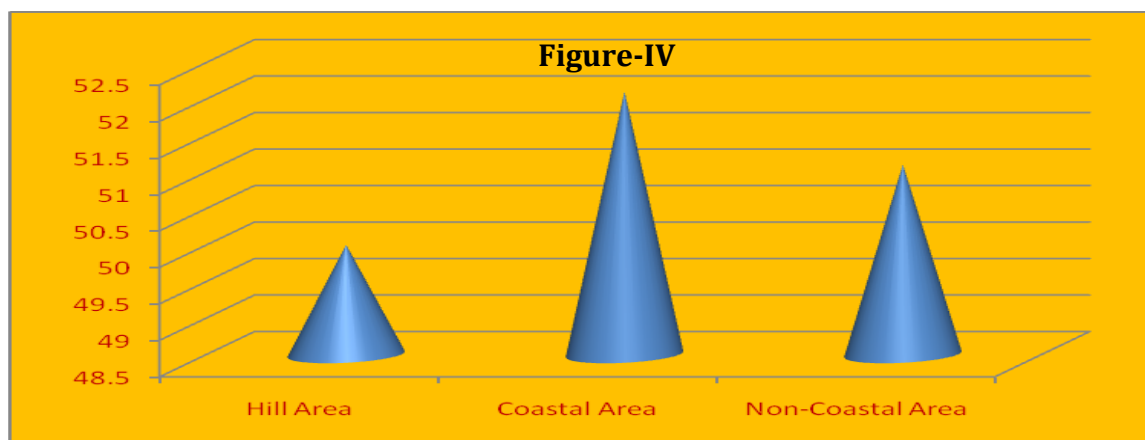
**TABLE-6**

**Analysis of variance in abdominal strength among hill area, coastal and non-coastal players**

Source of Variance	d.f	SS	MSS	F-ratio
Between Group	2	66.200	33.100	.820*
Within Group	87	3511.400	40.361	

\*Insignificant at .05 level,  $F_{.05}(2, 87) = 4.92$

The value shown in table-6 clearly indicates that the F-Value calculated is much lower than the required value to be significant. Hence it is stated that, no significant relationship exist among the means of hill area, coastal and non-coastal players. The scores are also illustrated in the figure-IV



**TABLE-7**

**Correlation coefficient of physical variables among hill area, coastal and non-coastal players**

Players	Correlation of coefficient
Speed	.442*
Endurance	.158
Leg Strength	.029
Abdominal Strength	.071

\*Significant at .05 level (.217)

It is evident from Table-7 that significant correlation was found among coastal, non-coastal and hill area players in relation to speed and insignificant correlation was found among coastal, non-coastal and hill area players in relation to endurance, leg strength and abdominal strength.

**4. DISCUSSION**

The result of the study was to compare the Physical variables speed, endurance and strength (leg strength & abdominal strength) among coastal area, non-coastal area and hill area national level badminton players. Though these exist significant difference among the coastal area, non-coastal area and hill area national level badminton players in relation to speed and endurance and insignificant difference among the coastal area, non-coastal area and hill area national level badminton players in relation to strength (leg strength & abdominal strength).

The result is in the direction of Balmani (1995) studies, consistently indicated that Analysis with regard to examine the significance of differences among the pre ( after warm up) and post test ( after playing on beaten earth court and sand court) means of all the selected variables revealed that there were significant differences in the variation of performance of muscular endurance in term of push-up (  $f = 7.20$ ) and in the performance cardiovascular endurance of one lateral jump (  $F = 4.195$ ) when their performance were compared to study the effect of different surfaces i.e. beaten earth court and sand on strength endurance and flexibility and for strength flexibility variables no significant differences were observed.

**5. CONCLUSIONS**

0. Significant relationship exist between the means of difference geographical conditions (coastal, non-coastal and hill area) in relation to their speeds level. The F-Value (4.92) calculated is much higher than the required value to be significant.
1. The post hock test to compare the speeds among hill area, coastal area and non-coastal area players has clearly revealed the in significant difference among the badminton players of hill area and coastal area where the calculated mean difference found (.86), hill area and non-coastal area where the calculated mean difference found (.55) and coastal area and non-costal area where the calculated mean difference found (.31) was lower than the required value 4.92. The required value was much lower than the calculated value at .05 level of significant.
2. Significant relationship exist between the means of difference geographical conditions (coastal, non-coastal and hill area) in relation to their endurance level. The F-Value (4.92) calculated is much higher than the required value to be significant.

3. The post hock test to compare the endurance between hill area, coastal area and non-coastal area players has clearly revealed the in significant difference between the badminton players of hill area and coastal area where the calculated mean difference found (697.67) and coastal area and non-costal area where the calculated mean difference found (510.34). Whereas the score did not reveal any significant difference between the badminton players of hill area and non-costal area. The calculated value also did not reveal any significant difference between the players of hill area to that of non-costal area as the required value was much higher than the calculated value at .05 level of significant.
4. No significant relationship exist between the means of difference geographical conditions (coastal, non-coastal and hill area) in relation to their strength level. The F-Value (4.92) calculated is much lower than the required value to be significant.
5. No significant relationship exist between the means of difference geographical conditions (coastal, non-coastal and hill area) in relation to their abdominal strength level. The F-Value (4.92) calculated is much lower than the required value to be significant.
6. Significant correlation was found among coastal, non-coastal and hill area players in relation to speed and insignificant correlation was found among coastal, non-coastal and hill area players in relation to endurance, leg strength and abdominal strength.

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## DO FEMALE ATHLETES DIFFERS IN TERMS OF SENSO-MOTOR COORDINATION AND TIME MOVEMENT ANTICIPATION ?

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### ABSTRACT

The purpose of the study was to analyze if there is any difference exist among female athletes of various sports in terms of senso-motor coordination and time/movement anticipation ability on Vienna test system. Thirty female university players (five from each) of different sports i.e. cricket, football, hockey, badminton, lawn tennis and swimming were selected. Subjects were tested for two psychomotor variables i.e. time/movement anticipation and reaction time. Subject's age ranged between 17 to 23 years with a mean and SD of  $19.73 \pm 2.14$  year. Descriptive statistics and ANOVA was applied to analyze the results. The result showed that the mean and SD of senso-motor coordination of female athletes of badminton, cricket, football, hockey, swimming and tennis were  $2.2 \pm 0.83$ ,  $5.4 \pm 3.4$ ,  $3.6 \pm 2.1$ ,  $3.00 \pm 1.7$ ,  $6.2 \pm 6.01$  and  $3.00 \pm 1.58$  respectively. The result also revealed that the mean and SD of time/movement anticipation ability of female athletes of badminton, cricket, football, hockey, swimming and tennis were  $0.70 \pm 0.14$ ,  $0.56 \pm 0.19$ ,  $0.59 \pm 0.05$ ,  $0.59 \pm 0.09$ ,  $0.43 \pm 0.06$ ,  $0.36 \pm 0.06$ ,  $0.60 \pm 0$ ,  $0.54 \pm 0.17$  respectively. The one-way ANOVA has shown difference among female athletes of various sports and they do differ in terms of sensomotor coordination and time movement anticipation ( $p < 0.05$ ).

**Keywords-**Time/movement anticipation, sensomotor coordination and Vienna test system



## 1. INTRODUCTION

Today performance in sports not only demands systematic training to develop physical, physiological variable and technical aspects of sports but also demands training and consideration of psychological characteristics for the success in this field (Mishra,2013).

Irrespective of the sport in question, an athlete's success or failure is dependent on a combination of physical and psychological abilities. Even though athletes and coaches generally do acknowledge the importance of mental skills, they are rarely practiced in a methodological manner. Usually, the insufficient time is allocated for mental training because of the lack of knowledge in implementing the programme, or due to the myth that mental skills cannot be learnt. Everyone is born with specific and psychological strengths and weaknesses, but skills can be learnt and developed. Being a champion requires the mental skills be systematically practiced and integrated with physical abilities.

Gierczuk, Bujak et al. (2012) compared selected coordination motor abilities (CMA) in elite wrestlers and Taekwon-do competitors and found no significant difference among them. This study is supported by Dogan (2009) who conducted a study in which the aim of the study was to determine multiple choice reaction and visual perception in female and male elite athletes Eating Disorder Prevalence and Symptoms for Track and Field Athletes and Non-athletes. The present study is further supported by Koçak et al. (2010). His study was on Coincidence-anticipation timing and reaction time in youth tennis and table tennis players

Day by day the amount of high quality research is increasing in the area of psychomotor domain. The literature shows that important psychomotor attributes to participate in sport are reaction time, coincidence-anticipation timing, coordination and peripheral perception, Bhabhor, et al. (2013). Gierczuk, Bujak et al. (2016) compared selected coordination motor abilities (CMA) in elite wrestlers and taekwon-do competitors. The CMA tests assessing quick reaction time, frequency of movements, partial spatial orientation, movement adaptability and movement coupling fulfilled the assumed criterion. Vienna test system were employed in the study. It was shown that there were no significant differences in CMA levels between wrestlers and taekwon-do competitors. So the present study is structured to analyze senso-motor coordination and time movement anticipation among female athletes.

## 2. METHODOLOGY

### 2.1 Selection of the subjects

To serve the purpose of the investigation, 30 female players of different sports i.e. cricket, football, hockey, badminton, lawn tennis and swimming of university level were selected on the basis of purposive sampling. The age range of participant was 17-23. The sample of 5 female athletes from each sport was selected. Subjects were selected from the students of Lakshmi Bai National University of Physical Education, Gwalior (M.P.). All the subjects in present study were tested on Vienna Test System.

### 2.2 Criterion Measure

#### 2.2.1 Time/Movement Anticipation

It is ability to imagine the effect of a movement and correctly estimate the movement of objects in space. It is the visualization of a future event or state or the act of looking forward and a prior action that takes into account or forestalls a later action. The reliability ranging from  $r=0.92$  to  $0.98$ . The unit of measurement is movement/sec (Carolien Hermans, 2002).

### 2.2.2 Sensomotor Coordination

It is the ability to integrate the above listed components so that effective movements are achieved. Co-ordination of nerves or their actions having or involving both sensory and motor functions pathways. The reliability is  $r=0.90$ . The unit of measurement is movement/sec.

### 2.2.3 Statistical Analysis:

To assess the time/movement anticipation and senso-motor coordination among female athletes of various sports and games, descriptive statistics and ANOVA were computed. As the F-value was found to be significant, the Scheffe's Test of Post-hoc Comparison was applied to see the significant difference between ordered paired means of different sports groups.

## 3. RESULTS

Descriptive statistics was computed for the performance of time/movement anticipation and senso-motor coordination on Vienna Test System of female athletes of various sports and games and data pertaining to this has been presented in Table 1 to 4.

**TABLE 1**

**DESCRIPTIVE STATISTICS OF TIME/MOVEMENT ANTICIPATION AND SENSO-MOTOR COORDINATION OF FEMALE ATHLETES OF DIFFERENT SPORTS GROUPS.**

Games	Anticipation		Senso-motor coordination	
	Mean	SD	Mean	SD
Badminton	0.70	0.14	2.2	0.83
Cricket	0.56	0.19	5.4	3.43
Football	0.59	0.05	3.6	2.19
Hockey	0.43	0.09	3	1.73
Swimming	0.36	0.06	6.2	6.01
Tennis	0.60	0.20	3	1.58
<b>Total</b>	<b>0.54</b>	<b>0.17</b>	<b>3.9</b>	<b>3.19</b>

Table 1 show the mean and standard deviation of anticipation and Senso-motor coordination score among female athletes from all the six sports. The mean and standard deviation of anticipation among female athletes of various sports i.e. badminton, cricket, football, hockey, swimming and tennis are  $0.70 \pm 0.14$ ,  $0.56 \pm 0.19$ ,  $0.59 \pm 0.05$ ,  $0.59 \pm 0.09$ ,  $0.43 \pm 0.06$ ,  $0.36 \pm 0.06$ ,  $0.60 \pm 0$ ,  $0.54 \pm 0.17$  and Senso-motor coordination are  $2.2 \pm 0.83$ ,  $5.4 \pm 3.4$ ,  $3.6 \pm 2.1$ ,  $3.00 \pm 1.7$ ,  $6.2 \pm 6.01$  and  $3.00 \pm 1.58$  respectively.

The mean scores of anticipation and Senso-motor coordination of female athletes from all the six sports have been depicted in Figure 1 and 2

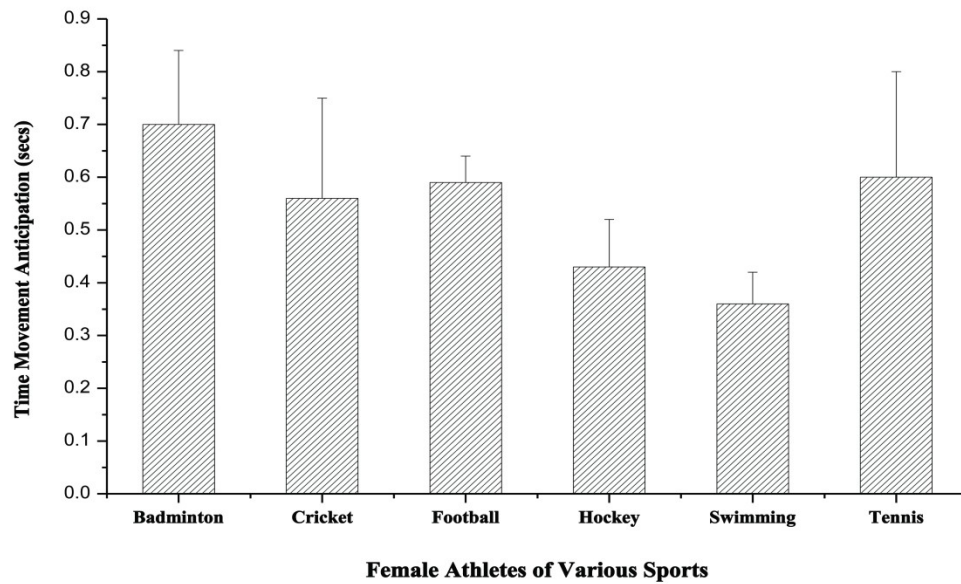


Figure.1 Mean Values of Anticipation of Female Athletes

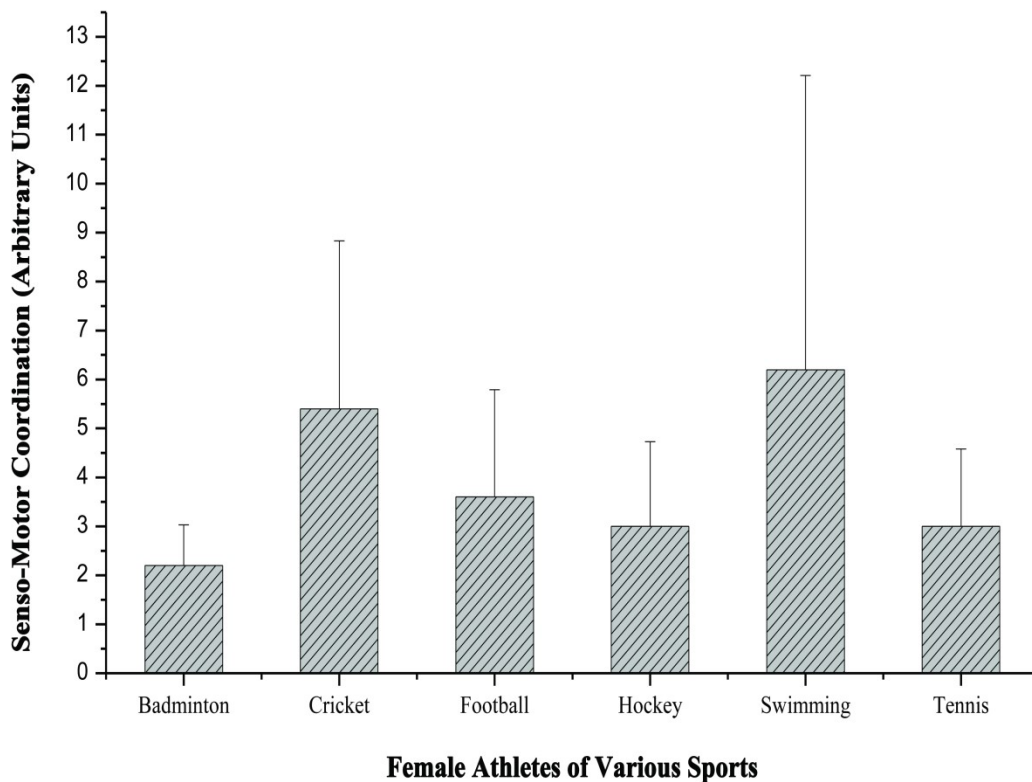


Figure.2 Mean Values of Scores Motor Coordination of Female Athletes

**TABLE 2**  
**ANALYSIS OF VARIANCE FOR TIME MOVEMENT ANTICIPATION OF FEMALE**  
**ATHLETES OF VARIOUS SPORTS AND GAMES**

Source of variance	Sum of Square	df	Mean Squares	F-value	Sig.
Between Groups	0.384	5	.077	3.883*	.010
Within Groups	0.475	24	.020		
Total	0.858	29			

\*Significant at .05 level

F 0.05 (5,24 df)=2.62

Table 2 reveals that there were statistically significant difference in time movement anticipation among female athletes of various sports and games, as the obtained F-value of 3.883 was higher than the required F.05 (5, 24)=2.62.

As the F-value was found to be significant, the post hoc test was applied to see the significant difference between the sports groups and data pertaining to this has been presented in Table 3 and 4

**TABLE 3**  
**SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED PAIRED MEANS ON TIME**  
**MOVEMENT ANTICIPATION FOR FEMALE ATHLETES OF VARIOUS**  
**SPORTS AND GAME**

Badminton	Cricket	Football	Hockey	Swimming	Tennis	MD	CI
0.70	0.56	-	-	-	-	0.14	0.32
0.70	-	0.59	-	-	-	0.11	
0.70	-	-	0.43	-	-	0.27	
0.70	-	-	-	0.36	-	0.34*	
0.70	-	-	-	-	0.60	0.10	
-	0.56	0.59	-	-	-	0.03	
-	0.56	-	0.43	-	-	0.13	
-	0.56	-	-	0.36	-	0.20	
-	0.56	-	-	-	0.60	0.04	
-	-	0.59	0.43	-	-	0.16	
-	-	0.59	-	0.36	-	0.23	
-	-	0.59	-	-	0.60	0.01	
-	-	-	0.43	0.36	-	0.07	
-	-	-	0.43	-	0.60	0.17	
-	-	-	-	0.36	0.60	0.24	

The data in table 3 clearly reveals that mean differences between Badminton-Cricket followed by Football, Hockey, and Tennis female athletes; between Cricket-Football followed by Hockey, Swimming and Tennis; between Hockey- Swimming followed by Tennis female athletes; Between Swimming-Tennis female athletes were not found statistically significant, as the paired mean differences. of 0.14, 0.11, 0.27, 0.10, 0.03, 0.13, 0.20, 0.04, 0.16, 0.23, 0.01, 0.07, 0.17 and 0.24 were lower than the confidence interval of 0.32 The significant difference was observed between Badminton- Swimming female athletes, as the paired mean difference. of 0.34 was higher than the confidence interval.

**TABLE 4**  
**ANALYSIS OF VARIANCE FOR SENSOMOTOR COORDINATION OF FEMALE ATHLETES**  
**OF VARIOUS SPORTS AND GAMES**

Source of variance	Sum of Square	df	Mean Squares	F-value	Sig.
Between Groups	60.70	5	12.14	1.235	.324
Within Groups	236.00	24	9.83		
Total	296.70	29			

**Insignificant at .05 level**

F 0.05 (5, 24) =2.62

Table 4 reveals that there was no significant difference in sensomotor coordination among female athletes of various sports and games, as the obtained F-value of 1.235 was less than the required F.05 (5, 24)=2.62.

#### **4. DISCUSSION**

From the findings it is clearly seen that there is significant difference in the sensomotor coordination and time/movement anticipation ability among female athletes of various sports. After analyzing the cognitive ability of female athletes of various sports, the results revealed that the multiple comparison of all the sports groups are insignificant in terms of mean difference of Anticipation and Sensomotor coordination among the various sports groups.

This study is supported by Dogan (2009) who conducted a study in which the aim of the study was to determine multiple choice reaction and visual perception in female and male elite athletes Eating Disorder Prevalence and Symptoms for Track and Field Athletes and Non-athletes. The present study is further supported by Koçak et al. (2010). His study was on Coincidence-anticipation timing and reaction time in youth tennis and table tennis players.

After conducting the post hoc test no difference was observed among various sport groups on their sensomotor coordination and anticipation. Sensomotor coordination is the hand and eye coordination to check the visual motor coordination, in which all sport groups in the present sample, seems to have equal ability.

Further on the basis of mean scores it was concluded that swimmers are better than others female athletes in terms of anticipation ( $0.36 \pm 0.1$ ) and sensomotor coordination ( $6.2 \pm 6.01$ ).

#### **5. CONCLUSIONS**

Based on the finding of this study, the following conclusion have been drawn-

1. The findings of the present study strongly indicate that the psychomotor variable i.e. anticipation ability and sensomotor coordination among female athletes of various sports were not similar.
2. It was revealed that the swimmers possess better sensomotor coordination and time/movement anticipation ability may be due to that swimming is perfect for improving the coordinative ability and performance. That's because regular swimming increases the lung capacity and cardiovascular health. and in turn, this improves the endurance and stamina which is indirectly connected to psycho motor domain.

3. The results may also be owing to the reason of small sample size in the present study, but if the similar study would be done on large sample size and higher achievement level then it may bring significant changes in the results.

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## COMPARISON OF SELECTED PSYCHOLOGICAL VARIABLES BETWEEN RURAL AND URBAN WORKING MEN

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### ABSTRACT

The purpose of the present study was to find out the differences in selected psychological variables namely of Self Confidence, Self Esteem, Job Involvement and Job Satisfaction between Rural and Urban Working Men. To achieve the purpose of the study, the investigator selected thirty male subjects which consist of fifteen Labours of Tamil Nadu and fifteen labour of other States labours who were working in the firework factories in Sivakasi. Their age ranged between 21 to 35 years. The following variables namely Self Confidence, Self Esteem, Job Involvement and Job Satisfaction were selected for the study. They were tested with Standardise Questionnaire of Hardy and Nelson (1992), Rosenberg's, Ashok Pratap Singh (1989) and Dubey, B.L., Uppal K.K. and Verma, S.K. (1989) test respectively. The "t" ratio was used to analyze the collected data. From the analysis of data it was proved that there was significant difference between labours of Tamil Nadu and Other States in the variables namely Self Confidence, Self Esteem, Job Involvement and Job Satisfaction. Further the analysis shows that the labours from Tamil Nadu state were better in Self Confidence, Self Esteem and Job Satisfaction when compared to labours of Other State. But in Job Involvement labours from Other State were better when compared to labours of Tamil Nadu State.

**Key words:** Self Confidence, Self Esteem, Job Involvement and Job Satisfaction, Labours, Fireworks Factories.

## 1. INTRODUCTION

Psychology is the science of the activities of an individual in relation to the environment.(Kamlesh, 1998). Self confidence as the belief that one can successfully perform a desired behavior. The desired behavior might be kicking a soccer goal, staying in an exercise regime, recovering from a knee injury, serving an ace. But the common factor is that one believes that he will get the job done. (Kamlesh, 1998).

Self-esteem is defined as the evaluation which the individual makes and customarily maintains with regard to himself (Coopermith, 1967).

Job involvement measures the degree to which people identify psychologically with their job and consider their perceived performance level important to self – worth. Employees with high level of Job involvement strongly identify with and really care about the kind of work they do. (Robbins, Stephen & Judge Timothy, 2007).

Contentment (or lack of it) arising out of inter play of employees positive and negative feeling toward his or her work.

The term of job satisfaction can be defined as a positive feeling about one's job resulting from an evaluation of its characteristics. A person which high level of job satisfaction holds positive feelings about the job, while a person who is dissatisfied holds negative feelings about the job.(Robbins, Stephen & Judge Timothy, 2007).

The purpose of the study was to find out the differences in selected psychological variables such as self confidence, self esteem, job involvement and job satisfaction between rural and urban working men. It was also hypothesized that there would be significant differences on selected psychological variables such as self-confidence, self-esteem, job involvement and job satisfaction between rural and urban working men.

## 2. METHODOLOGY

### 2.1 Selection of Subjects:

To achieve the purpose of the study, the investigator selected thirty male subjects which consist of fifteen working in rural and fifteen working in urban who were working in rural and urban regions of Kanchipuram, Tamilnadu. Their age ranged between 21 to 35 years.

### 2.2 Selection of Variables:

The following variables on namely Self Confidence, Self Esteem, Job Involvement and Job Satisfaction were selected for the study.

### 2.3 Instruments:

They were tested with Standardise Questionnaire of Hardy and Nelson (1992), Rosenberg's, Ashok Pratap Singh (1989) and Dubey, B.L., Uppal K.K. and Verma, S.K. (1989) test respectively.

### 2.4 Statistical Analysis:

To assess the self confidence, self esteem, job involvement and job satisfaction of males residing in rural and urban regions of Kanchipuram, Tamilnadu, means and standard deviations were computed. To find out the significant of difference between rural and urban males in their self confidence, self esteem, job involvement and job satisfaction t-ratio was computed.

## 3. RESULTS AND DISCUSSION

To find out the significant of difference between rural and urban males in their self confidence, self esteem, job involvement and job satisfaction, means, standard deviations

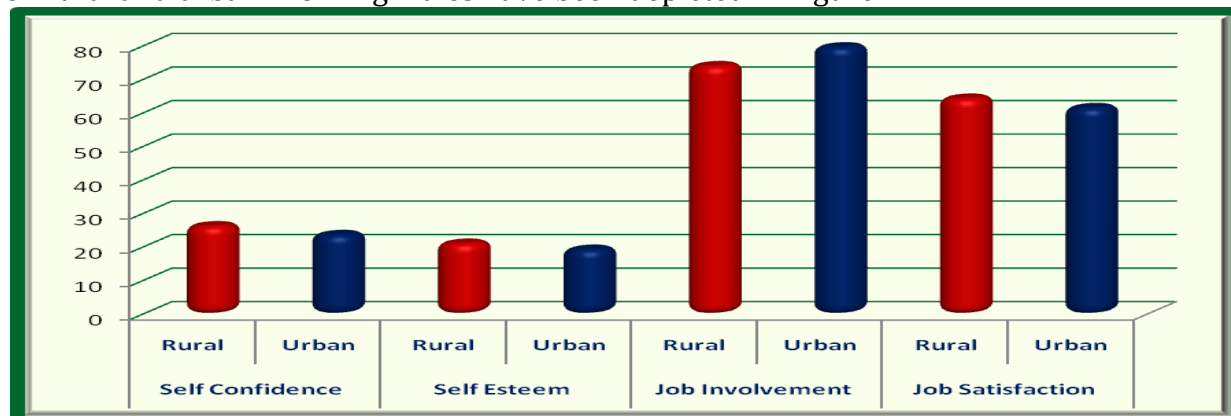


and t-ratio were computed. and data pertaining to this, has been presented in Table I and Depicted in Figure- 1

**TABLE I**  
**DESCRIPTIVE STATISTICS OF SELF CONFIDENCE, SELF ESTEEM, JOB INVOLVEMENT AND JOB SATISFACTION OF RURAL AND URBAN MALES**

Variable	Group	Mean	SD
Self Confidence	Rural	26.20	3.19
	Urban	23.60	2.68
Self Esteem	Rural	21.00	2.34
	Urban	19.20	1.90
Job Involvement	Rural	74.00	6.69
	Urban	79.60	5.76
Job Satisfaction	Rural	64.27	3.28
	Urban	61.47	3.14

The mean scores of self confidence, self esteem, job involvement and job satisfaction of rural and urban working males have been depicted in Figure -1.



**Figure - 1** Bar diagram showing the mean values of Rural and Urban Working Men

**TABLE II**  
**SIGNIFICANCE OF DIFFERENCES BETWEEN MEAN SCORES OF WORKING MALES IN RURAL AND URBAN REGION ON SELF CONFIDENCE, SELF ESTEEM, JOB INVOLVEMENT AND JOB SATISFACTION**

Variable	Group	Mean	MD	SEM	$\sigma_{DM}$	t-ratio
Self Confidence	Rural	26.20	2.60	3.19	1.12	2.32*
	Urban	23.60				
Self Esteem	Rural	21.00	1.80	2.34	0.79	2.27*
	Urban	19.20				
Job Involvement	Rural	74.00	5.60	6.69	2.43	2.30*
	Urban	79.60				
Job Satisfaction	Rural	64.27	2.80	6.69	1.28	2.18*
	Urban	61.47				

\*Significant at .05 level,  $t_{.05(28)} = 2.048$ .

From the analysis of data it was proved that there was significant difference between rural and urban working men in Self Confidence, Self Esteem, Job Involvement and Job Satisfaction as the calculated 't' value 2.32, 2.27, 2.30 and 2.18 respectively were greater than the required 't' value of 2.048. Further the analysis shows that the rural working men were better in Self Confidence, Self Esteem and Job Satisfaction when

compared to urban working men. But in Job Involvement labours from urban working men were better when compared rural working men.

#### **4. CONCLUSIONS**

1. It was concluded that there was a significant difference between working in rural and urban in the Self Confidence, Self Esteem, Job Involvement and Job Satisfaction.
2. There was concluded that the rural working men were better in Self Confidence, Self Esteem and Job Satisfaction when compared to urban working men.
3. There was also concluded that in Job Involvement urban working men were better when compared to rural working men.

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## SOCIOECONOMIC STATUS EFFECT ON SPORT PERFORMANCE OF NON ACHIEVER AND ACHIEVER SHOOTERS.

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### ABSTRACT

The purpose of the study was to find out the socio-economic status effect on sport performance of Achiever and Non Achiever Shooters belong to Punjab State. Total 60 players samples (Non-achiever =30(below 8<sup>th</sup> Position Men and Women Pistol and Rifle), Non Achiever =30( (first 8 position Men and Women Pistol and Rifle)) Inter college level Shooters were taken from inter college Shooting tournament Punjabi university Patiala held at Punjabi University patiala. The Socioeconomic status questionnaire prepared and validated by Aghase and Helode (2002) was used for the purpose of data collection. To find out the significant effect of socioeconomic status on sport performance of Inter college level man/women and women shooters belong to Punjabi University Related Colleges, means, standard deviations and t-ratios were computed Results of the study indicated the positive socioeconomic status effect on the sport performance of Inter college level man/women and women shooters. Significance of difference was also observed in sport performance between Non Achiever and Achiever Shooters of high, mediocre and low socioeconomic status.

**Keywords:** Shooters, Socioeconomic Status, sport performance, Inter college level.

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## 1. INTRODUCTION

Sports and physical education play an important role in human resource development. Games and other outdoor activities, properly planned and executed, promote social harmony, discipline and increased productivity. These activities develop in students right attitudes and values and help them grow into balanced, integrated and healthy citizens. Participation in physical activities and sports is a fundamental right of every citizen. Physical education and sports are essential elements of educational processes which promote among the participants health, physical fitness and quality of life (UGC report, 1987).

Socio-economic factors play a vital role in an individual's performance in sports. The socioeconomic status make-up of an individual plays an important role in their achievements in every field of life. Socio-economic status also Influence on habitual physical activity (Drenowatz *et al.* 2010).

Socio-economic status is an individual's or group's position within a hierarchical social structure. Socioeconomic status depends on a combination of variables, including occupation, education, income, wealth and place of residence. Sociologists often use socioeconomic status as a means of predicting behavior (Hirsch, Kett, and Trefil, 2002).

Index of socio-economic status comprises of occupational status, area of residence, monthly income, type of housing, condition of house, house ownership or rental status, level of living and formal social participation (Nair, 1978).

Socio-economic status of an individual may influence his opportunity, his desire to excel, his choice of activity and his success. The home environment often influences his motivation to succeed in sports and the degree to which success in this endeavor leads to inner satisfaction. Many psychological factors like socio-economic status, attitudes, motives, spectators, self concept, motivation, adjustment etc., which influence the participation and performance of sportsmen in games and sports. Socioeconomic-status and psychological factors plays a vital role in football players to enhances the performances to achieve the player's goal (Chandrasekaran, 2010) [4]

Socio economic status did not have any effect on the performance of badminton players (Attri, 2013) But the Socioeconomic status effects the team games more than Individual games (Webb,1969). Players of high socioeconomic status did not like to play Ice-Hockey, Golf and Tennis games (Stone, 1957). Socioeconomic status is a strong determining factor in both satisfaction with life domains and satisfaction of needs (Ali and Morcol, 2000) . Dissimilarity was observed between team and individual game players in their high, middle and low SES. and lows core on low SES than their counter parts (Srikanth,2012) Sharma (2015) reported the positive effect of socioeconomic status on the sport performance of junior national level male weightlifters. Significance of difference was also observed in sport performance between rural and urban junior national level male weightlifters of high, mediocre and low socioeconomic status

Considerable research has been conducted on the socio-economic status of sports persons, team sport versus individual sport (Deshmukh 2013; Khan 2009; Kumar. 2013; Kour & Singh, 2014). Sharma and Hardikar (2010) reported that income reflects the living of a family. There is no doubt that type, amount and timing of food can dramatically affect sport performance. Lee and Cubbin (2002) also reported that low SES teens were less physically active than high socio economic teens. University level students of low SES opt for less expensive sports and students of high SES opt for expensive sports. In all societies,

it is people in high income, high education, and high status occupational groups that have the highest rates of active sports participation, attendance at sports events, and even watching of sports on television.

As a consequence of choice of sports, acquisition and maintenance of physical fitness also vary. Therefore, it is worth investigating to learn as to which SES category will be more fit physically. Physical fitness and health are related to a certain degree. Proneness to disorders and physical fitness may be associated with SES. The purpose of the study was to find out the socio-economic status effect on sport performance of inter college level Shooters belong to Achiever and Non Achiever of India.

## 2. METHODOLOGY

### 2.1 Selection of Subject

The present study was conducted on 30 Non Achievers and 30 Achievers inter college level Shooters held at Punjabi University Patiala Subjects were randomly, who volunteered to participate in this study.

### 2.2 Instrumentation

The Socioeconomic status questionnaire prepared and validated by Aghase and Helode (2002) was used for the purpose of data collection during inter college level Shooting held at Punjabi University Patiala. This questionnaire is reliable and valid instrument to determine the socioeconomic status for the present investigation. Total university Shooting performance record was collected from the university Coordinator of the respective competition.

## 3. RESULTS

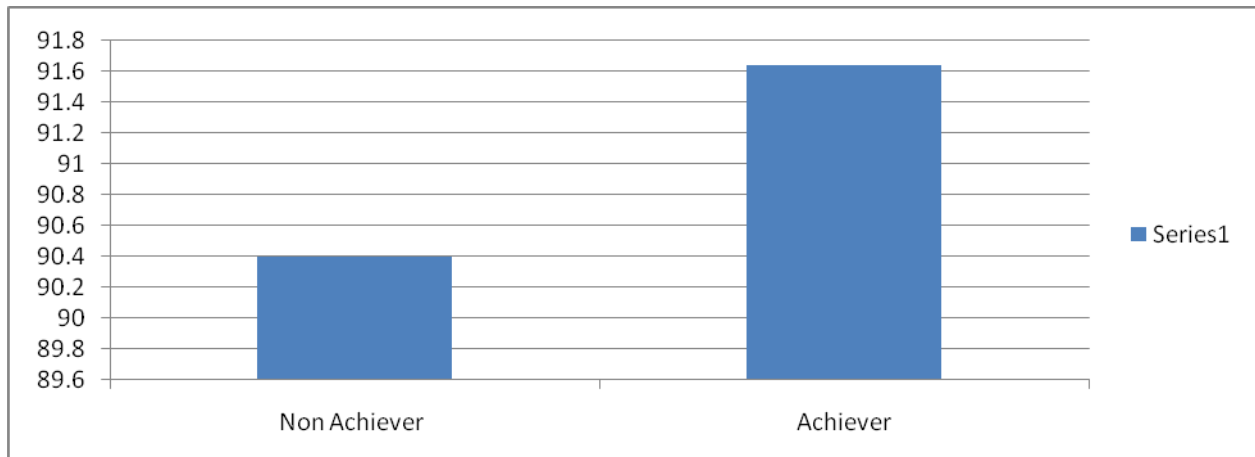
To find out the significant effect of socioeconomic status on sport performance of inter college level Shooting players Male/Women. belong to Achiever And Non Achiever, standard deviations and t-ratios were computed from the collected data and data pertaining to this have been presented in table 1-4

**TABLE 1**

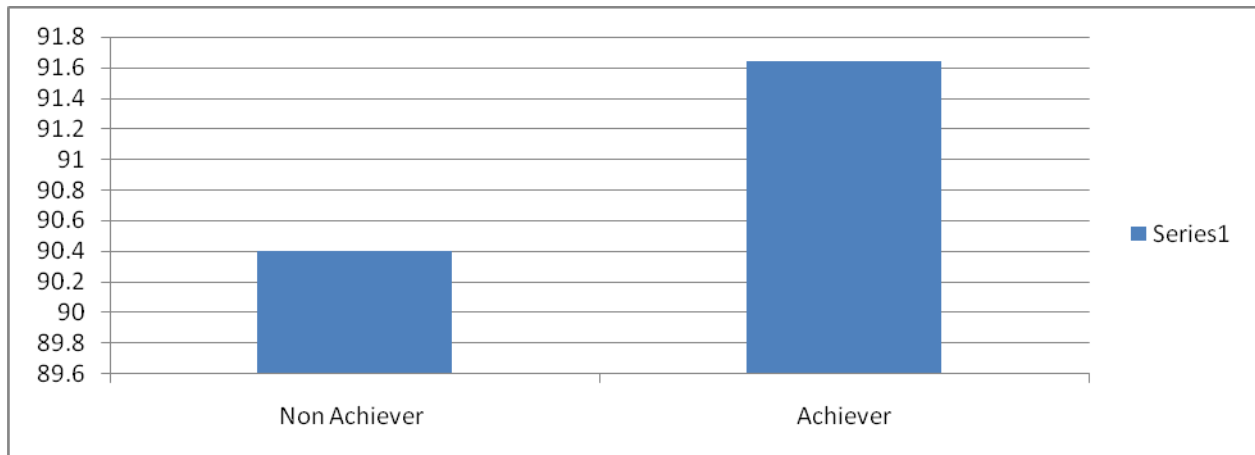
**DESCRIPTIVE STATISTICS OF TOTAL SHOOTING PERFORMANCE OF NON ACHIEVER AND ACHIEVER INTER COLLEGE LEVEL SHOOTING OF DIFFERENT SOCIOECONOMIC STATUS**

Region	High Socioeconomic Status			Mediocre Socioeconomic Status			Low Socioeconomic Status		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Non Achiever	9	54.28	9.5	11	90.4	12.22	10	58.8	12.33
Achiever	8	58.67	10.35	11	91.64	11.44	11	89.10	14.2

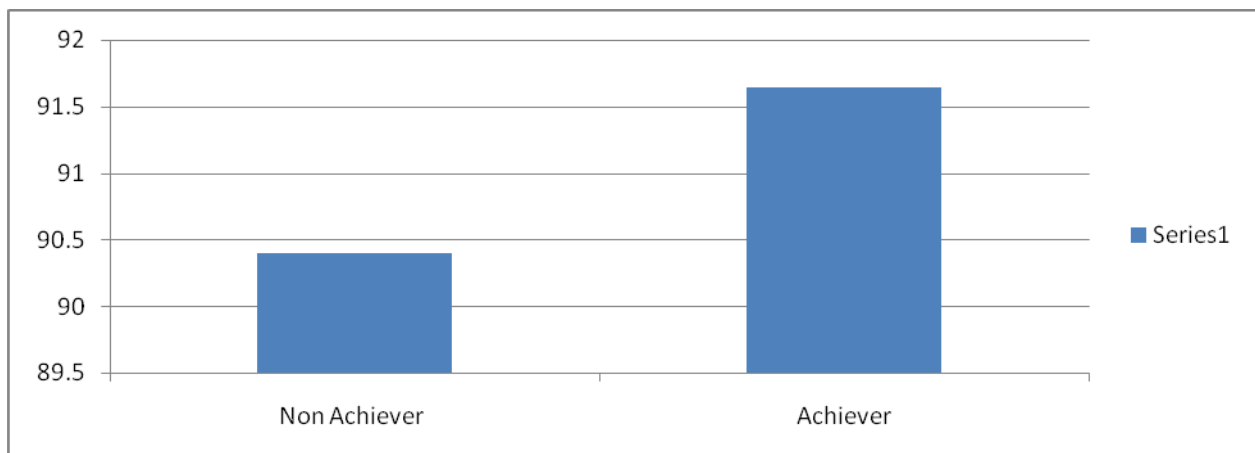
The mean scores of total Shooting Bout performance of achiever and Non-achiever inter college level men/women shooters of different socioeconomic status have been depicted in figure 1 to 3.



**Fig 1:** Mean Scores of total Shooting Bout Performance of high Socioeconomic Status inter college level men/women shooters belong to Achiever and Non-Achiever Shooters.



**Fig 2:** Mean Scores of total Shooting Bout Performance of Mediocre Socioeconomic Status inter college level Achiever Non Achiever Shooters.



**Fig 3:** Mean Scores of total Shooting Bout Performance of Low Socioeconomic Status inter college level Achiever Non Achiever Shooters.

**TABLE 2**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN NON ACHIEVER AND ACHIEVER INTER COLLEGE LEVEL MAN/WOMEN SHOOTERS OF HIGH SOCIOECONOMIC STATUS IN TOTAL SHOOTING BOUT PERFORMANCE**

Region	Mean	MD	$\sigma_{DM}$	t-ratio
Non-achiever (N=9)	54.28	4.39	6.40	2.56*
Achiever (N=8)	58.67			

\*Significant at .05 level

t.05 (15)=2.00

It is evident from table 2 that the statistically significant difference was found in sport performance of inter college level man/women shooters of high socioeconomic status belong non-achiever and achiever shooters of Punjab, as the obtained t-values of 2.56 was high than the required t-value of t. 05 (15) =2.00.

**TABLE 3**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN NON ACHIEVER AND ACHIEVER INTER COLLEGE LEVEL MAN/WOMENSHOOTERS OF MEDIOCRE SOCIOECONOMIC STATUS IN TOTAL SHOOTING PERFORMANCE**

Region	Mean	MD	$\sigma_{DM}$	t-ratio
Rural (N=11)	90.40	1.54	4.45	3.56*
Urban (N=11)	91.94			

\*Significant at .05 level,

t.05 (20)=2.00

It is evident from table 3 that the statistically significant difference was found in sport performance of inter college level men/women shooters of mediocre socioeconomic status belong rural and urban region of India, as the obtained t-values of 3.56 was high than the required t-value of t.05 (20) =2.00.

**TABLE 4**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN NON ACHIEVER AND ACHIEVER SHOOTERS INTER COLLEGE LEVEL MAN/WOMEN SHOOTERS OF LOW SOCIOECONOMIC STATUS IN TOTAL SHOOTING BOUT PERFORMANCE**

Region	Mean	MD	$\sigma_{DM}$	t-ratio
Rural (N=10)	58.80	22.30	4.45	5.68*
Urban (N=11)	89.10			

\*Significant at .05 level

t.05 (19)=2.00

It is evident from table 4 that the statistically significant difference was found in sport performance of inter college level men/women shooters of low socioeconomic status belong non-achiever and achiever shooters of India, as the obtained t-values of 5.68 was high than the required t-value of t.05 (19) =5.68.

#### 4. DISCUSSION

In our study, the proportion of the inter college level man/women shooters belonged to the high socioeconomic status were 9% of Non-achiever and 8% of achiever, Where as inter college level man/women shooters belonged to mediocre socioeconomic status were 11% of Non -achiever and 11% of Achiever. The inter college level man/women shooters of low socioeconomic status were found 10% from Non -achiever and 11% from achiever. The resulted study shows the effect of socioeconomic status on Non-achiever and achiever inter college level man/women shooters. Total Shooting bout performance of inter college level man/women shooters of urban region was higher than that of their counter parts. The statistical analysis indicated the dissimilarity in sport performance of inter college level man/women shooters belong to rural and urban region. People's region plays a significant role in maintaining the life style and skill development in players. Encouragement, better exposure, facility and the creating awareness among different region peoples is the must to promote the performance either at high and low level among the players in sports training. Hence in the present study, urban Shooter showed their better efficiency in Shooting and produced high level performance than other their counter parts.

#### 5. CONCLUSIONS

1. Significance of difference was observed in sport performance between Non Achiever and Achiever inter college level Man/Women Shooters of high, mediocre and low socioeconomic status.
2. Socioeconomic status had positive effect on the sport performance of inter college level Man/Women Shooters
3. Achiever inter college level Man/Women Shooters of high, mediocre and low socioeconomic status had better sport performance than their counter parts.

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**RELATIONSHIP OF EDUCATIONAL STATUS AND SOCIO-ECONOMIC STATUS OF THE ENGINEERING SPORTS PERSON AND NON SPORTS PERSON**

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**ABSTRACT**

The research was conducted on relationship of education status and socio-economic status of the engineering students. The sample consisted of 600 engineering sports person and non sports person selected randomly from different engineering colleges affiliated to Punjab Technical University. Relationship of educational status and Socio-economic status of engineering sports person and non sports person was the main objective of this study. Satish kumar's Socio-economic status Scale Questionnaire was implemented. On the basis of Chi-square it was found that the education of engineering sports person and non sports person is not affected by the socio economic status of their family. The significant correlation was set at .05 level.

**Key words:** Education, Engineer, relationship, sports person.

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## 1. INTRODUCTION

In India at grass root level the education is carried by the private organizations and money is provided by central government, state government and by the local authorities. It is considered as a birth right of the child to have education at early adolescence well India has made great progress regarding the student's presence in the schools thereby increased the educational level status to  $\frac{3}{4}$  of the total population Intense improvement has been seen at the higher level education and in research areas and all the goodness go to the public institutions. The nomination in schools has gone up rapidly from the last 10 to 15 years and the total check in ratio has gone up to 24% till 2013 ([https://en.wikipedia.org/wiki/Education\\_in\\_India](https://en.wikipedia.org/wiki/Education_in_India))

India has its great importance of its educational status provided to children as well as parents there are about 1285576 schools in different districts of the nation. In world India has the largest network of education still there is lot of improvement to be seen in coming years (<https://www.ibef.org/industry/education-sector-india.aspx>)

Study was conducted in Tamil Nadu in which various aspects such as skill involved in motor learning, skill for language, social development were included when relationship was established between pre adolescence education and social economical status of the family. In this study 193 children were involved from lower income groups and were mostly rural and urban students which were registered in 45 government and private organizations. It was found that four features 1) education of the father 2) education of mother 3) occupation of elders 4) quality of living standard, were having close relation with students efficiency. It was revealed that high quality of pre adolescence education helped in students learning process

In another study of Uttar Pradesh Board of High School and Intermediate Education was the first Board set up in India in the year 1921 with jurisdiction over Rajputana, Central India and Gwalior. In 1929, the Board of High School and Intermediate Education, Rajputana, was established. Later, boards were established in some of the states. But eventually, in 1952, the constitution of the board was amended and it was renamed Central Board of Secondary Education (CBSE). All schools in Delhi and some other regions came under the Board. It was the function of the Board to decide on things like curriculum, textbooks and examination system for all schools affiliated to it. Today there are thousands of schools affiliated to the Board (<https://www.gnu.org/education/edu-system-india.en.html>)

Socioeconomic status can be defined as 'a person's overall social position to which attainments in both the social and economic domain contributes. (Ainley et al., 1995: ix). When used in studies of children's school achievement, it refers to the SES of the parents or family. Socio-economic status is determined by an individual's achievements in: education; employment and occupational status; and income and wealth. Several comprehensive reviews of the relationship between SES and educational outcomes exist (Amato, 1987; Williams et al., 1991; Mukherjee, 1995; Ainley et al., 1995)

Socio economic status means the financial condition and social recognition of an individual or a family. Financial condition and social status also decide the activity of the person in society. Individuals or families socio economic status influence on his opportunities, his or her desires to participate, selection of activity to participate and success in such activity. Socio-economic status includes the occupational status of individual or parent, area of residence, monthly income, and type of housing, condition of house, house ownership or rental status, level of living and formal social participation. Same way the socio economic status is acts as a major role in selection of sports and participation.

Carrier selection is not a question for individual in student's life but also affects individuals whole life. If a student selects a field of higher education of his own choice, he will not only perform well in studies but it will help him to explore his dinner Potential and than his study would not become his burden but in our society individual is connected with his family as well as with society. And in our society one has to perform well in social life after completing his educational life. And these two things affect each other. Thus apart from individual's interest socio- economic status, guidance, job opportunities, social status of degree holders also affect individual's carrier. Primary important factor is parent's socio-economic status and educational background. Socio-economic

status defined a relative standing in society based on individuals income, power, occupation, education and prestige.

## 2. METHODOLOGY

### 2.1 Sample

600 engineering sports person and non sports person were selected randomly from different engineering colleges Affiliated to Punjab technical University.

### 2.2 Measures

Socio-economic status scale Questionnaire by Rajbir Singh, Radhey Shyam and Satish Kumar was administered on engineering Students to get the data.

### 2.3 Statistical techniques

Detailed study of Educational status of engineering sports person and non sports person and socioeconomic status was done; Chi- square was implemented.

## 3. RESULTS AND DISCUSSION

**TABLE 1**

**FREQUENCY DISTRIBUTION OF EDUCATION OF ENGINEERING SPORTS PERSON AND NON SPORTS PERSON AND SOCIO ECONOMIC STATUS OF THEIR FAMILY**

		SOCIO ECONOMIC STATUS					
Education Of		Low	Middle L	Middle A	Middle U	High	Total
Bihar Board	Count	2	1	1	0	0	4
	% within Education	50.0%	25.0%	25.0%	.0%	.0%	100 %
	% within SES	1.3%	.9%	.7%	.0%	.0%	.7%
CBSE	Count	60	53	69	55	42	279
	% within Education	21.5%	19.0%	24.7%	19.7%	15.1%	100 %
	% within SES	40.0%	48.6%	45.4%	50.0%	53.2%	46.5%
Haryana Board	Count	6	3	5	6	3	23
	% within Education	26.1%	13.0%	21.7%	26.1%	13.0%	100 %
	% within SES	4.0%	2.8%	3.3%	5.5%	3.8%	3.8%
H. P. Board	Count	16	12	14	11	9	62
	% within Education	25.8%	19.4%	22.6%	17.7%	14.5%	100 %
	% within SES	10.7%	11.0%	9.2%	10.0%	11.4%	10.3%
J. K. Board	Count	6	3	7	2	1	19
	% within Education	31.6%	15.8%	36.8%	10.5%	5.3%	100 %
	% within SES	4.0%	2.8%	4.6%	1.8%	1.3%	3.2%
PSEB	Count	49	31	49	31	20	180
	% within Education	27.2%	17.2%	27.2%	17.2%	11.1%	100 %
	% within SES	32.7%	28.4%	32.2%	28.2%	25.3%	30.0%
U. P. Board	Count	11	6	7	5	4	33
	% within Education	33.3%	18.2%	21.2%	15.2%	12.1%	100 %
	% within SES	7.3%	5.5%	4.6%	4.5%	5.1%	5.5%
Total	Count	150	109	152	110	79	600
	% within Education	25.0%	18.2%	25.3%	18.3%	13.2%	100 %
	% within SES	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The scores of the table 1 indicate that majority of the students belongs to middle socio-economic status group i.e. 371 students (61.8%) fall in middle socio-economic status. In other ways majority of the engineering students 76.5% were from CBSE board 279 students (46.5%) and PSEB 180students (30%) and remaining 23.5% were from Bihar board 04 (.3%), H. P. Board 62 (10.3%), Haryana Board 23( 3.8%), J&K board 19 ( 3.2%), UP Board 33 (5.5%)

**TABLE 2**  
**CHI SQUARE TEST OF EDUCATIONAL STATUS OF ENGINEERING SPORTS PERSON AND**  
**NON SPORTS PERSON AND SOCIO-ECONOMIC STATUS OF THEIR FAMILIES**

Group		Value	d.f.	Asymp. Sig.(2-Sided)
Engineering Students	Pearson Chi-Square	12.137(a)	24	.978*

\* p- value insignificant (0.05)

Table 2 indicates that the Engineering sports person and non sports person education is not affected by the socio economic status of their family.

#### **4. CONCLUSION**

The finding of the Chi-Square test shows that the socio economic status of the family did not have any influence on education status of engineering sports person and non sports person.

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**COMPARATIVE STUDY ON SPEED AMONG HANDBALL AND BASKETBALL PLAYERS OF NORTH MAHARASHTRA UNIVERSITY**

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**ABSTRACT**

The study aimed to compare the **Speed** of Handball and Basketball male players of North Maharashtra University. A total of Sixty (60) players, comparing 30 Handball players and 30 Basketball players of North Maharashtra University which were randomly selected for the study. The Subjects were selected by using random sampling. The age of the subjects ranged between 20 to 28 years. To analyze the speed of the players of both the games, the 50 Meters Test of AAHPER Youth Fitness Test were used for the study. The analysis of data using 't'- test for finding the significance difference of speed in between Handball and Basketball male players The following conclusion are drawn: that the speed of Handball players has significant difference that of Basketball players, concluded that the Handball players are having comparatively high speed from Basketball players of SGBA university. Its recommended that appropriate training to the Basketball players may improve their speed to a good effect and improve their performance as well

**Keywords:** Speed, Handball, Baseball and AAHPER

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## 1. INTRODUCTION

The world of games and sports has crossed many milestones through different type of researchers and scientific advancements in general and their application in the field of sports in particular. Sports have emerged in the last half of the 20th century and become one of the most persuasive social institutions in the contemporary societies.

Handball is played on a court 40 by 20 meters (131 ft × 66 ft), with a goal in the centre of each end. The goals are surrounded by a near-semicircular area, called the zone or the crease, defined by a line six meters from the goal. A dashed near-semicircular line nine meters from the goal marks the free-throw line. Each line on the court is part of the area it encompasses. This implies that the middle line belongs to both halves at the same time (Juhasz and Biro,2015)

Basketball is a non-contact sport played on a rectangular court. While most often played as a team sport with five players on each side, three-on-three, two-on-two, and one-on-one competitions are also common. The objective is to shoot a ball through a hoop 18 inches (46 cm) in diameter and 10 feet (3.048 m) high that is mounted to a backboard at each end of the court. The game was invented in 1891 by Dr. James Naismith, who would be the first basketball coach of the Kansas Jayhawks, one of the most successful programs in the game's history ([https://en.wikipedia.org/wiki/History\\_of\\_basketball](https://en.wikipedia.org/wiki/History_of_basketball)).

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

Triumph in diversions and challenges require more than simply being fit. It demands motor skills, speed and power. The components of skill-related fitness enable one to move and perform more efficiently, Further, health-identified fitness might likewise profit from ability identified fitness, whether it is in work-related activities, daily movement functions, or in sports performance. Further, health-related fitness may also benefit from skill-related fitness, since persons who possess skill-related fitness are more likely to be active throughout life. Skill-related fitness is compatible with health-related fitness. Many activities promote both types. Individuals who possess both will find participation in either type of activities more enjoyable and beneficial to their health and physical well-being. A person who is physically active cannot help but improve some aspects of skill-related fitness (Cureton, 1951).

The purpose of the study was to Compare the speed between Handball and Basketball players of North Maharashtra University (M.S). It was also hypothesized that there may not be significant difference inbetween the speed of Handball and Basketball male players of North Maharashtra university.

## 2.METHODOLOGY

### 2.1 Selection of Subjects:

A total of Sixty (60) players, comparing thirty Handball players and thirty Basketball players of North Maharashtra university. The Subjects are selected by using random sampling. The age of the subjects ranged between 20 to 28 years.

**2.2 Tool Used:**

To analyze the speed of the players of both the games, the 50 Meters Test of AAHPER Youth Fitness Test (Kansal, 1996) was used for the study.

**2.3 Test Administrations**

Motor Fitness Variable	Methods	Equipment/Test Items	Unit/Measures
<b>Speed</b>	50 Meters Run	Electronic Stopwatch, Starting Clapper etc	Sec

**2.4 Statistical Analysis:**

To assess the speed ability of handball and basketball players, mean, SD, and t-ratio (Garret, 1981) were calculated. Significance level was set at .05 level of confidence.

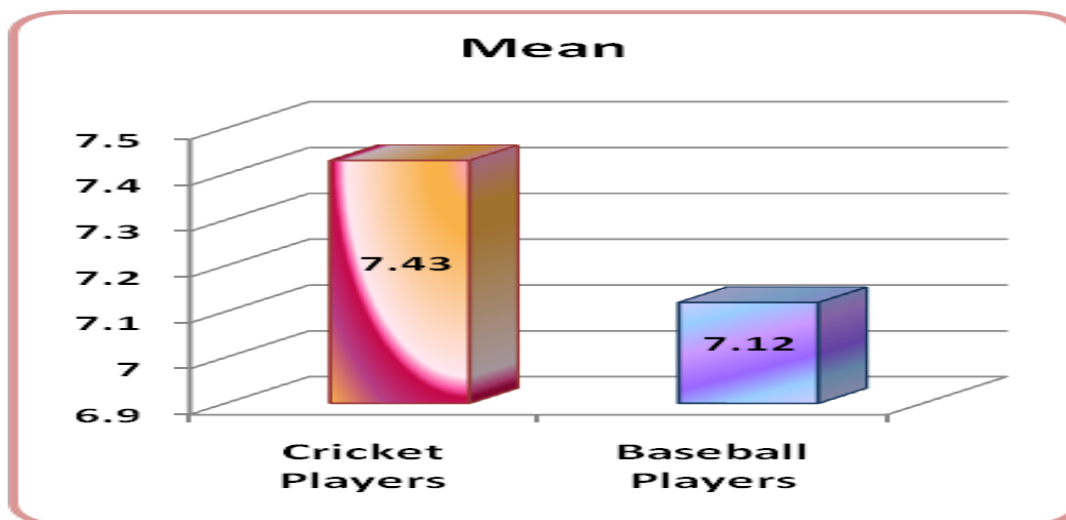
**3. RESULTS**

To find out the significance of difference statistically between speed of handball and basketball players, mean, SD, and t-ratio were computed and data pertaining to this, has been presented in Table 1 and means depicted in Figure 1 .

**TABLE I**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN MEAN SCORES ON SPEED OF HANDBALL AND BASKETBALL PLAYERS.**

Group	N	Mean	SD	Std Error	MD	DM	t-ratio	Df
<b>Handball</b>	30	7.43	0.621	0.1390	0.31	0.208	1.49	58
<b>Basketball</b>	30	7.12	0.656	0.1468				

The above Table - 1 indicates that the means of Handball players and Basketball players were 7.43 and 7.12 respectively. The obtained S.D was 0.621 and 0.656 for Handball and Basketball players respectively, This indicates that Handball players had higher means than the Basketball players.



**Fig.-1 Means values of Handball and Basketball players of North Maharashtra University.**



#### 4. DISCUSSION

For comparing the two groups i.e. Handball Players and Basketball Players of North Maharashtra University. The mean, standard deviation and 't' test were computed. The findings were presented in the form of table and graphs appropriately.

It was also hypothesized that there will be insignificant difference in between the speed of Handball and Basketball male players of North Maharashtra university The hypothesis was rejected on the basis of the results of the analysis in between Handball and Basketball male players.

#### 5. CONCLUSIONS

On the basis of analysis of data, the following conclusions may be drawn-

1. Handball and Basketball players indicated significant differences on the measure of speed..
2. The study also indicated that the Handball players had higher mean value as compared to the Basketball players.

#### 6. RECOMMENDATION

Its recommended that appropriate training to the Basketball players may enhance/improve their speed to a good effect and improve their performance also.

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**AN ASSESSMENT OF WAIST TO HIP RATIO AND HAND GRIP STRENGTH  
IN SPECIAL POPULATION OF KARNATAKA STATE**

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**ABSTRACT**

Special population should give due importance to maintain health and fitness in order to lead an independent life. There are numerous studies to substantiate that the physical form is a key indicator of the health of children and adolescents and it also predicts health in later life. The health and fitness status of special population need to be assessed from time to time. This will give a clear picture of present status and provide scope for diagnostic improvement. The purpose of the present study was to assess age wise health and fitness through waist to hip ratio as well as grip strength in special population of Karnataka state. The subjects for the present study were 414 males special population residing in various schools meant for them within Karnataka state. Digital tape measure was used to measure waist and hip circumferences of selected subjects. Hand grip strength was assessed by means of a standard hydraulic hand dynamometer. Apart from mean and standard deviation, percent analysis was carried out in order to accomplish assessment.

**Key words:** special population, visually impaired, hearing impaired, waist to hip ratio, hand grip strength.

## 1. INTRODUCTION

Health and fitness are valuable possessions of any individual. Every effort has to be made to improve and conserve the health for a productive life. Disability cannot be considered as a hindrance to conserve health and fitness. In fact, special population should give due importance to maintain health and fitness in order to lead an independent life.

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. (WHO, 2006). Physical fitness is defined as the ability of an individual to competently and capably perform everyday tasks without excessive fatigue, and with enough energy remaining to enjoy spending free time, as well as to resolve unusual situations of sudden and unforeseen emergency (Council of Europe, 1983). Physical fitness has been associated with health components (Anderson, et. al., 2011) and physical performance (Girard and Millet, 2009). There are evidences demonstrating that physical fitness could predict cardiopulmonary and metabolic disorders (Suriano, 2010) cognitive function (Chaddock, 2010)

There are numerous studies to substantiate that the physical form is a key indicator of the health of children and adolescents (Ruiz et al., 2006) and it also predicts health in later life (Ruiz et al., 2009). Constant assessment of the level of physical activity and physical fitness of special population should be considered a public health priority (World Health Organization, 2010). Monitoring involves constant measuring the levels of physical fitness of the individual as well as the evaluation of the data.

Waist-to-hip ratio is the dimensionless ratio of the circumference of the waist to that of the hips. The WHR has been used as an indicator or measure of health, and the risk of developing serious health conditions. It is used as a measurement of obesity, which in turn is a possible indicator of other more serious health conditions (Jonas, 1995). Regardless of height and build, a relative excess of fat around waist appears to increase risk of developing one or more chronic diseases or conditions such as heart disease and diabetes. Muscle strength has been considered as a significant component of health regardless of age (Ara, et. al., 2010) and clinical condition. One of the most used methods for assessing muscle strength is the handgrip strength (Ruiz, et. al., 2011) because it is a low cost and may be used in a time-efficient manner with unsophisticated equipment, mainly in clinical setting (, et. al., 2004).

The health and fitness status of special population need to be assessed from time to time. This will give a clear picture of present status and provide scope for diagnostic improvement. The purpose of the present study was to assess age wise health and fitness through waist to hip ratio as well as grip strength in special population of Karnataka state.

## 2. MATERIALS AND METHODS

### 2.1 Selection of subjects

The subjects for the present study were 414 male special population residing in various schools meant for them within Karnataka state. Among them 171 were hearing impaired and 243 visually impaired. Purposive random sampling was used in the present investigation.

### 2.2 Selection of test items

Digital tape measure was used to measure waist and hip circumferences of selected subjects. Hand grip strength was assessed by means of a standard hydraulic hand dynamometer. The data was collected in class room setting with voluntary consent.

**2.3 Procedure**

Apart from mean and standard deviation, percent analysis was carried out in order to accomplish assessment.

**3. RESULTS**

The results on waist to hip ratio and grip strength of special population is arranged in tables for clear assessment. Table 1 provides age wise information on waist to hip ratio in special population.

**TABLE 1  
AGE WISE MEAN AND STANDARD DEVIATION OF WAIST TO HIP RATIO IN SPECIAL POPULATION**

13 to 14 Years		15 to 16 Years		17 to 18 Years	
Mean	SD	Mean	SD	Mean	SD
0.84	0.04	0.82	0.05	0.83	0.05

From table, it is clear that the mean scores on waist to hip ratio is  $0.84 \pm 0.04$  during 13 to 14 years;  $0.82 \pm 0.05$  during 15 to 16 years and;  $0.83 \pm 0.05$  during 17 to 18 years. Table 2 provides results on percent analysis of waist to hip ratio in special population of Karnataka state.

**TABLE 2  
SUMMARY ON PERCENT ANALYSIS OF AGE WISE WAIST TO HIP RATIO IN SPECIAL POPULATION OF KARNATAKA STATE**

Ratio ranges	13- 14 years		15 to 16 Years		17 to 18 Years	
	Frequencies	%	Frequencies	%	Frequencies	%
.60 to .69	0	0	2	1.14	0	0
.70 to .79	19	14.84	58	32.95	30	27.27
.80 to .89	93	72.66	109	61.93	65	59.09
.90 to .95	15	11.72	7	3.98	15	13.64
Above .95	1	0.78	0	0	0	0
<b>Total</b>	<b>128</b>	<b>100</b>	<b>176</b>	<b>100</b>	<b>110</b>	<b>100</b>

From table 2 it is clear that 12.5 percent of special population in 13 to 14 years category is having waist to hip ratio more than 0.90. In 15 to 16 years category 3.98 percent of the subjects possess waist to hip ratio above 0.90. Similarly, 13.64 percent of subjects in 17 to 18 years category possess waist to hip ratio above 0.90. Table 3 presents results on hand grip strength of special population.

**TABLE 3  
MEAN AND STANDARD DEVIATION OF HAND GRIP STRENGTH**

13 to 14 Years		15 to 16 Years		17 to 18 Years	
Right Hand (Mean ± SD)	Left hand (Mean ± SD)	Right Hand (Mean ± SD)	Left hand (Mean ± SD)	Right Hand (Mean ± SD)	Left hand (Mean ± SD)
$19.60 \pm 5.72$	$18.16 \pm 5.29$	$23.75 \pm 5.73$	$22.34 \pm 5.51$	$26.00 \pm 5.31$	$24.15 \pm 5.39$

The results on percent analysis of hand grip strength in 13 to 14 years old age group is presented in table 4.

**TABLE 4**  
**HAND GRIP STRENGTH IN 13-14 YEARS OLD SPECIAL POPULATION OF KARNATAKA STATE**

<b>13 - 14 years</b>				
<b>Ranges</b>	<b>Right hand</b>	<b>Percentage</b>	<b>Left hand</b>	<b>Percentage</b>
5 to 10	7	5.47	7	5.47
11 to 15	29	22.66	36	28.13
16 to 20	37	28.91	44	34.38
21 to 25	32	25	28	21.88
26 to 30	18	14.06	12	9.38
31 to 35	5	3.91	1	0.78
36 to 40	0	0	0	0
41 to 45	0	0	0	0
<b>TOTAL</b>	<b>128</b>		<b>128</b>	

The results on percent analysis of hand grip strength in 15 to 16 years old age group is presented in table 5.

**TABLE 5.**  
**HAND GRIP STRENGTH IN 15-16 YEARS OLD SPECIAL POPULATION OF KARNATAKA STATE**

<b>15 - 16 years</b>				
<b>Ranges</b>	<b>Right hand</b>	<b>Percentage</b>	<b>Left hand</b>	<b>Percentage</b>
5 to 10	3	1.70	5	2.84
11 to 15	9	5.11	16	9.09
16 to 20	37	21.02	42	23.86
21 to 25	57	32.39	66	37.5
26 to 30	52	29.55	38	21.59
31 to 35	15	8.52	6	3.41
36 to 40	1	0.57	2	1.14
41 to 45	2	1.14	1	0.57
<b>TOTAL</b>	<b>176</b>		<b>176</b>	

The results on percent analysis of hand grip strength in 17 to 18 years old age group is presented in table 6.

**TABLE 6**  
**HAND GRIP STRENGTH IN 17-18 YEARS OLD SPECIAL POPULATION OF KARNATAKA STATE**

<b>17 - 18 years</b>				
<b>Ranges</b>	<b>Right hand</b>	<b>Percentage</b>	<b>Left hand</b>	<b>Percentage</b>
5 to 10	1	0.91	1	0.91
11 to 15	4	3.64	5	4.55
16 to 20	10	9.09	22	20
21 to 25	28	25.45	37	33.64
26 to 30	48	43.64	35	31.82
31 to 35	16	14.55	7	6.36
36 to 40	3	2.73	3	2.73
41 to 45	0	0	0	0
<b>TOTAL</b>	<b>110</b>		<b>110</b>	

#### 4. DISCUSSION

Objective measurements of waist to hip ratio and hand grip strength are an important component of population-specific normative data are essential for clinical and research purposes (Shim, et. al., 2013). The correlations calculated by Trosclair, et. al., (2011) implicate the usefulness of as a method to predict both muscular strength and endurance in a simple fashion. In a similar study by Walankar, Verma and Mehta (2016) normative values of hand grip for Indian population which can be used as reference values was generated. Soubhagyalaxmi, Balaram and Alex (2016) in their study suggest yoga as an effective option to improve muscle strength and motor function in children with visual impairment.

#### 5. CONCLUSION

AGE specific normative values on waist to hip ratio and grip strength is provided in the present study for future assessment and analysis of health and fitness of special population belonging to Karnataka state.

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## **EFFECT OF RETRO RUNNING ON DEVELOPMENT OF HEALTH RELATED PHYSICAL FITNESS AMONG COLLEGE WOMENS**

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### **ABSTRACT**

Retro running is a less natural motion, but can be accomplished with some speed with practice .it is better to start out backward running or walking or also called retro pedalling. Like normal running backward running will add an additional degree of difficulty. To achieve the purpose of the study was find out the effects of retro running on health related physical fitness among college women. Thirty (n=30) women were randomly selected from Bharathiar university, Coimbatore and their ages ranged from 19 to 25 years. Group-I underwent retro run training and group -II acted as control group. The duration of the training period was restricted to six weeks and the number of sessions per week was confined to five days in a row. Muscular strength and endurance, flexibility, cardiorespiratory endurance was measured as variablesThe data were collected in raw form and analysed by computing the descriptive statistical techniques and 't' test were applied. The level of significance was set at 0.05 level of confidence.

**Keywords:** College Women, Physical Fitness, Endurance, Training, Health

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## 1. INTRODUCTION

Running is a method of terrestrial locomotion allowing humans and other animals to move rapidly on foot. Running is a type of gait characterized by an aerial phase in which all feet are above the ground. This is in contrast to walking, where one foot is always in contact with the ground, the legs are kept mostly straight and the centre of gravity vaults over the stance leg or legs in an inverted pendulum fashion. A characteristic feature of a running body from the viewpoint of spring-mass mechanics is that changes in kinetic and potential energy within a stride occur simultaneously, with energy storage accomplished by springy tendons and passive muscle elasticity. The term running can refer to any of a variety of speeds ranging from jogging to sprinting. It is thought that human running evolved at least four and a half million years ago out of the ability of the ape-like *Australopithecus*, an early ancestor of humans, to walk upright on two legs. The theory proposed considered to be the most likely evolution of running is of early humans' developing as endurance runners from the practice of persistence hunting of animals, the activity of following and chasing until a prey is too exhausted to flee, succumbing to "chase myopathy" (Sears 2001), and that human features such as the nuchal ligament, abundant sweat glands, the Achilles tendons, big knee joints and muscular glutei maxims, were changes caused by this type of activity (Bramble & Lieberman 2004, et al.). There is nothing worse than knowing you can't run because of pain in an area of your body. But backward running can be done whether you have a groin, hamstring, knee, Achilles' tendon, or ankle injury. You can also continue to run if you have back pain or shin splints. Running backward will strengthen the opposing muscle groups that you normally work when running forward. Forward running puts a lot of pressure on the hamstrings and knees. Backward running will strengthen your calves, quads and shins to balance your muscular strength. It has been said that taking 100 steps backward is the same as taking 1,000 steps forward, and that going backward burns a fifth more calories than running forward. Not only is this great to enhance weight loss, but for those who are busy, going backward burns more calories in a shorter period of time.

Chaloupka et.al. (1997) indicated that: 1) at a given elevation, backward walking elicited greater cardiorespiratory, metabolic, and perceptual responses than forward walking and 2) backward walking at 5% elevation could provide a sufficient stimulus to maintain cardiorespiratory fitness.

Cavagna, Legramandi, and Torre (2010) concluded that the landing-takeoff asymmetry found in running, hopping and trotting is the expression of a convenient interplay between motor and machine. More metabolic energy must be spent in the opposite case when muscle is forced to work against its basic property (i.e. when it must exert a greater force during shortening and a lower force during stretching).

Flynn and Soutas-Little (1995) suggested that backward running at a self-selected speed may reduce patellofemoral joint compressive forces and, coupled with the quadriceps strengthening that has previously been reported, may be beneficial in the rehabilitation of patellofemoral pain syndrome in runners. However, constant speed comparisons or other models may yield different results.

The purpose of the study is to find out the effect of retro running on selected health related physical fitness components among college women's

## 2. METHODS AND MATERIALS

For conducting this study Thirty (n=30) women were randomly selected from Bharathiar university, Coimbatore and their ages ranged from 19 to 25 years.

Group-I underwent retro run training and group -II acted as control group. The duration of the training period was restricted to six weeks and the number of sessions per week was confined to five days in a row. Muscular strength and endurance, flexibility was measured as variables

The data were collected in raw form and analysed by computing the descriptive statistical techniques and 't' test were applied. The level of significance was set at 0.05 level of confidence.

### 3. RESULTS

**TABLE I**  
**COMPUTATION OF 't' RATIO ON MUSCULAR STRENGTH AND ENDURANCE OF RETRO TRAINING GROUP AND CONTROL GROUP**

Groups	Pre-test mean	Post test mean	Mean Difference	DM	't'-ratio
<b>Retro training group</b>	11.40	12.80	1.4	.940	6.65
<b>Control group</b>	11.40	11.5	0.01	0.02	2.086

Significant at 0.05 level for the degrees of freedom 1 and 14, 2.14

Table -I shows that the 't' ratios on retro training group was 6.65. Since, the values was higher than the required table value of 2.14, it was found to be statistically significant at 0.05 level of confidence for the degrees of freedom 1 and 14. Further the obtained 't' ratio of 2.086 between pre and post- test of control group was lesser than the required table value of 2.14, found to be not statistically significant. From the result it was inferred that retro training produced a significant improvement in the muscular strength and endurance among college women's

**TABLE I**  
**COMPUTATION OF 't' RATIO ON FLEXIBILITY OF RETRO TRAINING GROUP AND CONTROL GROUP**

Groups	Pre-test mean	Post test mean	Mean Difference	DM	't'-ratio
<b>Retro training Group</b>	25.00	34.60	9.60	0.75	12.72*
<b>Control group</b>	25.46	25.73	0.26	0.20	1.293

\*Significant at 0.05 level for the degrees of freedom 1 and 14, 2.14

Table -I shows that the 't' ratios on retro training group was 12.72. Since, the values was higher than the required table value of 2.14, it was found to be statistically significant at 0.05 level of confidence for the degrees of freedom 1 and 14. Further the obtained 't' ratio of 1.293 between pre and post- test of control group was lesser than the required table value of 2.14, found to be not statistically significant. From the result it was inferred that retro training produced a significant improvement in the flexibility among college women's

#### 4. DISSCUSSION

The findings of the study shows that the retro training enhance the flexibility and muscular strength and endurance according to **Cedric Whitaker (2015)** found a study on "The Effect of Backward Running on Hamstring Flexibility in College Football Athletes An independent t-test showed a statically significant difference in hamstring flexibility between groups ( $p=0.01$ ). With the experimental group having a mean increase of 0.75cm in hamstring flexibility, while the control group only had an increase of only 0.14cm. another study shows that Backwards running (BR) results in greater cardiopulmonary response and muscle activity compared to forward running (FR) **Ordway et.al., (2016)** conducted a study on the physiological effects of forward and backward walking training on lower extremity muscle strength before and after exhausting exercise. Fourteen healthy male adults were randomly divided into backward walking (BW,  $n=7$ ) and forward walking (FW,  $n=7$ ) training groups. Each group took part in pre-test consisted of knee extensor and flexor isokinetic peak torque (PT), total work (TW), electromyography (EMG) before and after exhausting exercise. Exhausting exercise was used to measure lower extremity endurance, which is incremental treadmill running using the Bruce protocol. The BW and FW training groups participated in a 6 weeks training program, consisted of 3 sessions per week for a total of 18 sessions. After finishing the training program, the post-test was performed using the same method. BW training group showed significant increases in knee extensor/flexor PT (4.6%/13.9%), TW (17.34%), EMG (35.9%) before exhausting exercise and PT (23.9%/18.8%), TW (46.7%), EMG (59.8%) after exhausting exercise. But FW training group did not show a significant increase in knee extensor/flexor PT (0.1%/3.2%), TW (1.8%), EMG (10.9%) before exhausting exercise and PT (2%/1%), TW (5.6%), EMG (17.2%) after exhausting exercise. BW training has positive effects on lower extremity muscle strength, especially muscle endurance that is important to prevent muscle weakness during competitive sports

#### 5. CONCLUSION

Based on the findings and within the limitation of the study it is noticed that practice retro training helped to improve physical fitness variables of college women. It was seen that there is progressive improvement in the selected criterion variables of experimental group of college girls after six weeks of training program. Further practice of drills also helps to improve other fitness factors i.e. Flexibility, Muscular Strength Endurance. It was concluded that individualized effects of retro training group showed a statistically significant positive sign over the course of the treatment periodon selected health related physical fitness variables of college women.

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**A COMPARATIVE STUDY ON SELECTED PHYSICAL FITNESS COMPONENTS  
BETWEEN KABADDI AND KHO-KHO PLAYERS**

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**ABSTRACT**

The present study has been designed to investigate the difference of selected physical fitness components between Kabaddi and Kho-Kho players. For accomplish the study total 100 players (50 of Kabaddi & 50 of Kho-Kho) of both games were selected through random sampling as subjects of this study. The age of the sample were ranged from 18 to 25. Body mass index (BMI) for obesity, 40 meter sprint for speed, standing broad jump for strength and sit and reach test for flexibility were used as criterion measure. SPSS version 17 was used to apply all statistical terms and t test was applied to compare the results. The level of significance was set at 0.05. Results of the study revealed that the significant difference found between Kabaddi and Kho-Kho players in there body mass index. It was also evident that Kho-Kho players have more speed than Kabaddi players. But in the strength, the mean of Kabaddi players was high than the Kho-Kho players. Kho-Kho players have more flexibility than the Kabaddi players.

**Key words:** Physical fitness, speed, strength, flexibility

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## 1. INTRODUCTION

Today's lifestyles have changed the average Indian into increasingly sedentary existence. Humans, however, are designed and built for movement. Physiologically, we have not adapted well to this active lifestyle. In fact, during what appeared to be a boom in fitness in the 1970s and 1980s, less than 20% of American adults exercised levels that could increase or maintain their aerobic capacity and strength. However, research has clearly established that, for almost everything, an active lifestyle is important for optimum health.

Sport plays a vital and important role for the social and cultural benefit of each individual. In the last decades sports have gained great popularity all over the world. The popularity of this sport continues to increase at a rapid pace and this happy trend will continue into the future. The contribution of sport to the general welfare of human society can be capsule in the following points:

- Sport helps in the integral development of the human personality.
- Provide great and healthy means of recreation and relaxation of the mind and the human body.
- are effective for the rehabilitation and social adaptation of the wounded, sick and disabled.
- Provide opportunities for social interaction, promoting peace and understanding between different people, nations, races, religion, etc.
- Perform preventive and curative functions for different diseases and ailments inflicted by the human body and mind.

The year 1990 will be remembered as the decade in which the medical profession formally recognized the fact that physical activity is essential for the health of the body. In other words, it seems rather ironic that it has taken this time for doctors and scientists to come to this conclusion, as Hippocrates (460-377 BC), a prominent physician and sportsman, had firmly supported physical activities and adequate nutrition as essential for Health more than 2,000 years ago. Physical fitness is a general state of health and well-being and, more in particular, the ability to perform sports aspects, professions and daily activities. Physical fitness is usually achieved through proper nutrition, moderate to vigorous exercise, and sufficient rest. Before the industrial revolution, fitness was defined as the ability to carry out the day's activities and without excessive fatigue. However, with automation and lifestyle changes of physical form is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases and To deal with emergency situations.

Barrow and Gee (1999) have recognized that physical form is a complex phenomenon that consists of several factors such as speed, strength, flexibility, agility, cardiovascular resistance and so on.

Jenson and Fisher (1999) demonstrated how physical characteristics are considered important parameters for athletes (Sprinter) of such strength, power, speed, agility, coordination, muscle strength, reaction time, cardiovascular respiratory resistance and flexibility. Due to the speed, agility, power, coordination and reaction time are the characteristics of the specific engine. These characteristics are best developed by repeated practice of a series of training courses for which they are needed. Strength, speed, agility, coordination, strength, flexibility contribute to these engine characteristics.

## 2. METHODOLOGY

### 2.1 Selection of the subject

A total 100 players were selected as selected through random sampling technique. Out of the total sample 50 subjects were from Kabaddi and 50 subjects were from Kho-Kho were selected respectively. The age of the sample were ranged from 18 to 25.

### 2.2 Selection of the variable

For the present study, the research scholar has gone through the various literatures to finalize the variables. The selection of the variables was utmost important as the total procedure and administration was dependent upon the nature of selection of variables. The variables are the key direction for the nature of the findings and outcomes from the present study. The experts were also consulted to get appropriate and rational suggestions to finalize the variables. The following variables were selected for the study:

Sr. No	Test	Measure
1	Body Mass Index (BMI)	Obesity
2	40 meter Sprint	Speed
3	Standing Broad Jump	Strength
4	Sit and Reach	Flexibility

### 2.3 Instrument Reliability

For the purpose of the test all the instruments were used of high standard and reputed companies and were calibrated by the respective companies. The stop watches were used from Casio Company make. All the instruments were calibrated prior to the actual testing procedure with the help of experts and also gone through the several practice trials with Instruments and testing.

### 2.4 Statistical Tool Used

To explore the difference between obtained results't' test was used as statistical tool. SPSS version 17.0 was used to apply all calculation. Mean, standard deviation and standard error of mean was used as descriptive statistics. The level of significance was set at 0.05.

## 3. RESULTS AND DISCUSSION

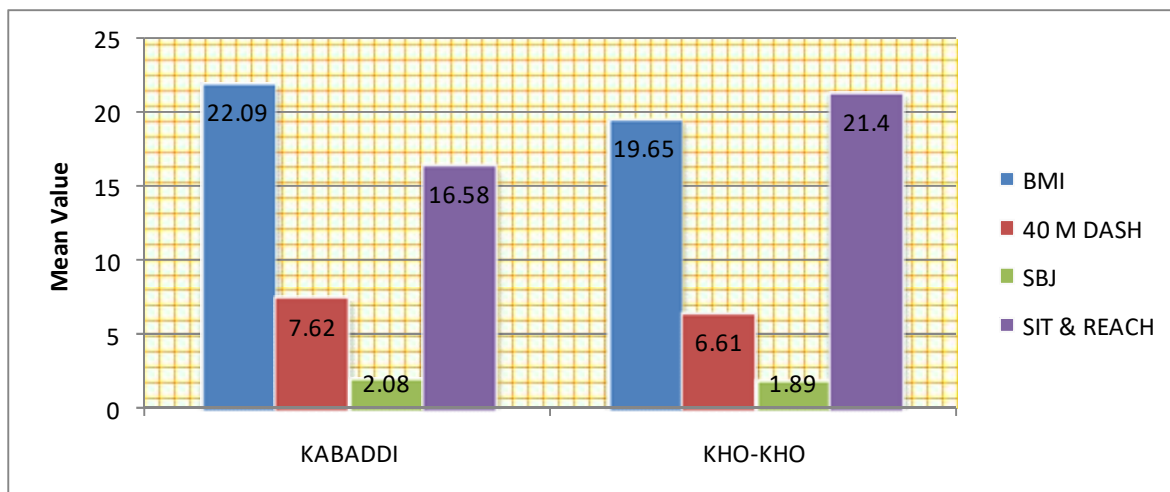
**TABLE. 1**  
**DESCRIPTIVE STATISTICS OF SELECTED VARIABLES FOR**  
**KABADDI AND KHO-KHO PLAYERS**

S.NO	Variables	Mean Kabaddi	Mean Kho-Kho	Mean Difference
1	Body mass index	22.09	19.65	02.44
2	40 M dash (in sec)	7.62	6.61	01.01
3	Standing broad jump (in mtr)	2.08	1.89	0.19
4	Sit & reach test (in cms)	16.58	21.40	04.82

N=100 (50 Kabaddi 50 Kho-Kho)

The Table - 3 highlight the mean values of Kabaddi and Kho-Kho players for the selected variables. The Body Mass Index for Kabaddi players depicts 22.09 and Kho-Kho players 19.65 with a mean difference of 02.44. It shows that Kabaddi players have more BMI score or they were fatter than the Kho-Kho players. The mean value for 40 M Dash for

Kabaddi and Kho-Kho players were 7.62 and 6.61 seconds respectively with a difference of 1.01 seconds, signifying that Kho-Kho players were reported faster than the Kabaddi players. The mean value of standing broad jump of Kabaddi players is higher than the Kho-Kho players with the mean difference of 0.19. Kho-Kho players were reported higher flexibility with the mean difference of 04.82 respectively



**Fig.1:** GRAPHICAL PRESENTATION OF COMPARATIVE MEAN VALUE OF SELECTED VARIABLES OF KABADDI AND KHO-KHO PLAYERS

**TABLE.2**  
**SIGNIFICANCE OF MEAN COMPARISON OF SELECTED VARIABLES**

S.NO.	Variables	Mean difference	S.D. Difference	't' Value
1	Body mass index	2.45	2.43	7.11*
2	40m Dash	1.01	1.21	5.89*
3	Standing broad jump	.19	.311	4.24*
4	Sit and reach test	4.86	6.94	4.96*

\*significance at 0.05 level (df=49) 2.01

The results mentions in table 2 in which it was found that for the body mass index mean and S.D difference is 2.45±2.43 and t value is 7.11 which was highly significant at 0.05 level of confidence as the tabulated value depicted as 2.01 respectively. It may be observed from the results that there is a significant difference between Kabaddi and Kho-Kho players in reference to body mass index component.

A test for measuring speed was selected as 40 M Dash for which the values of paired mean difference were 1.01, paired S.D. difference was 1.21 and 't' value was 5.89 was significant at both 0.05 and 0.01 levels of confidence against the tabulated value 2.01 and 2.68 respectively. It may also be observed that the speed component has significant difference between Kabaddi and Kho-Kho Players.

The paired mean difference for Standing Broad Jump was 0.19, paired S.D. difference was 0.31 and 't' value was 4.24, which was found significant at both 0.05 and 0.01 levels of confidence. The Sit & Reach Test was computed for the paired mean difference



which were 4.86, paired S.D. difference 6.94 and 't' value was 4.96 was significant at both 0.05 and 0.01 levels of confidence against the tabulated value 2.01 and 2.68 respectively. The table no. 2 also evident that there was a significant difference found between Kabaddi and kho-Kho players in their flexibility with t value of 4.96, which was highly significant at 0.05 level of confidence.

#### 4. CONCLUSION

After analysis and basis of the obtained results there is significant difference found between Kabaddi and Kho-Kho players in there body mass index with the t value of 7.11, it means Kabaddi players have higher percentage of body fat than Kho-Kho players. It was also evident that Kho-Kho players have more speed than Kabaddi players. But in the strength, the mean of Kabaddi players was high than the Kho-Kho players and t value of sit and reach was 4.96. it means Kho-Kho players have more flexibility than the Kabaddi players.

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## **EFFECT OF SELECTED PLYOMETRIC TRAINING ON EXPLOSIVE STRENGTH OF COLLEGE LEVEL SPORTSMEN**

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### **ABSTRACT**

The purpose of the present investigation was to find out the effects of selected plyometric exercises on explosive strength of college level sportsmen. For this purpose, sixty college level sportsmen who volunteered to participate in this study were randomly selected. The selected sportsmen were divided into two equal groups, namely experimental group and control group. Experimental group was given plyometric exercises and control group was not given any experimental treatment except of their regular workouts. Experimental Group performed plyometric drills i.e. Hopping on one leg;, Hopping, Bounding and Box Jumps and Depth Jumping. The standing broad jump was the criterion measures used to measure explosive strength of the college level sportsmen. The statistical analysis of data showed that there was significant effect of plyometric training on explosive strength. The significant improvement in explosive strength was seen more on plyometric group than control group

**Keywords:** Plyometric training, Explosive Strength, College level, Sportsmen

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## 1. INTRODUCTION

Plyometrics exercises are used to improve maximum strength and speed of movement which result in an increase of explosive power. Dynamic in nature, these exercises satisfy the basic training principles of specificity, practice with movements similar in nature and speed to the skills or events for which one is trained. Though plyometric training is relatively new in India, this training technique has been used extensively in USSR and America since the early 1960's. Early researches on plyometrics were made with a little interest in hopping and bounding drills. In recent years the method of plyometrics has become a part of the training methods in sports and games (Wilf & Freeman, 1984). Plyometric exercises are specialized, high intensity training techniques used to develop athletic power (strength and speed). Plyometric training involves high-intensity, explosive muscular contractions that invoke the stretch reflex (stretching the muscle before it contracts so that it contracts with greater force). The most common plyometric exercises include hops, jumps and bounding movements. One popular plyometric exercise is jumping off a box and rebounding off the floor and onto another, higher box. These exercises typically increase speed and strength and build power.

Plyometrics consists of exercises commonly used to enhance explosive power via the stretch-shortening cycle (SSC), (Michael et al., 2001; Rahimi, 2005). The stretch component of the SSC refers to the eccentric muscle action, whereas the shortening refers to the concentric muscle action (Michael et al., 2001). Elastic energy is stored in the tendo-muscular system during the eccentric action (Michael et al., 2001). This is accomplished by optimizing the stretch-shortening cycle, which occurs when the active muscle switches from rapid eccentric muscle action to rapid concentric muscle action (Luebbers et al., 2003; Lachance et al., 1995; Wagner et al., 1997).

The purpose of the present investigation was to find out the effects of selected plyometric exercises on explosive strength of college level sportsmen.

## 2. METHODOLOGY

### 2.1 Selection of Subject:

Sixty male sportsmen who volunteered to participate in this study were randomly selected for this purpose. All of the subjects participated in inter-collegiate level sports and games competitions. They were being trained by means of a plyometric exercises. The subjects received all the necessary information about the study's procedures.  $M \pm SD$  of age was  $22.14 \pm 1.59$  years. The selected sportsmen were divided into Experimental group-I, Experimental group and control group. Experimental group was given plyometric exercises and control group was not given any experimental treatment except of their regular workouts.

### 2.2 Training Protocols:

Training group was trained five days per week for a period of six weeks. Training exercises were given in the morning and evening for duration of 90 minutes per day from Monday to Friday. All workouts were given after warming up. Warming up was concluded with numbering exercises, Before the initiation of the training periods, the subjects of all the groups were instructed about the proper execution of all of the exercises to be used during the training period for all training regimens. This assured good orientation and helped the subjects to explore better. The subjects in the experimental group performed the following plyometric drills:

1. Hopping on one leg: Hopping should be considered as running on one leg. The other leg does not remain passive but punches hand forward landing with feet. Both knees should be released.
2. Hopping, Bounding and Box Jumps: Bounding is an exaggeration of the running action. The athlete emphasis a vigorous thrust off the ground and step high up and forward. The progressive thigh is driven at waist height and parallel to the ground landing employ an active reach for the ground. After hopping bounding jumping drills as per the work schedule was given, the subjects were given drills on jump over hurdles and depth jump.
3. Depth Jumping: To perform depth jumping the subjects stand on top of the box and drop off to the ground it was done in single leg and double leg. He should not jump off the box.

Initial and final scores on speed were collected using standard tests before and after the experimental period. And the collected data were subjected to statistical treatment.

### 3. TEST ADMINISTRATION

The standing broad jump (Yobu, 1988) was the criterion measures used to measure explosive strength of the college level sportsmen. The criterion measure is explained below:

Purpose : To measure the explosive power of legs. Materials: Tape, Jumping pit. Procedure: The student stands behind a take off line with his feet several inches apart. Before jumping, the student dips at the knees and swings the arm backward. He then jumps forward by simultaneously extending the knee and standing the arms forward three trials are permitted. Scoring: The scoring is the distance between the take off line and the nearest points where any part of the student body touches the floor. Best performance out of three trials is taken as his score.

### 4. RESULTS AND DISSCUSION

The collected data on the explosive strength prior to and after 6 weeks of plyometric exercise were statistically analysed using t- test and data pertaining to this has been presented in Table 1 and 2

**TABLE 1**  
**DESCRIPTIVE STATISTICS OF EXPLOSIVE STRENGTH OF LEG OF COLLEGE LEVEL MALE BEFORE PLYOMETRIC TRAINING**

Test	Groups	M	SD
Pre-test	Experimental Group	1.99	0.41
	Control Group	1.90	0.56
Post-test	Experimental Group	2.45	0.32
	Control Group	2.01	0.53

**TABLE 2**  
**SIGNIFICANCE OF DIFFERENCE BETWEEN THE PRE-TEST AND POST-TEST MEAN SCORES ON EXPLOSIVE STRENGTH OF COLLEGE LEVEL SPORTSMEN**

Test	Experimental Group	Control Group	MD	DM	t-ratio
Pre-test Mean	1.99	1.90	0.09	0.081	1.10
Post-test Mean	2.45	2.01	0.44	0.21	2.13*

\* Significance at .05 level,  $t_{.05}(58)=2.00$

It is evident from Table 2 that the significant difference was not found between pre-test mean scores between experimental and control group on explosive strength of college level sportsmen, as the obtained t-value of 1.10 was less than the required  $t_{.05}(58)$

= 2.00. So, it is demonstrated that the random assignment of the subjects for three groups (Plyometric, Weight training and control group) was successful

But the significant difference was found between post -test mean scores between experimental and control group on explosive strength of college level sportsmen, as the obtained t-value of 2.13 was high than the required  $t_{.05(58)} = 2.00$ . So, it was found that there was significant improvement due to treatment of plyometric training exercises on the subjects.

It was also documented that due to plyometric exercises, there was significant mean gains over experimental group. The findings of this study were in agreement with the findings of Mullai (1987), who found that plyometric exercises improved sprinting ability. The findings of this study were also in agreement with the findings of Watson (1983), who found that plyometric exercises were better in improving physical fitness of the subjects.

## 5. CONCLUSIONS

Based on the results and discussions of the study. it was concluded that

1. Significant difference was found between post -test mean scores between experimental and control group on explosive strength of college level sportsmen
2. There was more improvement in explosive strength was observed more in plyometric group than control group.

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**RESEARCH FACILITIES AND SCOPES IN THE FIELD OF  
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**ABSTRACT**

This research article provides an overview of research facilities and scopes in the field of chemistry in India. It highlights the robust infrastructure comprising universities, research institutions, and laboratories equipped with modern instrumentation. Government-funded organizations such as CSIR and DST support chemical research through grants, fostering interdisciplinary collaborations. The essay explores diverse scopes in chemistry research, including drug discovery, green chemistry, nanotechnology, and computational chemistry. India's expertise in these areas positions it as a key player in addressing global challenges and driving innovation in the field of chemistry. Conclusion: In conclusion, India's chemistry research landscape is characterized by a rich tapestry of research facilities and diverse scopes of study. With state-of-the-art infrastructure, collaborative partnerships, and a talented pool of researchers, India is poised to make significant contributions to the global chemical research community. By addressing pressing societal challenges and harnessing the power of innovation, Indian chemists are driving advancements that have the potential to shape the future of science and technology on a global scale.

**Keywords:** Research, Facility, Scope, Chemistry, India

## 1. INTRODUCTION

Chemistry, often dubbed as the "central science," serves as a cornerstone in various scientific disciplines, ranging from medicine to materials science. In India, the field of chemistry has witnessed significant growth over the years, bolstered by advancements in research facilities and expanding scopes of study. This essay explores the research facilities available and the diverse scopes present in the realm of chemistry in India.

Research Facilities: India boasts a robust infrastructure for chemical research, comprising a network of universities, research institutions, and laboratories. Premier academic institutions such as the Indian Institutes of Technology (IITs), Indian Institutes of Science Education and Research (IISERs), and universities like the University of Delhi and the University of Mumbai house state-of-the-art laboratories equipped with modern instrumentation. These facilities cater to diverse fields within chemistry, including organic, inorganic, physical, analytical, and theoretical chemistry.

Furthermore, government-funded research institutions like the Council of Scientific and Industrial Research (CSIR) and the Department of Science and Technology (DST) support chemical research through grants and fellowships. These institutions collaborate with academia and industry to foster interdisciplinary research and address pressing societal challenges.

Additionally, India's participation in international collaborations and consortia enables access to cutting-edge research facilities worldwide. Initiatives such as the Indo-US Knowledge Initiative in Agriculture and the Indo-German Science and Technology Centre facilitate knowledge exchange and joint research ventures, amplifying the research capabilities in the field of chemistry.

## 2. SCOPE

The scope of chemistry research in India is vast and encompasses a multitude of areas with significant societal implications. One prominent area is drug discovery and development, where researchers strive to identify novel therapeutic agents for various diseases, including cancer, infectious diseases, and metabolic disorders. Collaborative efforts between academia, pharmaceutical companies, and government agencies have led to breakthroughs in this field.

Another burgeoning area is green chemistry, which focuses on the design of chemical products and processes that minimize environmental impact. With increasing concerns about sustainability and climate change, research in green chemistry aims to develop eco-friendly alternatives to traditional chemical methodologies, thereby reducing pollution and conserving resources.

Nanotechnology is yet another field gaining traction in Indian chemistry research. By manipulating matter at the nanoscale, researchers are exploring innovative applications in fields such as catalysis, drug delivery, and sensor technology. India's expertise in nanoscience and nanotechnology positions it as a key player in this rapidly evolving domain.

Furthermore, computational chemistry is emerging as a powerful tool for understanding molecular phenomena and designing new materials with tailored properties. High-performance computing facilities coupled with advanced software enable researchers to simulate complex chemical systems and predict their behavior, thereby accelerating the pace of discovery and innovation.

### 3. DOMAINS

Beyond drug discovery, green chemistry, nanotechnology, and computational chemistry, India's chemistry research landscape encompasses several other significant domains. These include:

1. **Environmental Chemistry:** With growing concerns about pollution and climate change, research in environmental chemistry is paramount. Indian chemists are investigating the sources, fate, and impact of pollutants on ecosystems, as well as developing remediation strategies and sustainable technologies for waste management and water purification.
2. **Materials Chemistry:** Materials chemistry plays a crucial role in developing advanced materials for various applications, including electronics, energy storage, and catalysis. Indian researchers are exploring innovative synthesis routes, structure-property relationships, and functional materials design to address societal needs and contribute to technological advancements.
3. **Biochemistry and Biotechnology:** Biochemistry and biotechnology intersect chemistry with biology, offering solutions to healthcare, agriculture, and biomanufacturing challenges. Indian scientists are engaged in understanding biochemical processes, biomolecular interactions, and genetic engineering techniques to develop biopharmaceuticals, biofuels, and genetically modified crops.
4. **Analytical Chemistry:** Analytical chemistry provides tools and techniques for detecting and quantifying chemical species in diverse samples. In India, researchers are developing sensitive and selective analytical methods for applications in food safety, environmental monitoring, forensic analysis, and pharmaceutical quality control, ensuring public health and safety.
5. **Chemical Education and Outreach:** Chemistry education and outreach initiatives are vital for nurturing future generations of scientists and fostering public understanding of chemistry. Indian institutions and organizations are actively involved in curriculum development, teacher training programs, science communication activities, and public engagement events to promote scientific literacy and inspire interest in chemistry among students and the general public.
6. **Sustainable Chemistry:** Sustainable chemistry focuses on developing chemical processes and products that minimize environmental impact and conserve resources. Indian researchers are exploring renewable feedstocks, green solvents, and energy-efficient synthesis routes to create environmentally friendly alternatives to conventional chemical processes.
7. **Chemical Engineering:** Chemical engineering integrates principles of chemistry, physics, and engineering to design and optimize processes for the production of chemicals, fuels, and materials. In India, chemical engineers collaborate with chemists to scale up laboratory discoveries, optimize manufacturing processes, and address engineering challenges associated with chemical production.
8. **Food Chemistry and Nutrition:** Food chemistry encompasses the study of chemical composition, properties, and interactions of food components. Indian scientists are investigating food quality, safety, and nutritional value, as well as developing food additives, preservatives, and fortification methods to address malnutrition and ensure food security.
9. **Medicinal Chemistry and Natural Products:** Medicinal chemistry focuses on designing and synthesizing therapeutic compounds for the treatment of diseases. Indian researchers



harness the rich biodiversity of the country to discover bioactive natural products with medicinal properties, as well as design synthetic analogs and derivatives for drug development.

10. Surface and Interface Chemistry: Surface and interface chemistry explore the behavior of molecules at the interfaces of solids, liquids, and gases. In India, researchers investigate surface modification techniques, catalytic reactions, and surface characterization methods for applications in corrosion protection, catalysis, and biomedical devices.

Furthermore, interdisciplinary collaborations between chemists and researchers from fields such as physics, biology, engineering, and computer science contribute to the convergence of knowledge and innovation, driving forward the frontiers of chemistry research in India.

### **3. RESEARCH FACILITIES**

There are many institutes which provide research centre for advanced research in the field of Chemistry :-

#### **3.1 Indian Institute of Chemical Technology**

Indian institute of Chemical technology Hyderabad, a constituent of CSIR is a leading research institute in the area of Chemical sciences. The core strength of IICT lies in Organic Chemistry, and it have researches in the field of drugs ,Agrochemicals, Food, Organic intermediates, Adhesives etc. IICT has active collaborations with several countries Italy, USA, Australia, Japan, France, Germany, Korea etc.

#### **3.2 Bhabha Atomic Research Centre(BARC):Chemistry Group**

A primer multi-disciplinary Nuclear Research Centre of India having advanced infrastructure for research and development with expertise covering the entire spectrum of Nuclear Science and Engineering and related areas. It provide PIE facility for different types of experimental as well as Power reactors fuels and for validation of fuel modeling codes, Life management and post irradiation examination of reactor fuels, AHWR 300-LEU is a300MWe,vertical type boiling light water cooled and heavy moderated reactor with advanced safety features, Indigenous machines for the treatment of Cancer patients.

#### **3.3 Tata Institute of Fundamental Research:**

It is a national centre of the Government of India under the department of Atomic Energy, situated in Mumbai. The fields of researches are in Physics, Chemistry, Biology, Mathematics, Computer Science and Science Education. The additional campus of the institute is in Pune, Bangalore and Hyderabad also. Research facilities are: TIFR balloon facility Hyderabad, National facility for High-field NMR, Giant Metrewave Radio Telescope (GMRT), Palletron Linac facility.

#### **3.4 Inorganic and Physical Chemistry-Indian institute of Science**

IPC department has a centre for innovative and pioneering research in a wide range of area in Inorganic and Physical Chemistry. It was elevated to the status of a UGC centre of advanced study in 1980 in recognition to its achievements. The major researches are in field of Molecular structure and dynamics, Laser Spectroscopy, Organometallic and Coordination chemistry, Bio inorganic chemistry, Energy system, Catalysis, Polymers and Electrochemistry.

#### **3.5 CSIR –NCL National Chemical Laboratory**

CSIR is an autonomous body .India's largest research and development organization ,with 37 laboratories and 39 field stations. Funded by ministry of science and technology field--- aerospace engineering, structural engineering, ocean science, life science, metallurgy, chemicals, mining, food, petroleum, lather, environment.

It is situated in Pine, provides interdisciplinary research centre with interest in Polymer science, Organic chemistry, Material chemistry, Chemical engineering, Biochemical sciences and Process development. It also publishes the large number of papers in Chemical sciences, both in India and abroad. CSIR-NCL is participating in the activities of Academy of Scientific and Innovative Research (AsSIR) to maximize the number of qualified researchers and professionals and to equip them with the skills to innovate and conduct seamless interdisciplinary research; it focuses on imparting instructions in such areas that are not routinely taught in regular academic universities. NCL and its scientists have collaborative projects with Universities of science and Technology in France, USA, Japan, Korea, Melbourne, Australia ,Germany etc.

### **3.6 Indian Institute of Science Education and Research**

The IISER were established by the ministry of Human Resource Development (MHRD), Government of India, based on the recommendation of the scientific advisory council to the Prime minister. Five IISER's have been created and functioning at Pune, Kolkata, Mohali, Bhopal and Thiruvananthapuram.

### **3.7 Department of Chemistry, Indian Institute of Technology: IIT, Bombay**

It is started in 1965 in Mumbai. The departmental research is funded by Major Indian and international funding agencies and industries.

## **4. CAREER OPPORTUNITIES**

A student average student can expect several job opportunities after MSc Chemistry degree. There are jobs not just in research and development but also in Sales and in laboratories in different capacities. To fully understand the scope of a chemistry degree and job options, it is best to look at the private jobs and also Government jobs open to a Chemistry student.

### **4.1. Private Jobs**

Scientific job roles are abundant in the private sector at different product manufacturers. For instance, the cosmetics, pharmaceutical and agriculture sectors are some of the biggest employers for MSc Chemistry graduates. The right candidate with the appropriate skills and also mindset can make a successful career in the private sector. Within these employers, there are also many job roles one can work at:

#### **4.1.1. Become a Chemistry Expert at Chegg India**

Chemistry is a valuable degree to earn today. Students can go on to be contributing members in Pharmacy, Cosmetics, Agriculture and more. There is no dearth in terms of jobs and also higher education options for individuals to explore. However, there is one more option graduates can look into. Chegg Experts allow subject experts to practice teaching students,

#### **4.1.2. Pharma Sales Executives**

Pharmaceutical and medical equipment manufacturing companies that have several products have a dedicated sales department. Under this department, Sales Executives are hired whose sole responsibility is to promote sales and get more customers. They typically are an expert in the product and have a relevant degree like MSc Chemistry.

Pharmaceutical Sales Executives generally approach hospitals and doctors to sell them their offerings. One must not only be attentive to detail to understand what the client needs but also know how to convince them. They work on monthly and also annually targets on which they receive commissions with regular pay.

#### **4.1.3. Toxicologist**

Toxicologists are experts that combine both Chemistry and Biology to determine if certain substances are toxins or not. This is one post where all work is done in a laboratory

setting where the individual is conducting tests and doing research. The tests are done in a controlled environment on humans or animals whose results are then used in different industries.

Toxicologists, in particular, work with drugs and pharmaceuticals to determine if they are safe to use and consume. They will also create guidelines or training reports on how to use these ingredients. This is a well-paid role where one can earn around INR 7,50,757 LPA.

#### **4.1.4. Quality Control Manager**

The term Quality Control Manager is a broad term found in many different industries and also employers. For Chemistry graduates, this role is primarily available in pharmaceutical or cosmetics manufacturers. The Quality Check Manager will inspect and also test out the manufactured products to ensure they meet all set standards.

Thereafter, they put their findings in a report and sent it to upper management for changes to be implemented. Without the role of a Quality Control Manager, no products are sent to be sold out in the market.

#### **4.1.5. Research Scientist**

One of the best sought out MSc Chemistry jobs is, in particular, that of a Research Scientist. In the private sector, Research Scientists work with chemicals and analyse them to make different products and treatments. This is a core laboratory role where the Research Scientist generally works in a team. Besides the experiments and tests, they will also analyse the data and results.

## **4.2. Government jobs**

Government jobs for Chemistry students are normally available in organizations and research centers under Government management. These organizations typically hold an entrance examination along with a personal interview round to select candidates. Like with the private sector, the range of jobs and also employers vary greatly in the Government sector as well:

#### **4.2.1. Clinical Research Associate**

Clinical Research Associates work in Government or privately run laboratories conducting clinical trials. They conduct the tests to find out any benefits, risks and also how to use them. Most Clinical Research Associates work at testing new drugs on test subjects.

All aspects of the test from setting up the test to initiation and also monitoring the results are done by the Clinical Research Associate. This work is done in liaison with doctors and also drug authorities.

#### **4.2.2. Professor/Teacher**

Another of the more prestigious career after MSc Chemistry is in education. As teachers or professors, one can work in schools and also universities teaching Chemistry. To teach at Government colleges, individuals could be required to have a national test score. Government school teachers have high salaries and also long-term sustainability. For higher teaching positions, universities also require a doctorate in Chemistry.

#### **4.2.3. Laboratory Assistant**

This is one role that is self-explanatory. Laboratory Assistants will primarily work with senior scientists in laboratories. Their role is to assist the scientists in any way possible. From prepping for the experiments and tests to recording results, cleanup, sterilization and also preparing reports.

Laboratory Assistant will also collect and handle samples for the test and take care of administrative tasks for the senior scientist.

#### **4.2.4. Chemist**

Chemists are core Chemistry job roles where all one does is work with different chemicals, testing and also analysing them. Their work efforts are to not only create a new more

secure but also stable product. When testing, the Chemist will look at the properties of the chemical and how it reacts with different products.

Regular tasks in the laboratory like cleaning and sanitising the test equipment are also part of the Chemist's duties.

## 5. IMPORTANCE

Chemistry is that branch of science dealing with the study of composition, structure, and properties of matter. It deals with the study of the changes which different forms of matter undergo under different conditions. Chemistry also had branches that look at the laws governing these changes. There are many instances in your day-to-day life that involves chemistry, its applications, and its rules.

### 5.1 pply of Food

The study of chemistry provided the world with chemical fertilizers such as urea, calcium superphosphate, sodium nitrate, and Ammonium Sulphate. These chemicals have helped greatly in increasing the yield of fruits, vegetables, and other crops. Thus, we can cater to the ever-growing demand for food. It has helped to protect the crops from insects and harmful bacteria by the use of certain effective insecticides, fungicides, and pesticides.

Chemistry also led to the discovery of preservatives. These chemicals have greatly helped to preserve food products for a longer period. It has given methods to test the presence of adulterants. This ensures the supply of pure foodstuff.

### 5.2 ribution to Improved Health and Sanitation Facilities

Chemistry provided mankind with a large number of life-saving drugs. We could find a cure for dysentery and pneumonia due to the discovery of sulphur drugs and penicillin. Besides this, life-saving drugs like cisplatin and taxol are effective for cancer therapy and AZT is used for AIDS victim. Some of the common drugs that chemistry has blessed us with include:

- **Analgesics:** To reduce the pain of different types.
- **Antibiotics:** To curb infection and cure diseases.
- **Tranquillisers:**  
To reduce tension and bring about calm and peace to patients suffering from mental diseases.
- **Antiseptics:** To stop infection of the wounds.
- **Disinfectants:** To kill the microorganism present in toilets, floor, and drains.
- Discovery of **anaesthetics** has made surgical operations more and more successful.
- The use of **insecticides** such as DDT and Gammexane has greatly reduced the dangers of diseases caused by the rats, mosquitoes, and flies.

### 5.3 Scope of Chemistry in Saving the Environment

The science, now we have environment-friendly chemicals that help us conserve the nature. One such example is the replacement of CFCs in the refrigerators.

### 5.4 ease in Comfort, Pleasure, and Luxuries

Because of the advancements in science and the discoveries of chemistry, we lead a more comfortable life today. You may ask how? Let us see below.

### 5.5 Supply of metals:

Metals like gold, silver, copper, iron, aluminium, zinc and a large number of the alloys are used for making various objects. These include ornaments, utensils, coins, and many Industrial and agricultural implements.

## 6. DOMESTIC USE:

Chemistry has made our homes more comfortable by supplying a large number of articles of domestic uses. Examples include detergents, oils, and fats, sugar, paper, glass, plastic, paints, cosmetics, perfumes, cooking gas etc. We are able to beat the heat in summers by using refrigerants like ammonia, liquid sulphur dioxide, and freon.

Entertainment: Cinema, video cameras, simple cameras make use of films which are made of Celluloid and coated with suitable chemicals. Fireworks which amuses us on festival and marriages are chemical products. Can you imagine how boring life would have been if you wouldn't have been able to take all those cute selfies?

Transport and communication: All means of transport use either petrol or diesel or coal which are all chemical products.

Nuclear atomic energy: Chemistry has come to the rescue by providing an alternative source of energy which is nuclear energy.

## 7. OTHER SCOPE

Chemistry plays an important and useful role towards the development and growth of a number of industries. This includes industries like glass, cement, paper, textile, leather, dye etc. We also see huge applications of chemistry in industries like paints, pigments, petroleum, sugar, plastics, Pharmaceuticals. It has also helped in the greater production of sulphuric acid, nitric acid, and Ammonia, hydrogenated oils by providing suitable catalysts.

Chemistry plays an important role in the discovery of highly explosive substances such as TNT, nitroglycerine, and dynamite. It also plays a role in finding poisonous gases like mustard gas, Phosgene etc.

## 8. SUMMARY

The scope of chemistry research in India is dynamic and multifaceted, encompassing a wide range of disciplines and applications with far-reaching implications for science, technology, and society. By addressing pressing challenges, fostering innovation, and nurturing talent, Indian chemists are at the forefront of advancing knowledge and making meaningful contributions to the global scientific community.

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