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E-mail: rajesh2sports@gmail.com



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## Research Article

# Indian cricket come into all attention than any other sport

B. Gowri Naidu<sup>1</sup>, Ch. S. R. Naveen Kumar<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Physical Education, Rajiv Gandhi University of Knowledge Technologies, Srikakulam, Andhra Pradesh, India, <sup>2</sup>Assistant Director, Department of Physical Education, Rajiv Gandhi University of Knowledge Technologies, Nuzvid, Andhra Pradesh, India

## INTRODUCTION

It is unpleasant but very true that one single game blotting many others games in India. Cricket fever overshadowed our national sport hockey. There is no question of any debate that cricket is killing other sports in our country. Indians eat, live, sleep, talk, and walk cricket. Theoretically, we all know that hockey is our national game but in practical vision, its cricket maniac all over.

India is a multisporting nation where a variety of games are played on a daily basis. Football, hockey, badminton, and tennis are mainly followed and played. Out of these cricket holds the majority share, both in terms of a man following and playing numbers. People in India absolutely love the gentleman's game and it is the most cherished sport in the country.

From kids playing it in the streets to the oldies having the fun of it at their home, cricket has grown to be a widely popular sport in India. People from all race, religion, caste, creed, color, and gender love to play cricket in India. The India National Cricket Team has brought a lot of laurels in the world in recent years and this is one of the key reasons behind the sports' popularity in the country. Today, we'll take a look as to why cricket has gained so much popularity in India and why people go bonkers behind the sport in the country. A numerous of questions in our minds why cricket is the most famous, popular and followed sport in India? Here was described various factors.

## KEEP IT SIMPLE SILLY

To play the game, you just need a bat and a ball and a minimum of two players can easily play the game. It can be played even in the smallest of smallest dimensions, like a road, a street ally or even in a room. Reality check, in India, the sport is so

horribly popular among kids that they frequently play "gully cricket" even in most congested streets.

## BETTER INFRASTRUCTURE

Compared to other sports, cricket has more number of coaching centers in the entire country. This factor is hugely responsible for drawing more and more young children, who aspire to be future cricketers. Similarly, almost in each and every state, there is at least one world-class stadium present whereas if we take a peek into football and hockey, there are only a few FIFA accredited stadiums and genuine astro turfs, respectively, present in India. This important factor also contributes to the increased participation and popularity of the sport.

## VICTORIES AT MAJOR ICC TOURNAMENTS

India till now has won two ICC ODI World Cups, two Champions Trophies, one T20 World Cup. Moreover, with years India's performance in the cricketing arena has improved remarkably which undoubtedly makes India a reckoning force in today's cricketing fraternity. On the other hand, India used to excel in the game of hockey once but the country's performance in the sport has dwindled gradually. If we talk about football, India could never really make any mark in the world of football. The current FIFA ranking of India is 156 out of the 208 FIFA accredited nations which are more than enough to signify the poor state of Indian soccer. India's cricketing brand value is a huge reason for attracting a huge number of fans.

## PHYSICAL QUOTIENT OR PHYSICAL ATTRIBUTES

A major reason why Indians are unable to compete with other countries in sports such as football, hockey, athletics, or tennis

### Address for correspondence:

Ch. S. R. Naveen Kumar,

E-mail: naveensportsiit@gmail.com

is that we are not gifted with significant physical strength, good height, and substantial match fitness. The obvious reason behind this is the genetics which ultimately makes a big difference in these sports which are physically grueling. Our cricketers have more than enough strength and fitness in the body which enables them to play cricket at its highest level.

## **EMERGENCE OF WORLD-CLASS CRICKETERS OVER THE YEARS**

India over the years has produced a bunch of world-class cricketing legends who at some point or the other have taken the cricketing world by storm. Batsmen, bowlers, all-rounders, captains consisting the likes of Kapil Dev, Sachin Tendulkar, Virender Sehwag Mahendra Singh Dhoni, Sourav Gangly, Yuvraj Singh, and Virat Kohli to name a few. Their pictures and posters are pasted over walls and are idolized by numerous boys and girls. Each of them is alone enough to inspire millions to join the game.

## **A STRONG GOVERNING BODY**

Cricket in India is governed by BCCI, which is an efficient, rich, well-organized, and systematic council. The BCCI, over the years, has taken several constructive steps to protect and prosper the cricketing interests of India. It has been highly successful in establishing itself as a dominant body in the world. On the other hand, the governing bodies such as AIFF, HI, and IHF are highly disorganized and unmethodical when comes to functioning, and are often busy dealing with internal hassles. Their financial structures are also petty weak if compared to the BCCI. A strong backing helped it to emerge as the most popular sport in the country.

## **MONEY MATTERS**

Money and cricket have almost become synonymous. Cricketers in India have always been the richer breed of sportsmen compared to their peers. Be it the salary, prize money, or government initiatives. The cricketers have always been ahead in the money race. With the advent of IPL, it was just another opportunity for them to get even richer. By virtue of being rich, the players can afford to have a better lifestyle, rather a lavish and posh one. This, unfortunately, has not been the case with the players, involved with other sports in India. Money is the most important requirement in any individual's life. Hence, whenever a career choice in sports is in question, it climbs automatically toward the sport.

## **SPONSORS AND ADVERTISEMENTS**

Cricket is that sport in India which always has attracted a wide range of sponsors and advertisements as it's the most viewed

game. Even the players have made fortunes for themselves by endorsing several products and appearing in numerous commercials. Ever wondered why this happens in cricket and not in any other sport? A subtle thing it is, the few seconds break which is obtained repeatedly in between the starting and ending of overs or when a wicket falls, our television screens are flooded with heaps of advertisements. This period of discontinuity is not available in football or hockey or any other sport as they are continuative in nature. Thus, companies run after the sport and the people involved in the sport so that they can use those few seconds for publicity and ready to pay any amount of money for that!

## **EMERGENCE OF IPL FACTOR**

In 2008, when Lalit Modi first introduced this T20 extravaganza, it instantly became a huge sensation. Since then, IPL has proved to be a game changer as well as a great money-spinner in the sporting history of the country. All the best players from the world assembled in India to play this elite competition. Moreover, it gave the platform to relatively unknown players to become a hero. Moreover, the amount of money and glamour involved in the competition would draw any budding players toward itself. The IPL has amplified the popularity of the sport to a gigantic level amongst the Indians as for now every budding player wants to be a part of the greatest show on earth. Although now, we have several parallel leagues like ISL, Hero Indian Hockey League, and Indian Badminton League and so on, they are nowhere near the fame or popularity of IPL.

## **CRICKET IS AN EASY AND FUN SPORT**

Sure that, there are rules and regulations, just like any other sport. Those are necessary to make sure everyone is playing the same game and that there's no confusion as to how to play it. However, it does not take long to learn those rules. Once upon a time, kids were forced to play by exactly the same rules as adults. This quickly led to boredom and losing interest in the game.

## **Recommendations for Others Sports Most Famous, Popular, and Followed in India**

- Sports and physical education make an integral part of school main curriculum with minimum number of physical education teachers/sports periods per week.
- In school, college, and university level, physical education must be treated as curricular subject not cocurricular subject/extracurricular subject.
- Provide basic infrastructures to every schools, colleges, and universities.
- Once sports becomes a part of school main curriculum, gifted, and talented students can pursue dual pathway (academics and sports) which may make it necessary

having basic infrastructure and coaching facilities at school, college university level as well.

- System for talent identification and development with long-term athlete development program.
- Increase and setting up of sports schools and regional academies.
- Increase incentives for sportspersons.
- Community coaching development.
- Strengthen the governing bodies and amateurs.
- Avoid political influence and transparent manner of selection of teams.
- Put qualified professionals in federation posts instead of honorary members.
- Graduating sports sector as an industry.
- Regulation of sports sector education program.
- Monetary assistance to the sports based firms.
- Provide land and invest in sports infrastructure through PPP model.
- Increase funds and tax holidays for sports-based firms.
- Giving a boost to R and D in the sports sector.
- Advertise and broadcast more sports.
- Strengthen the structured competition.
- Tie-ups with foreign bodies who have a vested interest in developing the sport.

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## Research Article

# A study of self-concept and locus of control on cricket personality

Mahamad Mosin Ahmed<sup>1</sup>, H.S. Jange<sup>2</sup>

<sup>1</sup>Research Scholar, Department of Physical Education, Gulbarga University, Kalaburagi, Karnataka, India, <sup>2</sup>Research Guide/ Co-ordinator, Department of Physical Education, Gulbarga University, Kalaburagi, Karnataka, India

### ABSTRACT

In the light of the factual knowledge, sports have not to be viewed as a mere part-time but as extremely complex behavioral issues, genetic endowment, generally good environment, and the lightly specialized training go to make an individual athletes or players of some reckoning. This is the reason why psychological aspects of sports or “sport psychology” have become such a challenging and interesting field of study and research.

### INTRODUCTION

“Personality” as the term is used outside of psychology classrooms and books, includes a person’s physical appearance, but that is probably not an essential part of its meaning since we can readily imagine that a person could be transformed into an entirely different physical form and still maintain all of the essential characteristics which distinguish him or her from others.

When we refer to person as “having personality,” we usually mean that he has a kind of social charm or attractiveness. We like what we see. Actually, however, when personality is discussed by the social scientists, they are thinking of it as a fairly stable group of characteristics, which determine our reactions to situations, and thus our behavior.

### METHODOLOGY

Keeping major objectives of the study in view, appropriate design was adopted. The study was conducted on 400 cricket players selected from different zonal tournaments and South Zone Interuniversity Cricket Tournament. The criterion of selection was participation in sports at two levels. The distribution of sample is given in Table 1.

The sample so selected was administered with the personality inventory and the other psychosocial scales such as self-concept, locus of control, aggression, and social support. This is done to examine the difference between the sample subgroups on psychosocial factors, and subsequently, the sample was categorized based on the scores on psychosocial factors to assess influence of independent factors on the cricket performance of the respondents. Because the sports performance is believed to be influenced by the psychosocial factors of the participants, besides personality factors. Since the study attempt to assess the influence of psychological factors on sports performance of the sample, the psychological factors such as self-concept (SC), locus of control (LOC), and aggression, and social factor like social support (SS) were treated as independent variables that are believed to affect performance of sportspersons.

### Objectives of the Study

The objectives of the study were as follows:

1. To study the personality profile of cricket players.
2. To study psychological factors of sample subgroups of age and level of sports participations.
3. To study the influence of self-concept on performance of cricket players.
4. To study the influence of locus of control on sports performance of players.
5. To study the influence of aggression on sports performance.

### Hypothesis

1. There is a significant difference in the personality factors among different sample subgroups of cricket players.

Address for correspondence:

**Table 1: Distribution of sample**

Level	Age Group-I (18–21)	Age Group-II (22–25)	Total
Intercollegiate	50	50	100
University	50	50	100
Total	100	100	200

**Table 2: Mean, SD, and t-values of self-concept in two age groups (n=200)**

Age	High SC	Low SC	t-value
Age Group 1 Lower age			
Mean	85.2	36.0	21.41*
SD	19.3	11.2	
n	55	45	
Age Group 2 (higher)			
Mean	108.4	39.25	25.61**
SD	24.1	10.2	
n	45	55	
t-value	7.48**	2.20**	

\*\*Significant at 0.01 level

- There would be significant differences in psychosocial factors between the two sample subgroups of age and levels of sports participation.
- There is a significant influence of self-concept on sports performance.
- There is an influence of locus of control on sports performance.
- There is an influence of aggression on sports performance.

## RESULTS

The mean, SD, and t-values of self-concept in two age groups presented in Table 2. It can be noticed that the respondents of age Group-2 have scored a mean of 108.40 in high self-concept while the age Group 1 has scored a mean 85.20. t-value is 7.48 which is significant 0.01 level. In low self-concept, the age Group-1 has scored lower means 36.0 than Group-2 78.5. t-value of 2.20 is significant at 0.05 level.

Table 3 presents the data of two age group respondents in respect of locus of control – a psychological variable. Again, both age groups (200) are divided into two categories – internal and external of locus of control. As per the norms of the LOC scale (Roma and Pal 1985), one who score above 35 is categorized as belonging to external LOC while one who scores below 35 is considered to be of internal LOC. Accordingly, there are 40 higher age respondents with internal LOC and 60 with external LOC while there are 60 players of lower age with internal LOC and 80 with external LOC.

**Table 3: Mean, SD, and t-values of locus of control in two age groups (n=200)**

Age	Internal LOC	External LOC	t-value
Age Group 2			
Mean	38.90	30.90	5.40**
SD	11.24	8.75	
n	40	60	
Age Group 1			
Mean	35.12	28.72	4.47**
SD	10.9	9.27	
n	60	40	
t-value	2.36**	1.67**	

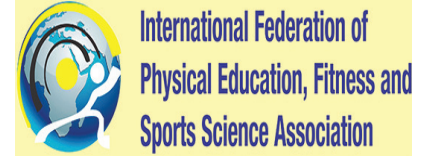
Significant at 0.01 level

## CONCLUSIONS

- The university level players have significantly higher self-concept than those of collegiate level.
- The university level respondents are found to have possessed more internal LOC than their counterparts.
- The respondents of age Group-2 (seniors) have significantly higher self-concept than their counterparts.
- There are significant differences in locus of control between two sample subgroups of age seniors which have more internal locus of control than juniors.
- The significance difference was found in all the personality factors between two age groups senior cricketers are outgoing, concrete thinking, dominant, enthusiastic, tough minded, practical, conscientious, venturesome, emotionally stable and experimenting than the lower age players juniors are reserved, more intelligent, humble, sober, expedient, shy, conservative, tender minded, and imaginative.

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## Research Article

# Significant study on anxiety among men and women kabaddi players of Krishna district

Sreedevi Nalivelugula<sup>1</sup>, N. Vijay Mohan<sup>2</sup>

<sup>1</sup>Assistant Professor, Mandava Institute of Engineering and Technology, Jaggaiahpet, Andhra Pradesh, India, <sup>2</sup>Director, Department of Physical Education, Andhra University, Visakhapatnam, Andhra Pradesh, India

### ABSTRACT

The purpose of the study was to find out the anxiety differentials between men and women kabaddi players of Krishna district. To achieve this purpose, 20 men intercollegiate kabaddi players and 20 women intercollegiate kabaddi players were selected from intercollegiate tournament at age limit of subject which were 18–22 years. Sports competition anxiety test (scat) questionnaire prepared by Rainer martens was used in the study. This questionnaire of a series of 15 statement in which the individual must respond by answering either “hardly ever” or “sometimes” or “often” which includes 5 spurious items, 8 positive items, and 2 negative items. After the test, it is concluded that there was slight significant different between the men and women kabaddi players anxiety level.

### INTRODUCTION

Psychology is an academic and applied field involving the study of the human mind, brain, and behavior. Psychology also refers to the application of such knowledge to various spheres of human activity, including problems of individuals' daily lives and the treatment of mental illness.

Psychology differs from anthropology, economics, political science, and sociology in seeking to capture explanatory generalizations about the mental function and overt behavior of individuals, while the other disciplines rely more heavily on field studies and historical methods for extracting descriptive generalizations. In practice, however, there is quite a lot of cross-fertilization that takes place among the various fields. Psychology differs from biology and in that it is primarily concerned with the interaction of mental processes and behavior, and of the overall processes of a system, and not simply the biological or neural processes themselves, though the subfield neuropsychology combines the study of the actual neural processes with the study of the mental effects they have subjectively produced.

### ANXIETY

Anxiety is a normal and often healthy emotion. However, when a person regularly feels disproportionate levels of anxiety, it might become a medical disorder. Anxiety disorders form a category of mental health diagnoses that lead to excessive nervousness, fear, apprehension, and worry. Anxiety plays an important role acquisition of motor skill as well as anxiety can either enhance or inhibit performance. Anxiety is considered a psychological manifestation involving all dimensions of athletes such as physiological behavior and psychological processes. A moderate level of anxiety sums best for the acquisition and performance of motor skill level of anxiety either too high or too low tend or inhibit learning and performance “anxiety is uneasiness and feeling of foreboding is after when a person is about embarking or hazardous ventured it is after accompanied by a strong drive to excel.” Marten (1977) defines competitive trait anxiety as tendency to perceive situation and respond with feeling of apprehension or tension or, on the other hand, the anxiety reaction triggered by a particular competitive situation is called competitive state anxiety.

### SIGNIFICANCE OF STUDY

The significant of the study lies in the fact that if the anxiety differentials of men and women kabaddi players is determined

#### Address for correspondence:

Sreedevi Nalivelugula,

E-mail: nalivelugulasreedevi@gmail.com

**Table 1: The comparisons of anxiety between men and women kabaddi players**

Group	Mean	SD	MD	"t" ratio	Sig.
Men	17.7	2.85	0.1	0.14	2.00
Women	16.2	3.32			

statistically, than the trainers and coaches in the field of physical education and sports would be benefited to a great extent by giving some relaxation training to players to minimize the anxiety level, if it would affect the performance. The different anxiety scores would help the coaches the players on the basis of level of anxiety.

### Objective of the Study

The purpose of the study was to find out the anxiety differentials between men and women kabaddi players of Krishna district.

### Hypothesis

There may not be any significant difference between men and women kabaddi players of Krishna district in relation to anxiety level.

## METHODS AND MATERIALS

To achieve this purpose, 20 men intercollegiate kabaddi players and 20 women intercollegiate kabaddi players were selected from intercollegiate tournament at age limit of subject which were 18–22 years.

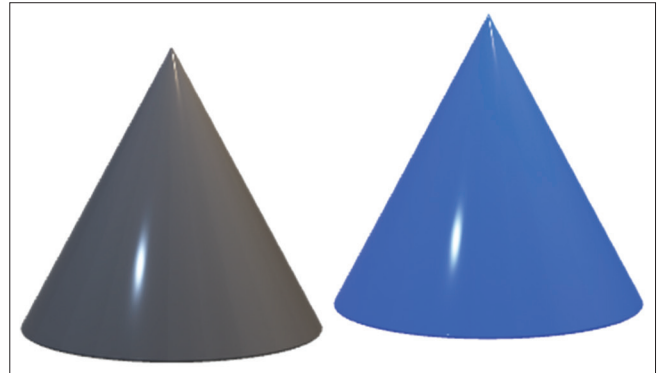
### TOOLS USED

Sports competition anxiety test (scat) questionnaire prepared by Rainer martens was used in the study. This questionnaire of a series of 15 statement in which the individual must respond by answering either "hardly ever" or "sometimes" or "often" which includes 5 spurious items, 8 positive items, and 2 negative items.

## RESULTS AND DISCUSSION

The present study consists of variables (independent variable) that are men and women kabaddi players. Anxiety was selected as (dependent variable) for this study. The results obtained were given statistical treatment using "t;" the obtained results are presented in Table 1.

Table 1 shows that the obtained "t" ratio for anxiety for anxiety level between the individual sports and team sports was 0.14. It was lesser than required Table 2.00, which



**Graph 1:** Comparison of anxiety between men and women kabaddi players

has found to be insignificant. Hence, the hypothesis was rejected.

## CONCLUSION

The advanced sports and games techniques have greatly influenced the psychological skills of the standard of players. In the present scenario, the sports psychology has been playing a significant role in the creeping performance of the games. By and large, the players exposed at higher levels of competition need to be fit physically, mentally, and technically so that the standards of the big muscle power game will remain at its best all the time at international level. It is conducted that there was slight significant different between the men and women kabaddi players anxiety level.

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## Research Article

# Effect of plyometric training and combined with skill training on performance parameters of intercollegiate male volleyball players of Hyderabad district

Hari Naik Devasoth

Indian Council of Social Science Research-Post Doctoral Research Fellow, Aruna Asaf Ali Marg, New Delhi, India

## INTRODUCTION

### Volleyball

Volleyball is a team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules. It has been a part of the official program of the Summer Olympic Games since 1964. The complete rules are extensive, but simply, play proceeds as follows: A player on one of the teams begins a "rally" by serving the ball (tossing or releasing it and then hitting it with a hand or arm), from behind the back boundary line of the court, over the net, and into the receiving team's court. The receiving team must not let the ball be grounded within their court. The team may touch the ball up to 3 times but individual players may not touch the ball twice consecutively. Typically, the first two touches are used to set up for an attack, an attempt to direct the ball back over the net in such a way that the serving team is unable to prevent it from being grounded in their court.

### Plyometric Training (PT)

Plyometric exercise is especially useful in sports that require speed strength (Lundin, PA 1989; Matveyev, 1983). Speed strength is the ability to exert maximal force during high speed movements. Sports that require speed strength include, throwing, and sprinting; volleyball, baseball, football, and basketball.

### Statement of the Problem

The purpose of the study is to find out the effect of PT and combined with skill training (ST) on performance parameters of intercollegiate male volleyball players of Hyderabad District.

#### Address for correspondence:

Hari Naik Devasoth,  
E-mail: hari2sports.ou@gmail.com

### Objectives of the Study

- The first objectives of the study are to assess the effect of PT on performance parameters of intercollegiate male volleyball players of Hyderabad District
- The second objectives of the study are to assess the effect of PT and combined with ST on performance parameters of intercollegiate male volleyball players
- The third objectives of the study are to assess the superiority effect of PT and combined with ST on performance parameters of intercollegiate male volleyball players.

### Hypotheses

1. It is hypothesized that effect of PT may produce significant improvement on performance parameters of intercollegiate male volleyball players
2. It is hypothesized that effect of PT and combined with ST may produce significant improvement on performance parameters of intercollegiate male volleyball players
3. It is hypothesized that effect of PT may produce significant improvement on performance parameters better than PT and combined with ST of intercollegiate male volleyball players.

### Significance of the Study

The study will be helpful to find out the suitable training needed for the development of selected performance parameters of intercollegiate male volleyball players.

The study may help the physical educators, coaches and the players as they would be able to scientifically understand and assess the changes in the performance parameters due to selected training programs.

### Delimitations

The study is delimited as follows

1. The study will be confined to 45 intercollegiate male volleyball players from affiliated colleges of Osmania University, Hyderabad, Telangana state

2. The age of the subject will be 20–24 years
3. The duration of the training intervention delimited to 3 days per week of 12 weeks.

Further study is delimited to performance variables as dependent variables and training combined with ST delimited as independent variables.

### Limitations

Certain factors such as food habit, life style, daily routine work, climatic conditions, and environmental factors, which may have an effect on the result of this study, will not be taken into consideration while interpreting the result.

### Operational Terminologies Definition of Terms

#### Training

It is a program of exercise designed to improve the skills and increase the energy capacity of an athlete for a particular spot or event (Fox 1984).

#### PT

PT refers to exercise that enable a muscle to reach maximal strength in a short time as possible (Gambetta 1988).

#### ST

The ST means, the skills was direct linked with game and playing situations.

#### Explosive Power

Explosive power is the ability of a muscle or a group of muscles to release maximum force in the shortest possible time, in an explosive manner, projecting the body or an object (Clarke, 1976).

#### Anaerobic Power

Anaerobic power is energy that is stored in muscles and that can be accessed without the use of oxygen. (C.b. fox 2013).

## METHODS AND TOOLS

### Selection of Subjects

To execute this investigation, the research scholar will randomly select 45 intercollegiate male volley ball players from affiliated colleges of Osmania University, Hyderabad, and Telangana state. The subjects will be divided randomly, into four equal group's, namely, experimental Groups 1, 2 and control group.

### Experimental Designs

The study is formulated as pre- and post-test random group design, in which select 45 intercollegiate male volley ball players are dividing into three equal groups. The experimental Group 1 ( $n = 20$ , PT) design to isolated PT, the experimental Group 2 ( $n = 20$ , PT-ST) design to combined plyometric and ST, and the Group 3 serve as ( $n = 20$ , CG) control condition.

### Selection of Variables

Based on the relevant literature reviewed and in accordance with views of professional experts in physical education and the personnel understanding of the researcher following variables are selected.

#### Independent variables

1. PT
2. Combined PT-ST.

#### Dependent variables

1. Explosive power
2. Anaerobic power
3. Reaction time
4. Service test
5. Volley test.

The investigator reviewed the available scientific literature pertaining to three PT combined with ST of volley ball players from books, journals, periodicals, and research articles. Restoring from the review of literature and discussion with the expect and considering the feasibility criteria of the study and the relevance of the variables of the present study the following variables were selected as criterion variables which was more involved in the game of volley ball.

Selection of test and criterion measures		
Variables	Test	Unit of measurement
Leg explosive power	Vertical jump	Centimeters
Anaerobic power	Margaria-kalaman step test	Watts
Reaction time	Reaction timer	s
Service test	Volleyball playing ability	reputation
Volley test	Russel-lange test	Skill test/mints

### Training Approaches for the Proposed Study

The selected intercollegiate male volleyball players are 20–24 years old. They are participating intercollegiate volley ball tournament. The subjects possess the basic fitness qualities. The subject is less knowledge about the slected training concept and along with ST. Hence, the investigator decided to introduce this training protocol to enhancing better performance. The total duration of the training intervention is 12 weeks, for 3 alternative days in a week.

### Statistical Application

In the present study, random group design will be used. The one-way analysis of covariance will be applied to find out the adjusted post-test mean difference if any among the selected groups. To observe the paired mean difference the effects

*post hoc* will be used. The level of significance is fixed at 0.05 levels to test the hypothesis.

### CONCLUSION

In the present study, random group design will be used. The one-way analysis of covariance will be applied to find out the adjusted post-test mean difference if any among the selected groups. To observe the paired mean difference the effects *post hoc* will be used. The level of significance is fixed at 0.05 levels to test the hypothesis.

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## Research Article

# Comparison of speed among bowlers and batsman of Gulbarga University cricket players

Basavaraj Siddappa Singe<sup>1</sup>, H. S. Jange<sup>2</sup>

<sup>1</sup>Research Scholar, Department of Physical Education, Gulbarga University, Gulbarga, Karnataka, India, <sup>2</sup>Chairman and Co-ordinator, Department of Physical Education, Gulbarga University, Gulbarga, Karnataka, India

### ABSTRACT

The purpose of the present study was to find out the speed among bowlers and batsman of Gulbarga University Cricketers in India. The sample for the present study consists of 20 male bowlers and 20 male Batsman of Gulbarga University Cricket Players. To assess the speed, the 50 M Run Test was conducted among bowlers and Batsman. It was found that bowlers are having good speed compare to compare to the Batsman. Hence, it is also concluded that bowlers required more speed compared to batsman. It is recommended the speed training must be given to bowlers and batsman in cricket.

**Keywords:** Batsman, Bowlers, Cricket

### INTRODUCTION

Cricket is a bat-and-ball game played between two teams of 11 players each on a field at the center of which is a rectangular 22-yard long pitch. The game is played by 120 million players in many countries, making it the world's second most popular sport. Each team takes its turn to bat, attempting to score runs, while the other team fields. Each turn is known as an innings. The bowler delivers the ball to the batsman who attempts to hit the ball with his bat away from the fielders so he can run to the other end of the pitch and score a run. Each batsman continues batting until he is out. The batting team continues batting until ten batsmen are out, or a specified number of overs of six balls have been bowled, at which point the teams switch roles and the fielding team comes in to bat.

From a T20 game that is played for 3 h to an International Test Match that stretches to 5 days, the game of cricket requires a high level of fitness for a professional player to perform effectively. Every cricketer needs to undergo a specific proper strength, speed, and conditioning program. For example, a batsman may damage his tennis elbow if he pulls a shot too quickly or twists his arm suddenly. Similarly, a bowler may risk

ligament tear or ankle damage if he twists his leg. A strength conditioning program helps the body to adapt quickly to sudden movements in the sport and reduces chances of bodily damage.

In addition to the high level of skill required to play cricket, a successful player needs good balance and core strength, speed for running between the wickets and in the field, and fast bowlers particularly need very good speed and power. Polls we have run on this site about the fitness requirements for cricket, have determined balance, coordination, and speed to be most important.

Motor components required for cricketers

1. Speed/quickness, balance and coordination
2. Motivation and self-confidence, skill, and technique
3. Strength and power, reaction time
4. Analytic and tactical ability, flexibility, and agility.

Sandeep Sangwan and Tejpal (2018) investigate the Reaction Time among Bowlers, Batsman and Wicket Keepers in Cricket who participated at inter-university and national level in Haryana state. For accomplish the study 20 male batsman, 20 male bowlers and 20 male wicket keepers were randomly selected as sample. The age of all samples was ranged 18–28 years. Male sports persons who participate at inter-university level and national level were randomly selected as samples. To accomplish the study reaction time test was used in the

#### Address for correspondence:

Basavaraj Siddappa Singe,  
E-mail: singe.basavaraj85@gmail.com



**Table 1: Mean values and independent samples test of 50 M run between bowlers and batsmen in cricket**

Variables	Group	Mean	SD	<i>t</i>	<i>P</i> -value
50 M Run	Bowlers	7.10	0.261	4.57	0.000
	Batsman	7.61	0.409		

\*Significant at 0.05 level

study. All samples were selected from the Haryana state. The obtained data were analyzed by applying one-way analysis of variance. The level of significance was set at 0.05. A significant difference was found between bowlers, batsman, and wicket keepers in their reaction time. Wicket keepers are having more reaction time in comparison of bowlers and batsman.

## METHODOLOGY

The sample for the present study consists of 20 male bowlers and 20 male Batsman those who have attended the Gulbarga Cy Years. To assess the speed the 50 M Run was conducted among bowlers and batsman.

## RESULTS

This study shows that bowlers are having better speed compare to the Batsman in 50 M run.

In Table 1, the mean values of 50 M Run of bowlers are 7.10 and Batsman is 7.61 The average mean of bowlers in 50 M Run is lesser than the batsman.

In Cricket bowlers require speed to do fast bowling. It was found that bowlers are having good speed compare to compare to the batsman. Hence, it is also concluded that speed of running is very important bowling for bowlers.

## CONCLUSION

1. It is concluded that bowlers are having better speed than batsman
2. Conditioning exercises plays a major role for improvement of speed among cricketers
3. Sprint training is not all about running fast. It is important to have a good fitness base to build speed on, and to have the capacity to train regularly.

## Recommendations

1. Similar studies can be conducted on other events and among females
2. This study also helps the physical educators and coaches to improve their training regime to excel in cricketers.

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## Research Article

# Effect of circuit training for development of endurance among football players of Bidar District

Ravi Nayak

Physical Director, First Grade College, Bidar, Karnataka, India

### ABSTRACT

Circuit training is specifically designed to make the entire body improvement especially strength, speed, mobility, speed endurance, etc. The purpose of the present study was to find out the effect of circuit training for the development of endurance among football players of Bidar district. The sample for the present study consists of 20 male football players of Bidar district of which ten are experimental group and ten are controlled group. Circuit training was given to experimental group on alternate days, that is, three sessions per week and controlled group were given the general training for 6 weeks. Pre-test and post-test were conducted in 12 min Run Cooper Test to measure the endurance among experimental group and controlled group. This study shows that due to the circuit training there is an improvement of experimental group in endurance and controlled group is decreased in performance of endurance.

**Keywords:** Circuit training, Football players, Speed, Stride length etc

### INTRODUCTION

Circuit training is a form of body conditioning or resistance training using high-intensity aerobics. It targets strength building or muscular endurance. An exercise “circuit” is one completion of all prescribed exercises in the program. When one circuit is complete, one begins the first exercise again for the next circuit. Conventionally, the time between exercises in circuit training is short, often with rapid movement to the next exercise. The program was developed by Morgan and Adamson in 1957 at the University of Leeds in England.

Endurance is a conditional ability. It is primarily determined by energy liberation process. Endurance is directly or indirectly of high importance in all sports. Endurance is the ability to do sports movements, with the desired quality and speed, under conditions of fatigue. Endurance is a very important ability in sports. In sports, endurance ensures optimum speed of motor actions. Good endurance also ensures high quality or skill of movement execution which finds expression in accuracy, precision, rhythm, consistency,

etc. Endurance training results in the improvement of functioning of various organs and systems of the human body. This, in turn, improves the ability to recover quickly from training and competition load. The importance of endurance for recovery assumes much more relevance during completion, that is, in between heats, rounds, and matches on successive days. Endurance performances are of different nature indifferent sports. Endurance activities have been found to be of high value for maintenance of good organic health, for increasing the general resistance against infection and for cure and treatment of various diseases and metabolic disorder.

### Previous Studies

Markovic (2007) published in the British Journal of Sports Medicine has justify the application of plyometric training for the purpose of development of vertical jump performance in healthy individuals.

Jayaraman (2011) Asian Journal of Physical Education and Computer Science in sports- Vol.5- Effect of weight training and fartlek training on selected physiological variables among college men students: His studies there is a significant improvement of physiological variables due to weight training.

**Address for correspondence:**  
Ravi Nayak,  
E-mail: ravinayakgr@gmail.com

Days	Exercises	Repetitions and sets
Monday	Circuit training with continuous method Pushups, sit ups, high knee action running, dumb bell exercises, back arches, half squat with medicine ball, money walk, sit ups, heel raising, front press with weight, dumbbell side ward bend, half squat jumps	Continuous method 3–4 Sets (No recovery) Each exercises 30 s. followed by another exercises immediately
Wednesday	Circuit training with interval method Medicine ball catching and throwing up and down , sit ups, shuttle runs, back press with weights, half squat with medicine ball, pushups, sit ups, heel raising, bicep cups with weight, dumbbell side ward bend, lunge	Interval method 1 Min S. exercises 30 S. Rest
Friday	Circuit training with continuous method Pushups, sit ups, high knee action running, dumbbell exercises, situps, half squat with medicine ball, push-ups, bridge, heel raising, front press with weight, dumbbell side ward bend, burpee	Continous method 3–4 Sets (No recovery) Each exercises 30 S. followed by another exercises immediately

**Table 1: Paired samples statistics of experimental group and control group of football players in pre test and post test in 12 Min run cooper test**

12 Min run cooper test	Mean	Std. deviation	Std. error mean	n
Experimental				
Pre-test	2368.00	90.468	28.608	10
Post-test	2440.40	93.223	29.480	10
Control group				
Pre-test	2347.50	74.470	23.550	10
Post-test	2340.00	76.992	24.347	10

Al Moslim Hasan (2014) Journal of Physical Education and Sport – Effect of combined plyometric and weight training on speed of male students with different body fat combined plyometric and resistance training has positive effects on fitness variables such as speed Ronnestad *et al.* 2008, Rahimi *et al.* 2006, De Villareal *et al.* 2011 etc

## METHODOLOGY

The purpose of the present study was to find out the effect of circuit training exercises for the development of endurance among men football players. The sample for the present study consists of 20 male football players which practices at Bidar district stadium, of which ten are experimental group and ten are controlled group. Circuit training was given to experimental group on alternate days, that is, three sessions per week and controlled group were given the general training for 6 weeks. Pre-test and post-test were conducted in 12 Min Cooper Test to measure the endurance among experimental group and controlled group.

## RESULTS AND DISCUSSION

This result of the study shows that due to the circuit training there is an improvement of experimental group in the endurance and controlled group is decreased in performance in speed due to the general training.

The experimental group of 12 Min Run Pre Test is 2368.00 and controlled group mean is 2347.40 in pre-test. The experimental group mean is 2.440.40 in post-test and controlled group mean is 2340.00. Hence, there is an improvement in the experimental group from pre-test to post-test.

## CONCLUSION

The aim is to build some strength, both in your limbs and also your trunk, which will allow for the maintenance of speed when you are tired and also the power for running at the high pace often involved in races. A large part of the strength required can be attained from circuit training. A range of press ups, abdominal curls, tricep dips, back arches, etc., will provide a good base of strength and strength endurance. Circuit training is very essential for development of endurance.

## Recommendations

Similar studies can be conducted on other sports and games. The circuit training program is useful for developing the motor quality of the sports persons.

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## Review Article

# Computers and technology for sports management

Saipramod Yerra

Institute of Aeronautical Engineering, Dundigal, Hyderabad, India

## INTRODUCTION

Computer science in sport is an interdisciplinary discipline that has its goal in combining the theoretical as well as practical aspects and methods of the areas of informatics and sport science. The main emphasis of the interdisciplinary is placed on the application and use of computer-based but also mathematical techniques in sport science, aiming in this way at the support and advancement of theory and practice in sports. Computers have revolutionized the sports industry. Sports teams and other organizations use computers to track scores, maintain player records, create virtual playing fields, and model new sports techniques and methods. The reason why computer science has become an important partner for sport science is mainly connected with “the fact that the use of data and media, the design of models, the analysis of systems, etc., increasingly requires the support of suitable tools and concepts which are developed and available in computer science.” Sports equipment manufacturers use computers to design and test new equipment. Even if you don’t participate in sports yourself, you may have used your computer to buy tickets to sporting events, check out sports schedules, or chat with other sports fans about the latest game.

## COMPUTERS IN DIFFERENT SPORTS

Athletes who depend on speed to win will stop at nothing to reduce their times. Some Olympic swimmers wear full-body “skinsuits” so they can glide through the water more easily. Hence, it should not be a surprise to hear that they use computer applications to improve their speeds. Coaches use a computer application to develop perfect swimming strokes. This simulation software attempts to copy the way water flows around parts of the swimmer’s body, such as the arms and hands. The swimmer’s goal is to move through the water as smoothly as possible. Water turbulence can slow a swimmer down. The application allows the user to change the positions of the

swimmer’s hands and arms. The user can then see how these changes affect the amount of water turbulence. This information is used to design the best swimming stroke. Coaches can then teach swimmers to use this stroke to obtain their greatest speed.

Simulation software has also been used to design racing yachts. It can help in determining how to shape the yacht’s hull so that it moves through the water with the least amount of resistance. A chip was strapped to each skier’s ankle. Electronic devices were buried in the snow along the track. When a skier passed over one of the devices, his or his chip sent information to the device. This information included the skier’s location, speed, and number. This information was sent to a central computer.

## DATA ANALYSIS

Computers are used to store and watch videos in sports. As there is a great need of videos in sports, because players watch other players playing styles from different angles to learn them through videos or they want to watch their own past performances in order remove drawbacks from them or they can watch live matches, etc. Computers are used in sports each and every day. It helps sports organizations to achieve their goals.

Statistical data are very important for sports. Team players, Coaches, Public all want to know the past performance of team players. Hence, computers can be used to record statistical data in different attractive ways.

### On the Cloud

The information available on sports teams’ Web sites is amazing. Some of it includes:

- Schedules. Game dates and locations are available
- Statistics. Up-to-the-minute information on teams and individual players is ready whenever you want it
- Team news. Web sites contain coach and player interviews, information on injuries, and so forth
- Ticket purchasing. Rather than stand in line, you can purchase your tickets at home. You can even look at a diagram of the stadium to see exactly where you will be seated

### Address for correspondence:

Saipramod Yerra,  
E-mail: saipramodme@gmail.com

- Online shopping. You can buy cricket bat, caps, ball, and many other items.

## COMPUTERS AND SPORTS TRAINING

Computers help gauge an athlete's performance during a specific training regimen. Trainers for sports teams can put a player's height; weight; and body model into a computer and develop a training program that best fits her needs. Trainers can also put sensors and equipment onto a player during training, allowing the computer to register results while the player trains.

## EQUIPMENT DEVELOPMENT

Safety is an important aspect in professional sports today. News stories are often released about the study of concussions on football and hockey athletes. To help minimize those injuries equipment developers have used computers to develop safer equipment. The same type of research is being done for such sports as hockey and auto racing to better improve the safety of the athletes.

The pro sports venues of today are managed by a large array of computers which will update player stats, out-of-town scores, graphic displays, and even weather forecasts in real time.

## CONCLUSION

It is hard to believe we ever managed without computers in the sports world; hence, you consider that nowadays we scrutinize

every nuance of an athlete's performance, and keep stats on practically everything. For the improvements they have made possible in players' performance, training; equipment, and sports medicine, computers are indeed invaluable to sports.

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## Research Article

# Development of six sigma scales (seven-point grading) of fitness level of female senior citizens

Dhananjay Shaw<sup>1</sup>, Syed Murtaza Hussain Andrabi<sup>2</sup>

<sup>1</sup>Indira Gandhi Institute of Physical Education and Sports Sciences, University of Delhi, New Delhi, India, <sup>2</sup>Department of Physical Education and Sports Sciences, University of Delhi, New Delhi, India

### ABSTRACT

A standard scale is a useful tool which can help in classification, assessment, and finding the relative standing of a person on a particular trait. This study aims to develop six sigma scales with seven-point grading for female senior citizens in regard to the senior fitness test. This study used the data of Rikli and Jones (1999) in which more than 5000 female senior citizens participated. Six sigma scales with seven-point grading for female senior citizens have been developed in regard to the test items, namely, chair stand test, arm curl test, 6 min walk test, 2 min step test, chair sit and reach test, back scratch test, 8 ft up and go test, and body mass index.

**Keyword:** Female senior citizens, Five-point grading, Six sigma scales, Senior fitness test

## INTRODUCTION

The fitness of senior citizens is increasingly becoming relevant as the independent living is seen parallel to graceful life. The senior fitness test introduced by Rikli and Jones (1999) is a measure of fitness for female senior citizens and is a valid test of functional fitness.<sup>[1]</sup> The senior fitness test assesses four key fitness components, namely, aerobic endurance, flexibility, muscular strength, and balance which determine the functional fitness of a person.<sup>[2]</sup>

The senior fitness test consists of eight test items, each of which produces score which gives an objective assessment of the various components of fitness in senior citizens.<sup>[3]</sup> However, the yielding results do not mean much unless they are compared to the norms of the test which will define the relative standing of a person on a particular test component.<sup>[4]</sup> Therefore, the norms become necessary in identifying how good or bad the scores are and make it easy to interpret the test results. Hence, the objective of the study was to develop a six sigma scales with seven-point grading in regard to the senior fitness test for female senior citizens.

Address for correspondence:

## ANALYSIS OF DATA AND SOURCE OF DATA

The data source<sup>[2]</sup> of this study was the work done by Rikli and Jones (1999) in which more than 5000 female subjects participated, thus providing a strong and reliable source of data for the normative standards. The mean and standard deviations of the test results were put in excel and the six sigma scales were produced using the method in the text.<sup>[5]</sup>

## SAMPLE DATA OF ONE PERSON FOR THE INTERPRETATION OF TEST RESULTS

According to Table 4, if person A having age of 84 years has a score of 31 on 2 min step test, then she will be considered as “Very Poor” because the score of 31 lies between 27 and 45 which is “Very Poor” category. If the same person has a score of 4.6 on chair sit and reach test, then she will be considered as “Good” because the score of 4.6 lies between 2.10 and 5.27 which is “Good” category (Table 5). Similarly, if the same person has a score of 4.87 on back scratch test, then she will be marked as “Very Good” because the score of 4.87 falls between 2.83 and 6.22 which is “Very Good” category (Table 6).

**Table 1: Seven-point six sigma scales of chair stand for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 2.5 to 5.9	From 5.91 to 9.34	From 9.35 to 12.78	From 12.79 to 16.22	From 16.23 to 19.66	From 19.67 to 23.1	From 23.11 to 26.5
	From 3 to 6	From 6 to 9	From 9 to 13	From 13 to 16	From 16 to 20	From 20 to 23	From 23 to 27
From 65 to 69	From 3 to 5.98	From 5.99 to 8.99	From 9.0 to 12	From 12.01 to 15.01	From 15.02 to 18.02	From 18.03 to 21.03	From 21.04 to 24
	From 3 to 6	From 6 to 9	From 9 to 12	From 12 to 15	From 15 to 18	From 18 to 21	From 21 to 24
From 70 to 74	From 2.1 to 5.34	From 5.35 to 8.23	From 8.24 to 11.36	From 11.37 to 14.45	From 14.46 to 17.54	From 17.55 to 20.47	From 20.48 to 23.7
	From 2 to 5	From 5 to 8	From 8 to 11	From 11 to 14	From 14 to 18	From 18 to 21	From 21 to 24
From 75 to 79	From 1.1 to 4.33	From 4.34 to 7.6	From 7.61 to 10.87	From 10.88 to 14.13	From 14.14 to 17.40	From 17.41 to 20.67	From 20.68 to 23.9
	From 1 to 4	From 4 to 8	From 8 to 11	From 11 to 14	From 14 to 17	From 17 to 21	From 21 to 24
From 80 to 84	<2.48	From 2.49 to 5.89	From 5.90 to 9.50	From 9.51 to 13.12	From 13.13 to 16.72	From 16.73 to 20.12	From 20.13 to 23.9
	<2	From 2 to 6	From 6 to 10	From 10 to 13	From 13 to 17	From 17 to 20	From 20 to 24
From 85 to 89	<1.7	From 1.71 to 5.14	From 5.15 to 8.58	From 8.59 to 12.02	From 12.03 to 15.46	From 15.47 to 18.9	From 18.91 to 22.3
	<2	From 2 to 5	From 5 to 9	From 9 to 12	From 12 to 15	From 15 to 19	From 19 to 22
From 90 to 94	-	<1.42	From 1.43 to 5.81	From 5.82 to 10.19	From 10.20 to 14.58	From 14.59 to 18.71	From 18.72 to 23.3
	-	<1	From 1 to 6	From 6 to 10	From 10 to 15	From 15 to 19	From 19 to 23

–: Data could not be scaled; scores have been rounded to two digits after decimals

**Table 2: Seven-point six sigma scales of arm curl test for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 2.5 to 5.9	From 6.0 to 9.34	From 9.35 to 12.78	From 12.79 to 16.22	From 16.23 to 19.66	From 19.67 to 23.1	From 23.2 to 26.5
	From 2 to 6	From 6 to 9	From 9 to 13	From 13 to 16	From 16 to 20	From 20 to 23	From 23 to 26
From 65 to 69	From 3 to 5.97	From 5.98 to 8.98	From 8.99 to 11.99	From 12.0 to 15.00	From 15.01 to 18.01	From 18.02 to 21.02	From 21.03 to 24
	From 3 to 6	From 6 to 9	From 9 to 12	From 12 to 15	From 15 to 18	From 18 to 21	From 21 to 24
From 70 to 74	From 2.1 to 5.34	From 5.35 to 8.26	From 8.27 to 11.35	From 11.36 to 14.45	From 14.46 to 17.54	From 17.55 to 20.46	From 20.47 to 23.7
	From 2 to 5	From 5 to 8	From 8 to 11	From 11 to 14	From 14 to 18	From 18 to 20	From 20 to 24
From 75 to 79	From 1.1 to 4.33	From 4.34 to 7.60	From 7.61 to 10.87	From 10.88 to 14.13	From 14.14 to 17.40	From 17.41 to 20.67	From 20.68 to 23.9
	From 1 to 4	From 4 to 8	From 8 to 11	From 11 to 14	From 14 to 17	From 17 to 21	From 21 to 24
From 80 to 84	<2.48	From 2.49 to 5.88	From 5.89 to 9.49	From 9.50 to 13.11	From 13.12 to 16.72	From 16.73 to 20.12	From 20.13 to 24.3

(Contd...)



**Table 2: (Continued)**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
	<2	From 2 to 6	From 6 to 9	From 9 to 13	From 13 to 17	From 17 to 20	From 20 to 24
From 85 to 89	<1.7	From 1.8 to 5.14	From 5.15 to 8.58	From 8.59 to 12.02	From 12.03 to 15.46	From 15.47 to 18.9	From 19.0 to 22.3
	<2	From 2 to 5	From 5 to 9	From 9 to 12	From 12 to 15	From 15 to 19	From 19 to 22
From 90 to 94	-	<1.42	From 1.43 to 5.81	From 5.82 to 10.19	From 10.20 to 14.58	From 14.59 to 18.71	From 18.72 to 23.3
	-	<1	From 1 to 6	From 6 to 10	From 10 to 15	From 15 to 19	From 19 to 23

–: Data could not be scaled; scores have been rounded to two digits after decimals

**Table 3: Seven-point six sigma scales of 6 min walk test for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 351 to 422.4	From 422.5 to 494.64	From 494.65 to 566.88	From 566.89 to 639.12	From 639.13 to 711.36	From 711.37 to 783.6	From 783.7 to 855
From 65 to 69	From 265 to 350.85	From 350.86 to 437.71	From 437.72 to 524.57	From 524.58 to 611.43	From 611.44 to 698.29	From 698.30 to 785.15	From 785.16 to 871
From 70 to 74	From 254 to 342.2	From 342.3 to 421.58	From 421.59 to 505.86	From 505.87 to 590.14	From 590.15 to 674.42	From 674.43 to 753.8	From 753.9 to 842
From 75 to 79	From 167 to 263.9	From 264.0 to 361.94	From 361.95 to 459.98	From 459.99 to 558.02	From 558.03 to 656.06	From 656.07 to 754.1	From 754.2 to 851
From 80 to 84	From 111 to 216.3	From 216.4 to 311.07	From 311.08 to 411.69	From 411.70 to 512.31	From 512.32 to 612.93	From 612.94 to 707.7	From 707.8 to 813
From 85 to 89	From 39 to 148.65	From 148.66 to 259.59	From 259.60 to 370.53	From 370.54 to 481.47	From 481.48 to 592.41	From 592.42 to 703.35	From 703.36 to 813
From 90 to 94	<92.4	From 92.5 to 194.46	From 194.47 to 302.82	From 302.83 to 411.18	From 411.19 to 519.54	From 519.55 to 621.6	From 621.7 to 7351

**Table 4: Seven-point six sigma scales of 2 min step test for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 19 to 39.4	From 39.5 to 60.04	From 60.05 to 80.68	From 80.69 to 101.32	From 101.33 to 121.96	From 121.97 to 142.6	From 142.7 to 163
	From 19 to 19	From 19 to 60	From 60 to 81	From 81 to 101	From 101 to 122	From 122 to 143	From 143 to 163
From 65 to 69	From 12 to 34.1	From 34.2 to 56.46	From 56.47 to 78.82	From 78.83 to 101.18	From 101.19 to 123.54	From 123.55 to 145.9	From 146.0 to 168
	From 12 to 34	From 34 to 56	From 56 to 79	From 79 to 101	From 101 to 124	From 124 to 146	From 146 to 168
From 70 to 74	From 9 to 31.5	From 31.6 to 51.75	From 51.76 to 73.25	From 73.26 to 94.75	From 94.76 to 116.25	From 116.26 to 136.5	From 136.6 to 159
	From 9 to 31	From 31 to 52	From 52 to 73	From 73 to 95	From 95 to 116	From 116 to 136	From 136 to 159
From 75 to 79	From 12 to 32.4	From 32.5 to 53.04	From 53.05 to 73.68	From 73.69 to 94.32	From 94.33 to 114.96	From 114.97 to 135.6	From 135.7 to 156
	From 12 to 32	From 32 to 53	From 53 to 74	From 74 to 94	From 94 to 115	From 115 to 136	From 136 to 156

(Contd...)

**Table 4: (Continued)**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 80 to 84	From 6 to 26.7	From 26.8 to 45.33	From 45.34 to 65.11	From 65.12 to 84.89	From 84.90 to 104.67	From 104.68 to 123.3	From 123.4 to 144
From 85 to 89	From 6 to 27	From 27 to 45	From 45 to 65	From 65 to 85	From 85 to 105	From 105 to 123	From 123 to 144
From 90 to 94	From 4 to 22.7	From 22.8 to 41.62	From 41.63 to 60.54	From 60.55 to 79.46	From 79.47 to 98.38	From 98.39 to 117.3	From 117.4 to 136
	From 4 to 23	From 23 to 42	From 42 to 61	From 61 to 79	From 79 to 98	From 98 to 117	From 117 to 136
	<13.9	From 14.0 to 30.91	From 30.92 to 48.97	From 48.98 to 67.03	From 67.04 to 85.09	From 85.10 to 102.1	From 102.2 to 121
	<14	From 14 to 31	From 31 to 49	From 49 to 67	From 67 to 85	From 85 to 102	From 102 to 121

Scores have been rounded to two digits after decimals

**Table 5: Seven-point six sigma scales of chair sit and reach for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From -9.9 to -6.5	From -6.4 to -3.06	From -3.05 to 0.38	From 0.39 to 3.82	From 3.83 to 7.26	From 7.27 to 10.7	From 10.8 to 14.1
From 65 to 69	From -8.8 to -5.74	From -5.73 to -2.64	From -2.63 to 0.45	From 0.46 to 3.55	From 3.56 to 6.64	From 6.65 to 9.74	From 9.75 to 12.8
From 70 to 74	From -9.7 to -6.37	From -6.36 to -3.37	From -3.36 to -0.19	From -0.18 to 2.99	From 3.00 to 6.17	From 6.18 to 9.17	From 9.18 to 12.5
From 75 to 79	From -10.2 to -6.97	From -6.96 to -3.70	From -3.69 to -0.43	From -0.42 to 2.83	From 2.84 to 6.10	From 6.11 to 9.37	From 9.38 to 12.6
From 80 to 84	From -10.6 to -7.27	From -7.26 to -4.27	From -4.26 to -1.09	From -1.08 to 2.09	From 2.10 to 5.27	From 5.26 to 8.27	From 8.28 to 11.6
From 85 to 89	From -11.2 to -8.05	From -8.04 to -4.87	From -4.86 to -1.69	From -1.68 to 1.49	From 1.50 to 4.67	From 4.68 to 7.85	From 7.86 to 11
From 90 to 94	From -13.7 to -10.1	From -10.1 to -6.86	From -6.85 to -3.42	From -3.41 to 0.02	From 0.01 to 3.46	From 3.47 to 6.7	From 6.8 to 10.3

**Table 6: Seven-point six sigma scales of back scratch for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From -11.2 to -8.22	From -8.21 to -5.21	From -5.21 to -2.20	From -2.19 to 0.80	From 0.81 to 3.81	From 3.83 to 6.82	From 6.83 to 9.8
From 65 to 69	From -12.3 to -9.15	From -9.14 to -5.97	From -5.96 to -2.79	From -2.78 to 0.39	From 0.40 to 3.57	From 3.58 to 6.75	From 6.76 to 9.9
From 70 to 74	From -13.1 to -9.68	From -9.67 to -6.60	From -6.59 to -3.33	From -3.32 to -0.07	From -0.06 to 3.20	From 3.21 to 6.28	From 6.29 to 9.7
From 75 to 79	From -14.4 to -10.91	From -10.90 to -7.39	From -7.38 to -3.86	From -3.85 to -0.34	From -0.33 to 3.19	From 3.20 to 6.71	From 6.72 to 10.2
From 80 to 84	From -15.2 to -11.42	From -11.41 to -8.01	From -8.0 to -4.41	From -4.40 to -0.79	From -0.78 to 2.82	From 2.83 to 6.22	From 6.23 to 10
From 85 to 89	From -17.4 to -13.58	From -13.57 to -9.71	From -9.70 to -5.84	From 5.83 to -1.97	From -1.98 to 1.91	From 1.92 to 5.78	From 5.79 to 9.6
From 90 to 94	From -20.1 to -15.42	From -15.41 to -11.21	From -11.20 to -6.74	From -6.73 to -2.26	From -2.25 to -2.20	From 2.21 to 6.42	From 6.43 to 11.1

**Table 7: Seven-point six sigma scales of 8 ft up and go for female senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 8.8 to 7.78	From 7.77 to 6.75	From 6.74 to 5.72	From 5.71 to 4.68	From 4.67 to 3.65	From 3.64 to 2.62	From 2.61 to 1.6
From 65 to 69	From 9.2 to 8.18	From 8.17 to 7.15	From 7.14 to 6.12	From 6.11 to 5.08	From 5.07 to 4.05	From 4.04 to 3.02	From 3.01 to 2
From 70 to 74	From 10.8 to 9.36	From 9.35 to 8.06	From 8.05 to 6.69	From 6.68 to 5.31	From 5.3 to 3.94	From 3.93 to 2.64	From 2.63 to 1.2
From 75 to 79	From 11.1 to 9.74	From 9.73 to 8.36	From 8.35 to 6.99	From 6.98 to 5.61	From 5.6 to 4.24	From 4.23 to 2.86	From 2.85 to 1.5
From 80 to 84	From 13.8 to 11.82	From 10.81 to 10.04	From 10.03 to 8.15	From 8.14 to 6.25	From 6.24 to 4.36	From 4.35 to 2.58	From 2.57 to 0.6
From 85 to 89	From 15.4 to 13.27	From 13.26 to 11.12	From 11.11 to 8.97	From 8.96 to 6.82	From 6.81 to 4.67	From 4.66 to 2.52	From 2.51 to 0.4
From 90 to 94	From 19 to 16.12	From 16.11 to 13.53	From 13.52 to 10.77	From 10.76 to 8.02	From 8.01 to 5.27	From 5.26 to 2.68	Below 2.67

**Table 8: Seven-point six sigma scales of body mass index for female senior citizens**

Age	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 10.7 to 15.12	From 15.13 to 19.59	From 19.60 to 24.06	From 24.07 to 28.54	From 28.55 to 33.01	From 33.02 to 37.48	From 37.49 to 41.9
From 65 to 69	From 10.9 to 15.32	From 15.33 to 19.79	From 19.80 to 24.26	From 24.27 to 28.74	From 28.75 to 33.21	From 33.22 to 37.68	From 37.69 to 42.1
From 70 to 74	From 12.6 to 16.65	From 16.66 to 20.29	From 20.30 to 24.16	From 24.17 to 28.03	From 28.04 to 31.90	From 31.91 to 35.55	From 35.56 to 39.6
From 75 to 79	From 12.2 to 15.94	From 15.95 to 19.72	From 19.73 to 23.51	From 23.52 to 27.29	From 27.30 to 31.08	From 31.09 to 34.86	From 34.87 to 38.6
From 80 to 84	From 12.4 to 16.09	From 16.00 to 19.41	From 19.42 to 22.94	From 22.95 to 26.46	From 26.47 to 29.99	From 30.00 to 33.31	From 33.32 to 37
From 85 to 89	From 13.2 to 16.34	From 16.35 to 19.53	From 19.54 to 22.71	From 22.72 to 25.89	From 25.90 to 29.07	From 29.08 to 32.25	From 32.26 to 35.4
From 90 to 94	From 10.6 to 14.65	From 14.66 to 18.29	From 18.30 to 22.16	From 22.17 to 26.03	From 26.04 to 29.90	From 29.91 to 33.55	From 33.56 to 37.6

## DISCUSSION

The six sigma scales are a standard scale which grades the performance of a person depending on how far above or below the score lies from the mean. It has  $\pm 3$  standard deviation on both sides of the mean score. This generates a possibility of many scores falling out of the scale, hence, some score cannot be evaluated using this scale. This makes the six sigma scales most appropriate at club level or district level but not at national or international level.

## CONCLUSIONS

1. Six sigma scales with seven-point grading has been developed in regard to all the test items of the senior fitness test, namely

2. Six sigma scales are most appropriate for club level or district level.

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## Research Article

# An analytical study of injuries among athletes of Jawaharlal Nehru Technological University, Anantapur

Joji Reddy Boggula

Secretary Sports Council, JNTU, Anantapur, Andhra Pradesh, India

### ABSTRACT

The practice of athletics can lead to an increased risk of injury. Engaging in sport activities has numerous health benefits but also carries the risk of injury. Sports trauma commonly affects joints of the extremities, that is, knee, ankle, hip, shoulder, elbow, wrist, etc. The objective of the study is to investigate the frequency of injuries among athletes of Jawaharlal Nehru Technological University. The sample for the study consists of 100 male athletes which includes 25 throwers, 25 sprinters, 25 middle- and long-distance runners, and 25 jumpers those who participated in the Jawaharlal Nehru Technological University intercollege athletics championships for the year 2019–2020 between the age group of 18 and 25 years. The data are collected through questionnaire. The results of the study show that throwers secured 50% injuries in lower extremities, 30% injuries in vertebral column, and 20% injuries in upper extremities, sprinters secured 80% injuries in lower extremities, 15% injuries in vertebral column, and 5% injuries in upper extremities. Middle- and long-distance runners secured 87% injuries in lower extremities, 10% injuries in vertebral column, and 3% injuries in upper extremities. Jumpers secured 80% injuries in lower extremities, 13% injuries in vertebral column, and 7% injuries in upper extremities. It is concluded that athletes must have good conditioning and prevention to avoid the injuries. This type of study is useful to coaches to give proper coaching for the development of motor qualities for the prevention of injuries among athletes.

**Keywords:** Injuries, Lower extremities, Upper extremities, Vertebral column

### INTRODUCTION

Engaging in sports activities has numerous health benefits but also carries the risk of injury. At every age, sportspersons sustain a wide variety of soft tissue, bone, ligament, tendon, and nerve injuries caused by direct trauma or repetitive stress. Different sports are associated with different patterns and types of injuries, whereas age, gender, and type of activity influence the prevalence of injuries. Sports trauma commonly affects joints of the extremities, that is, knee, ankle, hip, shoulder, elbow, wrist, and spine. The sports injuries that occur in competition or practice have loss of time for participation in sport.

According to the TRIPP model (Finch, 2006), the first step in injury research is to understand the extend of the problem. The prevalence and prevalence proportion of sport injuries have been widely investigated across sports. Unfortunately, such

studies have only included groups selected by either one or more criteria, such as specific sport (Jacobsson *et al.*, 2012), level (Hall *et al.*, 2013), age (Scase *et al.*, 2012), or injury type (Maselli *et al.*, 2015).

### PURPOSE OF RESEARCH

The objectives of the study are to investigate the frequency of injuries among athletes of Jawaharlal Nehru Technological University. This study was designed to investigate the most common types of injuries, mechanisms of injury, activities leading to injury, time, and place of injury occurrence, and time lost to injury.

### Population and Sample Group

The sample for the study consists of 100 male athletes which includes 25 throwers, 25 sprinters, 25 middle- and long-distance runners, and 25 jumpers those who participated in the Jawaharlal Nehru Technological University intercollege athletics championships for the year 2019–2020 between the age group of 18 and 25 years.

#### Address for correspondence:

Joji Reddy Boggula,

E-mail:ssc.jntua@gmail.com

**Table 1: Percentage of injuries among throwers**

Lower extremities injuries	Upper extremities	Head	Neck	Vertebral column
50	20	Nil	Nil	30

**Table 2: Percentage of injuries among sprinters**

Lower extremities injuries	Upper extremities	Head	Neck	Vertebral column
80	05	Nil	Nil	15

**Table 3: Percentage of injuries among middle- and long-distance runners**

Lower extremities injuries	Upper extremities	Head	Neck	Vertebral column
87	03	Nil	Nil	10

**Table 4: Percentage of injuries among jumpers**

Lower extremities injuries	Upper extremities	Head	Neck	Vertebral column
80	13	Nil	Nil	7

### Research Instruments

All the players were given a questionnaire regarding the sports injuries occur while playing athletics during the practice and competition. All the sportspersons are doing regular practice for minimum last 3 years.

The questionnaire consisting of the following injuries:

1. Lower extremities
2. Upper extremities
3. Head
4. Neck
5. Spine.

## RESULTS

The results of the study show that throwers secured 50% injuries in lower extremities, 30% injuries in vertebral column, and 20% injuries in upper extremities, sprinters secured 80% injuries in lower extremities, 15% injuries in vertebral column, and 5% injuries in upper extremities. Middle- and long-distance runners secured 87% injuries in lower extremities, 10% injuries in vertebral column, and 3% injuries in upper extremities. Jumpers secured 80% injuries in lower extremities, 13% injuries in vertebral column, and 7% injuries in upper extremities. It is concluded that athletes must have good conditioning and prevention to avoid the injuries. This type

of study is useful to coaches to give proper coaching for the development of motor qualities for prevention of injuries among athletes.

The majority of sports injuries are soft tissue in nature and because many of injuries arise in football is due to improper body mechanics and improper sport techniques.

## DISCUSSION

It is concluded in throwers that lower extremities injuries are 50%, upper extremities 20%, and vertebral column 30%. It is concluded in sprinters that lower extremities injuries are 80%, upper extremities 5%, and vertebral column 15%. It is concluded in middle- and long-distance running that lower extremities injuries are 87%, upper extremities 3%, and vertebral column 10%. It is concluded in jumps that lower extremities injuries are 80%, upper extremities 13%, and vertebral column 7%.

### Research Recommendations

Sufficient warm up, proper technique, correct biomechanics, proper conditioning, optimizing balance, coordination, optimizing reaction times, optimal diet, adequate rest, and positive attitude will reduce the risk of injuries. Increase your flexibility by performing dynamic warm up before practice and competition followed by static stretching post activity.

### Recommendations' For Further Research

Consult a coach or physical trainer to incorporate the conditioning programs during the practice. Have a pre-season physical examination and follow your doctor's recommendations.

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## Research Article

# Practical management of sudden cardiac arrest on the football field

G. Syam Kumar

Assistant Professor in Physical Education, J.N.T.U. Kakinada, East Godavari, Andhra Pradesh, India

### ABSTRACT

Sudden cardiac arrest (SCA) remains a tragic occurrence on the football field. The limits of pre-participation cardiovascular screening make it compulsory that prearranged emergency medical services be available at all football matches to immediately respond to any collapsed player. Management of SCA involves prompt recognition, immediate cardiopulmonary resuscitation, and early defibrillation. Any football player who collapses without contact with another player or obstacle should be regarded as being in SCA until proven otherwise. An automated external defibrillator (AED), or manual defibrillator if an AED is not available, should be immediately accessible on the field during competitions. This study presents guidelines for a practical and systematic approach to the management of SCA on the football field.

### INTRODUCTION

Sudden cardiac arrest (SCA) is the leading cause of death in athletes during exercise and sport, and a tragic occurrence on the football field. Although the pre-competition medical assessment (PCMA) was developed by F-MARC to provide a standard evaluation to identify athletes at risk for SCA, it is not yet a mandatory requirement for all amateur or professional football players internationally. The variable compliance with PCMA for all footballers combined with the limits of pre-participation cardiovascular screening in athletes makes it compulsory that prearranged emergency medical services be available at all football matches to immediately respond to any collapsed football player on the field who may be in cardiac arrest.

Management of SCA involves prompt recognition, immediate cardiopulmonary resuscitation (CPR), and early defibrillation where appropriate. Although the literature makes reference to various aspects of SCA and its immediate management on the football field, proper emergency planning for this life-threatening incident is not universally practiced, thereby leaving it up to each field-side medical team, physician, or attending rescuer to enact a practical plan *ab initio*. The aim of this paper is to recommend a practical and systematic

approach to the management of SCA on the football field, and to emphasize the critical importance of local adaptation of these guidelines at all football venues.

### RECOGNITION

Any football player who collapses without contact with another player or obstacle should be regarded as being in SCA until it is proved otherwise. Delayed recognition of SCA by first responders can lead to critical delays or even failure to initiate resuscitative measures. Brief seizure-like activity or involuntary myoclonic movements have been reported in over 50% of athletes with SCA. Thus, SCA should not be mistaken for a seizure. Inaccurate rescuer assessment of pulse or respirations is another cause of delayed resuscitation. Agonal or occasional gasping can occur in the 1<sup>st</sup> min after SCA and be misinterpreted as normal breathing. Therefore, to avoid potentially fatal delays in resuscitation, any collapsed and unresponsive athlete should be managed as SCA including immediate CPR and application of an automated external defibrillator (AED), or manual defibrillator if an AED is not available, as soon as possible for rhythm analysis and shock as indicated.

On the field, once SCA has been recognized by the field medical team, players, or the referee, additional medical personnel and the defibrillator should enter the field of play simultaneously. Each football venue for training or competition must have

#### Address for correspondence:

G. Syam Kumar,  
E-mail:

access to an AED, or manual defibrillator if an AED is not available, with a goal of a <3 min time delay from player collapse to first defibrillation shock. For competitions, the home team and stadium management should be responsible for ensuring that a defibrillator is present and located preferably with the fourth referee official. However, it should be a matter of routine that the location of the AED must be reviewed by both teams before the match, including a brief readiness check of the device by the team physician.

Time taken to initiate CPR and defibrillation are important determinants of successful cardiac arrest resuscitation, hence, delay in entering the field of play in a potential SCA must be minimized, even if the Fédération Internationale de Football Association Rules of the Game are to be amended to accommodate management of this life-threatening event, including education of referees.

## EMERGENCY ACTION PLAN

Once it has been established that the collapsed player is in cardiac arrest, a pre-planned, pre-rehearsed emergency action plan should be initiated. CPR should be effectively established and the AED immediately retrieved. Concerned football players should be directed away from the collapsed player to provide sufficient space for the resuscitating medical team. The referees may be helpful to organize the players on the field in this regard. Other field staff should be responsible for directing an ambulance onto the pitch as soon as possible (if feasible).

## CPR

SCA in an active footballer on the field usually means that the blood oxygen saturation level is sufficient for hands-only chest compression to be undertaken for the first few minutes of CPR. After that, an effective form of rescue ventilation should be initiated through mouth-to-mask or manual resuscitator ventilation, with or without supplemental oxygen, and with or without use of an appropriate supraglottic airway.

## ON-FIELD DEFIBRILLATION

The single greatest factor affecting survival from SCA is the time interval from cardiac arrest to defibrillation, with survival decreasing to 10%/min defibrillation which is delayed in the absence of CPR but 3–4% with CPR. Survival following SCA has been greatly improved by rescuer and public access defibrillation programs designed to shorten the time interval from SCA to shock delivery, with survival rates >60% in young athletes if prompt CPR and defibrillation can be achieved.

Immediately after SCA recognition, the defibrillator should be retrieved and positioned next to the collapsed player and

applied as soon as possible. AEDs will determine whether a shockable rhythm is present and charge the AED accordingly, whereas manual defibrillators require health-care rescuer rhythm recognition and manual defibrillation. Wet sweaty and/or excessively hairy chests may make it problematic for adequate defibrillation pads attachment or paddle placement, necessitating the use of a towel and/or disposable razor. For these situations, it is recommended that each defibrillator meant for the football field has an accessory kit that contains a rescue-type scissors, a cloth towel, two disposable razors, and spare AED pads or extra defibrillation gel as minimum. These items are likewise useful when SCA and defibrillation are undertaken in the rain, which is a safe practice.

## IMMOBILIZATION AND TRANSFER

Players who experience SCA may collapse in an uncontrolled and unprotected manner with the potential for a cervical spinal injury. Therefore, cervical spine precautions should be taken when transferring the player from the ground onto an appropriate rigid immobilization device (e.g., basket stretcher or spine board), and to immobilize the neck with head blocks accordingly.

Initial sequences of CPR and defibrillation should occur on the field at the location of collapse to avoid unnecessary delays in resuscitation by attempting to move the player. The decision to transfer the player from one's initial position of collapse and CPR is critical, because external chest compression in transit, with a player strapped to a rigid immobilization device, may not be as effective as when stationary on the ground and may compromise the success of the resuscitation. Therefore, at least three cycles of external chest compression and intermittent defibrillation (as per international guidelines), should be undertaken as a minimum before transfer is considered. Interruptions in CPR should be minimized with chest compressions reinitiated immediately after shock delivery.

If on-field measures do not return the player to a spontaneous rhythm, or if ventricular fibrillation appears to persist, the player should be loaded into an ambulance, preferably that has been brought onto the field, where more advanced cardiac care can be provided during transport to a hospital facility. It is imperative to continue, without delays or interruptions, effective, efficient CPR, and intermittent appropriate defibrillation, until a spontaneous cardiac rhythm is obtained with signs of life.

## POST-SCA PROCEDURES AND REPORTING

After a major medical event of this nature on the football field, protocols should be instituted which address issues

related to psychological team debriefing and event review. Comprehensive documentation is likewise mandatory for not only medical and legal purposes, but to assist in research of SCA, its etiology, and successful treatment.

## EDUCATION AND TRAINING

It is strongly recommended that all players, officials, referees, and associated staff at stadiums and training grounds be trained in basic CPR and AED use because of the potential life saving benefits that may result on and off the football field of play.

## KEY RECOMMENDATIONS FOR EMERGENCY PLANNING FOR SCA ON THE FOOTBALL FIELD

- Every team and venue hosting football training or competition should have a written emergency response plan for SCA.
- Potential responders to SCA on the field (i.e., coaches, referees, physiotherapists, athletic trainers, and other medical staff) should be regularly trained in CPR and AED use, and demonstrate skills proficiency in this regard.
- An AED should be immediately available on the pitch during competitions.
- Both teams should review before the match the location of the AED and details of the emergency response plan.
- AED; CPR; SCA.

## PRACTICAL MANAGEMENT OF SCA ON THE FOOTBALL FIELD

- Prompt recognition of SCA
- SCA should be assumed in any collapsed and unresponsive athlete
- Seizure-like activity and abnormal breathing or gasping must be accepted as SCA until proven otherwise
- Early activation of the emergency medical response system and call for additional rescuer assistance
- Early CPR
- If unresponsive and not breathing normally, begin hands-only (compression only) CPR – push hard, push fast
- C-A-B (chest compressions-airway-breathing).
- Immediate retrieval of the AED or manual defibrillator.
- Application of the AED or manual defibrillator as soon as possible – while CPR continues. Stop CPR only for rhythm analysis and shock delivery if indicated
- If no shock is delivered, CPR and life support measures should be continued until the player becomes responsive or a non-cardiac etiology can be clearly established.
- If a shock is delivered, immediately continue CPR for 2 min, then allow AED to reanalyze the rhythm.

- On the discretion of the senior clinician on scene, transport of the SCA victim to a hospital facility capable of advanced cardiac life support, realizing that effective CPR should be continued en route.
- On return of spontaneous circulation, while still in coma, rapid cooling (induced hypothermia) for SCA victims with VF arrest has been shown to improve survival and decrease neurological complications.
- AED; CPR; SCA; VF, ventricular fibrillation.

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## Research Article

# Development of six sigma scales (seven-point grading) of fitness level of male senior citizens

Dhananjoy Shaw<sup>1</sup>, Syed Murtaza Hussain Andrabi<sup>2</sup>

<sup>1</sup>Indira Gandhi Institute of Physical Education and Sports Sciences, University of Delhi, New Delhi, India, <sup>2</sup>Department of Physical Education and Sports Sciences, University of Delhi, New Delhi, India

### ABSTRACT

Standard scale is a tool that can help in the assessment, grading, and classification of a population on a certain characteristic. This study aims to develop six sigma scales with five-point grading in regard to the test items in the senior fitness test. The source of the data was the work done by Rikli and Jones (1999). Six sigma scales (seven-point grading) for male senior citizens have been developed in regard to the test items, namely, chair stand test, arm curl test, 6 min walk test, 2 min step test, chair sit and reach test, back scratch test, 8 ft up and go test, and body mass index. Six sigma scales are most appropriate when the classification is sought at district or club level.

**Keywords:** Male senior citizens, Six sigma scales, Senior fitness test, Seven-point grading

## INTRODUCTION

Senior fitness test is an accepted measure of functional fitness in senior citizens.<sup>[1,2]</sup> It consists of several test items that give an objective assessment of various physical fitness components, namely, aerobic endurance, muscular strength, flexibility, and balance. The information about the various fitness components is of vital importance collectively and helps determine the functional fitness of a senior citizen.

The fitness test battery gives a score on the various test items, however, without the knowledge of normative standards, it is difficult to identify the relative standing of a person on a particular fitness component. Therefore, the objective of this study was to develop six sigma scales with seven-point grading, that can be used as a tool, to interpret the test results, grouping, assessment, and comparison of a senior citizen on a particular test item. Although T-scales have been developed for various test items, namely, back scratch test<sup>[3]</sup> and chair stand test,<sup>[4]</sup> the t-scale is not appropriate when a strict grouping is needed in which case six sigma scales are more appropriate.

Address for correspondence:

## ANALYSIS OF DATA AND SOURCE OF DATA

The means and standard deviations were available from the data source<sup>[5]</sup> which were extracted and put in tabular form in excel for further data analysis (construction of the scale). For the test administration of the senior fitness test see here.<sup>[6]</sup> The six sigma scales with seven-point grading were constructed by following the 4-step procedure in the text.<sup>[7]</sup>

## SAMPLE DATA OF ONE PERSON FOR THE INTERPRETATION OF TEST RESULTS

According to Table 4, if a person A having age 78 has a score of 78 on 2 min step test, then he will be interpreted as “Poor” because the score of 78 lies between 56 and 79 which is “Poor” category (Table 4). If the same person has a score of 0.5 on chair sit and reach test, then he will be interpreted as “Average” because the score of 0.5 lies between -3.11 and 0.92 which is “Average” category (Table 5). Again if the same person scores -2 on a back scratch test, then he will be considered as “Good” because the score of -2 lies between -3.40 and 0.98 which is “Good” category (Table 6).

**Table 1: Seven-point six sigma scales of chair stand test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 3.6 to 7.16 From 4 to 7	From 7.17 to 10.85 From 7 to 11	From 10.86 to 14.55 From 11 to 15	From 14.56 to 18.25 From 15 to 18	From 18.26 to 21.95 From 18 to 22	From 21.96 to 25.65 From 22 to 26	From 25.66 to 29.3 From 26 to 29
From 65 to 69	From 1.8 to 5.53 From 2 to 6	From 5.54 to 9.4 From 6 to 9	From 9.5 to 13.27 From 9 to 13	From 13.28 to 17.14 From 13 to 17	From 17.15 to 21.01 From 17 to 21	From 21.02 to 24.88 From 21 to 25	From 24.89 to 28.7 From 25 to 29
From 70 to 74	From 2.0 to 5.68 From 2 to 6	From 5.69 to 9.08 From 6 to 9	From 9.09 to 12.69 From 9 to 13	From 12.70 to 16.31 From 13 to 16	From 16.32 to 19.92 From 16 to 20	From 19.93 to 23.32 From 20 to 23	From 23.33 to 27.1 From 24 to 27
From 75 to 79	From 1.12 to 4.75 From 1 to 5	From 4.76 to 8.45 From 5 to 8	From 8.46 to 12.15 From 8 to 12	From 12.16 to 15.85 From 12 to 16	From 15.86 to 19.55 From 16 to 20	From 19.56 to 23.25 From 20 to 23	From 23.26 to 26.9 From 23 to 27
From 80 to 84	From 0.8 to 4.21 From 1 to 4	From 4.22 to 7.37 From 4 to 7	From 7.38 to 10.72 From 7 to 11	From 10.73 to 14.08 From 11 to 14	From 14.09 to 17.43 From 14 to 17	From 17.44 to 20.59 From 17 to 21	From 20.60 to 24.1 From 21 to 24
From 85 to 89	From -2.7 to 1.21 From -3 to 1	From 1.22 to 5.17 From 1 to 5	From 5.18 to 9.12 From 5 to 9	From 9.13 to 13.08 From 9 to 13	From 13.09 to 17.03 From 13 to 17	From 17.04 to 20.99 From 17 to 21	From 21 to 24.9 From 21 to 25
From 90 to 94	From -1.7 to 1.72 From -2 to 2	From 1.73 to 4.8 From 2 to 5	From 4.9 to 8.07 From 5 to 8	From 8.08 to 11.33 From 8 to 11	From 11.34 to 14.6 From 11 to 15	From 14.7 to 17.68 From 15 to 18	From 17.69 to 21.1 From 18 to 21

Note: Scores have been rounded to two digits after decimals

**Table 2: Seven-point six sigma scales of arm curl test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 4.9 to 8.89 From 5 to 9	From 8.90 to 12.94 From 9 to 13	From 12.95 to 16.98 From 13 to 17	From 16.99 to 21.02 From 17 to 21	From 21.03 to 25.06 From 21 to 25	From 25.07 to 29.10 From 25 to 29	From 29.11 to 33.1 From 29 to 33
From 65 to 69	From 2.5 to 7.0 From 2 to 7	From 7.1 to 11.56 From 7 to 12	From 11.57 to 16.12 From 12 to 16	From 16.13 to 20.68 From 16 to 21	From 20.69 to 25.24 From 21 to 25	From 25.25 to 29.79 From 25 to 30	From 29.80 to 34.3 From 30 to 34
From 70 to 74	From 2.4 to 6.9 From 2 to 7	From 7 to 10.95 From 7 to 11	From 10.96 to 15.25 From 11 to 15	From 15.26 to 19.55 From 15 to 20	From 19.56 to 23.85 From 20 to 24	From 23.86 to 27.9 From 24 to 28	From 28 to 32.4 From 28 to 32
From 75 to 79	From 2.4 to 6.31 From 2 to 6	From 6.32 to 10.27 From 6 to 10	From 10.28 to 14.22 From 10 to 14	From 14.23 to 18.18 From 14 to 18	From 18.19 to 22.13 From 18 to 22	From 22.14 to 26.09 From 22 to 26	From 26.1 to 30 From 26 to 30
From 80 to 84	From 3.1 to 6.97	From 6.98 to 10.45	From 10.46 to 14.15	From 14.16 to 17.85	From 17.86 to 21.55	From 21.56 to 25.03	From 25.04 to 28.9

(Contd...)

**Table 2: Continued**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
	From 3 to 7	From 7 to 11	From 11 to 14	From 14 to 18	From 18 to 22	From 22 to 25	From 25 to 29
From 85 to 89	From 0.7 to 4.35	From 4.36 to 8.05	From 8.06 to 11.75	From 11.76 to 15.45	From 15.46 to 19.15	From 19.16 to 22.84	From 22.85 to 26.5
From 90 to 94	From 1 to 4.65	From 4 to 8 to 7.48	From 8 to 12 to 10.49	From 12 to 15 to 13.50	From 15 to 19 to 16.51	From 19 to 23 to 19.35	From 23 to 26 to 22.5
	From 1 to 5	From 5 to 7	From 7 to 10	From 10 to 13	From 13 to 17	From 17 to 19	From 19 to 22

Note: Scores have been rounded to two digits after decimals

**Table 3: Seven-point six sigma scales of 6 min walk test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 398 to 476.2	From 476.3 to 555.32	From 555.33 to 634.44	From 634.45 to 713.56	From 713.57 to 792.68	From 792.69 to 871.8	From 871.9 to 950
From 65 to 69	From 322 to 409.55	From 409.56 to 498.13	From 498.14 to 586.71	From 586.72 to 675.29	From 675.30 to 763.87	From 763.88 to 852.45	From 852.46 to 940
From 70 to 74	From 306 to 397.8	From 397.9 to 480.42	From 480.43 to 568.14	From 568.15 to 655.86	From 655.87 to 743.58	From 743.59 to 826.2	From 826.3 to 918
From 75 to 79	From 177 to 284.1	From 284.2 to 392.46	From 392.47 to 500.82	From 500.83 to 609.18	From 609.19 to 717.54	From 717.55 to 825.9	From 826 to 933
From 80 to 84	From 164 to 272	From 272.1 to 369.2	From 369.3 to 472.4	From 472.5 to 575.6	From 575.7 to 678.8	From 678.9 to 776	From 776.1 to 884
From 85 to 89	From 51 to 171.7	From 171.8 to 293.82	From 293.83 to 415.94	From 415.95 to 538.06	From 538.07 to 660.18	From 660.19 to 782.3	From 782.4 to 903
From 90 to 94	<92.2	From 92.3 to 212.08	From 212.09 to 339.36	From 339.37 to 466.64	From 466.65 to 593.92	From 593.93 to 713.8	From 713.9 to 847

**Table 4: Seven-point six sigma scales of 2 min step test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 38 to 55.85	From 55.86 to 73.91	From 73.92 to 91.97	From 91.98 to 110.03	From 110.04 to 128.09	From 128.10 to 146.15	From 146.16 to 164
	From 38 to 56	From 56 to 74	From 74 to 92	From 92 to 110	From 110 to 128	From 128 to 146	From 146 to 164
From 65 to 69	From 32 to 51.55	From 51.56 to 71.33	From 71.34 to 91.11	From 91.12 to 110.89	From 110.90 to 130.67	From 130.68 to 150.45	From 150.46 to 170
	From 32 to 52	From 52 to 71	From 71 to 91	From 91 to 111	From 111 to 131	From 131 to 150	From 150 to 170
From 70 to 74	From 26 to 46.7	From 46.8 to 65.33	From 65.34 to 85.11	From 85.12 to 104.89	From 104.90 to 124.67	From 124.68 to 143.3	From 143.4 to 164
	From 26 to 47	From 47 to 65	From 65 to 85	From 85 to 105	From 105 to 125	From 125 to 143	From 143 to 164
From 75 to 79	From 10 to 32.95	From 32.96 to 56.17	From 56.18 to 79.39	From 79.40 to 102.61	From 102.62 to 125.83	From 125.84 to 149.05	From 149.06 to 172
	From 10 to 33	From 33 to 56	From 56 to 79	From 79 to 103	From 103 to 126	From 126 to 149	From 149 to 172
From 80 to 84	From 15 to 36.6	From 36.7 to 56.04	From 56.05 to 76.68	From 76.69 to 97.32	From 97.33 to 117.96	From 117.97 to 137.4	From 137.5 to 159

(Contd...)

**Table 4: Continued**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
	From 15 to 37	From 37 to 56	From 56 to 77	From 77 to 97	From 97 to 118	From 118 to 137	From 137 to 159
From 85 to 89	From 3 to 23.4	From 23.5 to 44.04	From 44.04 to 64.68	From 64.69 to 85.32	From 85.33 to 105.96	From 105.97 to 126.6	From 126.7 to 147
	From 3 to 23	From 23 to 44	From 44 to 65	From 65 to 85	From 85 to 106	From 106 to 126	From 126 to 147
From 90 to 94	Below 14.4	From 14.41 to 35.46	From 35.47 to 57.82	From 57.83 to 80.18	From 80.19 to 102.54	From 102.55 to 123.6	From 123.7 to 147
	Below 14	From 14 to 35	From 35 to 58	From 58 to 80	From 80 to 103	From 103 to 124	From 124 to 147

Note: Scores have been rounded to two digits after decimals

**Table 5: Seven-point six sigma scales of chair sit and reach test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From -13 to -9.72	From -9.71 to -5.59	From -5.58 to -1.46	From -1.45 to 2.66	From 2.67 to 6.79	From 6.80 to 10.92	From 10.93 to 15
From 65 to 69	From -13.8 to -9.89	From -9.88 to -5.93	From -5.92 to -1.98	From -1.97 to 1.98	From 1.99 to 5.93	From 5.94 to 9.89	From 9.9 to 13.8
From 70 to 74	From -14.2 to -10.06	From -10.05 to -6.33	From -6.32 to -2.38	From -2.37 to 1.58	From 1.59 to 5.53	From 5.54 to 9.26	From 9.27 to 13.4
From 75 to 79	From -15.2 to -11.20	From -11.19 to -7.16	From -7.15 to -3.12	From -3.11 to 0.92	From 0.93 to 4.96	From 4.97 to 9.0	From 9.1 to 13
From 80 to 84	From -17 to -12.5	From -12.4 to -8.45	From -8.44 to -4.15	From -4.14 to 0.15	From 0.16 to 4.45	From 4.46 to 8.5	From 8.6 to 13
From 85 to 89	From -15 to -11.43	From -11.42 to -7.82	From -7.81 to -4.21	From -4.20 to 0.59	From 0.60 to 3.02	From 3.03 to 6.63	From 6.64 to 10.2
From 90 to 94	From -16.5 to -12.63	From -12.62 to -9.15	From -9.14 to -5.45	From -5.44 to -1.75	From -1.74 to 1.95	From 1.96 to 5.43	From 5.44 to 9.3

**Table 6: Seven-point six sigma scales of back scratch test for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From -17.8 to -13.72	From -13.71 to -9.59	From -9.58 to -5.46	From -5.45 to -1.34	From -1.33 to 2.79	From 2.8 to 6.92	From 6.93 to 11
From 65 to 69	From -18.8 to -14.63	From -14.62 to -10.42	From -10.41 to -6.21	From -6.20 to -1.99	From -1.98 to 2.22	From 2.23 to 6.43	From 6.44 to 10.6
From 70 to 74	From -19.2 to -14.79	From -14.78 to -10.82	From -10.81 to -6.60	From -6.59 to -2.39	From -2.38 to 1.82	From 1.83 to 5.79	From 5.8 to 10.2
From 75 to 79	From -20.9 to -16.56	From -16.55 to -12.18	From -12.17 to -7.79	From -7.78 to -3.41	From -3.40 to 0.98	From 0.99 to 5.36	From 5.37 to 9.7
From 80 to 84	From -21.9 to -17.04	From -17.03 to -12.67	From -12.66 to -8.02	From -8.01 to -3.38	From -3.37 to 1.27	From 1.28 to 5.64	From 5.65 to 10.5
From 85 to 89	From 20.6 to -16.5	From -16.51 to -12.39	From -12.38 to -8.26	From -8.25 to -4.14	From -4.13 to -0.01	From 0 to 4.12	From 4.13 to 8.2
From 90 to 94	From -21.6 to -17.28	From -17.27 to -13.39	From -13.38 to -9.26	From -9.25 to -5.14	From -5.13 to -1.01	From -1 to 2.88	From 2.89 to 7.2

**Table 7: Seven-point six sigma scales of 8 ft up and go for male senior citizens**

Age group	Worst	Very poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 8.6 to 7.49	From 7.48 to 6.38	From 6.37 to 5.26	From 5.25 to 4.14	From 4.13 to 3.02	From 3.01 to 1.90	From 1.89 to 0.8
From 65 to 69	From 8.7 to 7.68	From 7.69 to 6.65	From 6.64 to 5.62	From 5.61 to 4.58	From 4.57 to 3.55	From 3.54 to 2.52	From 2.51 to 1.5
From 70 to 74	From 9.2 to 8.03	From 8.02 to 6.98	From 6.97 to 5.86	From 5.85 to 4.74	From 4.73 to 3.62	From 3.61 to 2.57	From 2.56 to 1.4
From 75 to 79	From 11.6 to 9.98	From 9.97 to 8.35	From 8.34 to 6.72	From 6.71 to 5.08	From 5.07 to 3.45	From 3.44 to 1.81	From 1.80 to 0.2
From 80 to 84	From 11.8 to 10.18	From 10.17 to 8.72	From 8.71 to 7.17	From 7.16 to 5.63	From 5.62 to 4.08	From 4.07 to 2.62	From 2.61 to 1
From 85 to 89	From 15 to 12.79	From 12.78 to 10.55	From 10.54 to 8.32	From 8.31 to 6.08	From 6.07 to 3.85	From 3.84 to 1.61	Bellow 1.6
From 90 to 94	From 16.8 to 14.19	From 14.18 to 11.84	From 11.83 to 9.35	From 9.34 to 6.85	From 6.84 to 4.36	From 4.35 to 2.01	Below 2

**Table 8: Seven-point six sigma scales of body mass index for male senior citizens**

Age group	Worst	Very Poor	Poor	Average	Good	Very good	Excellent
From 60 to 64	From 14.8 to 18.37	From 18.38 to 21.98	From 21.99 to 25.59	From 25.6 to 29.21	From 29.22 to 32.81	From 32.82 to 36.43	From 36.44 to 40
From 65 to 69	From 14.9 to 18.47	From 18.48 to 22.08	From 22.09 to 25.69	From 25.7 to 29.31	From 29.32 to 32.92	From 32.93 to 36.53	From 36.54 to 40.1
From 70 to 74	From 14.9 to 18.41	From 18.42 to 21.57	From 21.58 to 24.92	From 24.93 to 28.28	From 28.29 to 31.63	From 31.64 to 34.79	From 34.8 to 38.3
From 75 to 79	From 14.7 to 18.01	From 18.02 to 21.37	From 21.38 to 24.72	From 24.73 to 28.08	From 28.09 to 31.43	From 31.44 to 34.78	From 34.79 to 38.1
From 80 to 84	From 15.9 to 18.96	From 18.97 to 21.71	From 21.72 to 24.64	From 24.65 to 27.56	From 27.57 to 30.49	From 30.5 to 33.24	From 33.25 to 36.3
From 85 to 89	From 17.7 to 19.74	From 19.75 to 21.80	From 21.81 to 23.87	From 23.88 to 25.93	From 25.94 to 28	From 28.1 to 30.06	From 30.07 to 32.1
From 90 to 94	From 13.8 to 17.13	From 17.14 to 20.13	From 20.14 to 23.31	From 23.32 to 26.49	From 26.5 to 29.67	From 29.68 to 32.67	From 32.68 to 36

## DISCUSSION

The six sigma scales are a very rigid scale which makes it appropriate for male senior citizens of club or district level where, the possibility of the outliers is least. On the other hand, when the grouping of populations at national and international level is warranted, the standard scales such as hull scale and t-scale are most appropriate.

## CONCLUSIONS

Six sigma scales (seven-point grading) for male senior citizens have been developed in regard to the test items, namely, chair stand test, arm curl test, 6 min walk test, 2 min step test, chair sit and reach test, back scratch test, 8 ft up and go test, and body mass index.

1. Six sigma scales are most appropriate when the classification is sought at district or club level.

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## Research Article

# Effect of femoral length discrepancy (leg length discrepancy) on the pelvis list during human gait

Dhananjay Shaw<sup>1</sup>, Syed Murtaza Hussain Andrabi<sup>2</sup>

<sup>1</sup>Indira Gandhi Institute of Physical Education and Sports Sciences, University of Delhi, New Delhi, India, <sup>2</sup>Department of Physical Education and Sports Sciences, University of Delhi, New Delhi, India

### ABSTRACT

Femoral length discrepancy (FLD) is the difference in the length of the femur bone in a same person. The objective of this study was to understand how FLD affects the motion of the pelvis in the frontal plane. We used OpenSim platform to carry out the simulations on a subject specific data by manipulating the length of the femur bone with 0.25% increments up to 4% FLD. We split the data set at the median to get two groups with FLD less than 2% and FLD more than 2%. The Mann–Whitney’s U-test showed a significant difference for all the gait events between the two groups. Our data show that the FLD interferes with the ideal gait pattern with persistent listing to the contralateral side of the longer leg.

### INTRODUCTION

Leg length discrepancy (LLD) results due to different reasons namely congenital (genetical), developmental, or accidental hence, it can be overall discrepancy or femoral or tibial.<sup>[1]</sup> Femoral length discrepancy (FLD) is a type of anatomical LLD of lower limbs solely or predominantly as a consequence of difference in the length of femur bone. The other can be tibial length discrepancy which is a consequence of difference in tibia bone length. The more common of the two is the FLD,<sup>[2]</sup> which can be due to a fracture in the femur bone, or is often experienced after total hip replacement surgery (total hip arthroplasty).<sup>[1]</sup>

LLD is a common phenomenon which is characterized by unequal paired limbs.<sup>[3]</sup> This phenomenon provokes mechanical and functional changes, altering the postural alignment during static standing<sup>[4]</sup> as well as deviation from ideal gait during dynamic walking<sup>[5]</sup> of the effected person. Mechanically, LLD causes asymmetric load distribution through the two limbs during gait which can be catastrophic over a duration of time by inducing osteoarthritis,<sup>[6]</sup> low back pain,<sup>[7]</sup> and scoliosis.<sup>[8]</sup>

LLD can be congenital or acquired. The most common causes of congenital LLD are congenital short femur, congenital

coxa vara, poliomyelitis, hemihyperplasia, or in case of acquired, it could be due to fractured femoral diaphysis, total hip arthroplasty, etc.<sup>[1]</sup> Regardless of the etiology of LLD, the anatomic discrepancy can be a consequence of either tibial length difference or femoral length difference.<sup>[9]</sup> A study done on children suggested that the compensatory changes were different for tibial length difference and femoral leg difference. The study further revealed that when the discrepancy was in the femur subjects chose more distal compensatory strategy (greater ankle moment) and when the discrepancy was in tibia length, the subjects compensated with pelvic list (pelvic obliquity).<sup>[2]</sup>

Pelvic obliquity or pelvic list has been reported to be the most common compensatory strategy in mitigating the mechanical deviations of LLD.<sup>[3-8]</sup> Yet, only a small number of studies have made it a focus in their study. A comprehensive and in-depth understanding of the pelvis motion during gait is, therefore, necessary in understanding the pathomechanics of LLD.

Majority of the studies investigating LLD have induced LLD by placing an insole in the shoe or by including a heel lift<sup>[10]</sup> which technically increases the effective length of tibia segment during gait and thus disregards when the discrepancy could stem from femoral length difference. One of the major issues have been the inability to accurately quantify the discrepancy, while radiographic measurements are considered the most

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accurate but it remains a very expensive method and also exposes the human subjects to harmful radiations.<sup>[11]</sup>

Alternatively, the musculoskeletal modeling offers the flexibility to manipulate the anthropometry of skeletal segments and to experiment how the human body translates during locomotion. The present study uses a deterministic approach by manipulating a musculoskeletal model in OpenSim to give a qualitative description of the kinematics of pelvis during gait with rightful consideration to the source of discrepancy.

## METHODS

The simulations were done using the open license software OpenSim (version 4.1). The 2392 model of gait was used in which 16 levels of LLD were manipulated for the condition of FLD with increments to the right leg. The generic model was scaled for a subject specific data provided by the software. Inverse kinematic tool was used to generate the kinematics during a complete gait cycle and the pelvic kinematics was plotted using the plot panel.

### Statistical Analysis

The data set for the pelvic list obtained was split at the median to divide the values into two groups of FLD less than 2% ( $n=8$ ) and FLD more than 2% ( $n=8$ ). Subsequently, Mann–Whitney’s U non-parametric test for independent samples was used to test the difference between the two groups.  $P < 0.05$  was taken

as statistically significant. All the statistical operations were carried out in IBM SPSS.

### Note

The model (gait 2354) in the OpenSim uses a limited number of musculotendon actuators to simulate the musculoskeletal system, however, the human motion is far more complex than that and may vary to some extent with the real experimental data.

## RESULTS

Figure 1 displays the deviation in the pelvic list for various levels of femur length discrepancy in which the femur length was increased with 0.25% increments in the right limb to produce 17 levels of discrepancy. The plot shows that the pelvic list follows a pattern similar to 0% LLD condition as the level of discrepancy increases. However, as the discrepancy increases the pelvic listing decreases in the positive direction while the pelvic listing increases in the negative direction. As the locomotion progresses from RHS to LTO the pelvic listing alternates from listing in the positive direction to listing in the negative direction. From LTO to LHS, the pelvic listing takes a rise and fall and peaks at the LHS in the negative direction.

Pelvic list in the group with FLD less than 2% (Mdn = 2.1) was significantly different than the group with FLD more than 2% (Mdn = -0.075) for the variable RHS,  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . In regard to the variable LTO, the group with FLD less than 2% (Mdn = -1.19) was significantly different

**Table 1: Data set for femoral length discrepancy for various gait events**

S. No.	Gait events → level of LLD (%) ↓	Right heel strike (°)	Left toe off (°)	Left heel strike (°)	Right toe off (°)	Right heel strike (°)	Left toe off (°)	Left heel strike (°)
1	0	2.92	-0.27	-4.46	-1.5	2.3	0.85	-5.33
2	0.25	2.72	-0.47	-4.64	-1.68	2.1	0.65	-5.49
3	0.50	2.44	-0.81	-4.97	-2	1.82	0.32	-5.84
4	0.75	2.22	-1.06	-5.22	-2.24	1.59	0.06	-6.08
5	1	1.98	-1.32	-5.46	-2.48	1.36	-0.19	-6.32
6	1.25	1.81	-1.53	-5.71	-2.68	1.19	-0.41	-6.57
7	1.50	1.55	-1.81	-5.96	-2.94	0.93	-0.68	-6.81
8	1.75	1.3	-2.07	-6.22	-3.21	0.68	-0.98	-7.07
9	2	1.04	-2.37	-6.47	-3.47	0.41	-1.25	-7.32
10	2.25	0.81	-2.62	-6.74	-3.72	0.18	-1.49	-7.58
11	2.50	0.55	-2.9	-6.98	-3.99	-0.08	-1.78	-7.84
12	2.75	0.3	-3.15	-7.25	-4.23	-0.32	-2.03	-8.09
13	3	0.05	-3.42	-7.5	-4.48	-0.58	-2.3	-8.35
14	3.25	-0.2	-3.71	-7.76	-4.77	-0.83	-2.59	-8.6
15	3.50	-0.45	-3.99	-8.02	-5.03	-1.08	-2.86	-8.88
16	3.75	-0.71	-4.26	-8.28	-5.29	-1.33	-3.14	-9.14
17	4	-0.96	-4.51	-8.53	-5.53	-1.59	-3.39	-9.38

Values are rounded to two digits after decimal



Table 2: Descriptive statistics of pelvis list during various events of gait

Gait events	RHS		LTO		LHS		RTO		RHS1		LTO1		LHS1	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Mean	2.1175	-0.0763	-1.1675	-3.5700	-5.3300	-7.6325	-2.3413	-4.6300	1.4963	-0.7038	-0.0475	-2.4475	-6.1888	-8.4825
Median	2.1000	-0.0750	-1.1900	-3.5650	-5.3400	-7.6300	-2.3600	-4.6250	1.4750	-0.7050	-0.0650	-2.4450	-6.2000	-8.4750
SD	0.56383	0.61792	0.63396	0.66612	0.62393	0.62989	0.59987	0.63756	0.56358	0.61734	0.63919	0.66727	0.61925	0.63342
Range	1.62	1.77	1.80	1.89	1.76	1.79	1.71	1.81	1.62	1.77	1.83	1.90	1.74	1.80
Min.	1.30	-0.96	-2.07	-4.51	-6.22	-8.53	-3.21	-5.53	0.68	-1.59	-0.98	-3.39	-7.07	-9.38
Max.	2.92	0.81	-0.27	-2.62	-4.46	-6.74	-1.50	-3.72	2.30	0.18	0.85	-1.49	-5.33	-7.58

A is the group with FLD less than 2% and B is the group with FLD more than 2%

than the group with FLD more than 2% (Mdn = -3.56),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . For the variable LHS, the group with FLD less than 2% (Mdn = -5.34) was also significantly different than the group with FLD more than 2% (Mdn = -7.63),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . The variable RTO was significantly different for the two groups of FLD less than 2% (Mdn = -2.36) and FLD more than 2% (-4.62),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . For the variable RHS1, the test showed a significant difference between FLD less than 2% (Mdn = 1.47) and FLD more than 2% (Mdn = -0.70),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . In regard to the variable LTO1, the group with FLD less than 2% (Mdn = -0.06) was significantly different than the group with FLD more than 2% (Mdn = -2.44),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ . Finally, the variable LHS1 was also significantly different for the groups FLD less than 2% (Mdn = -6.2) and FLD more than 2% (Mdn = -8.47),  $U = 0.000$ ,  $z = -3.361$ ,  $P < 0.000$ .

## DISCUSSION

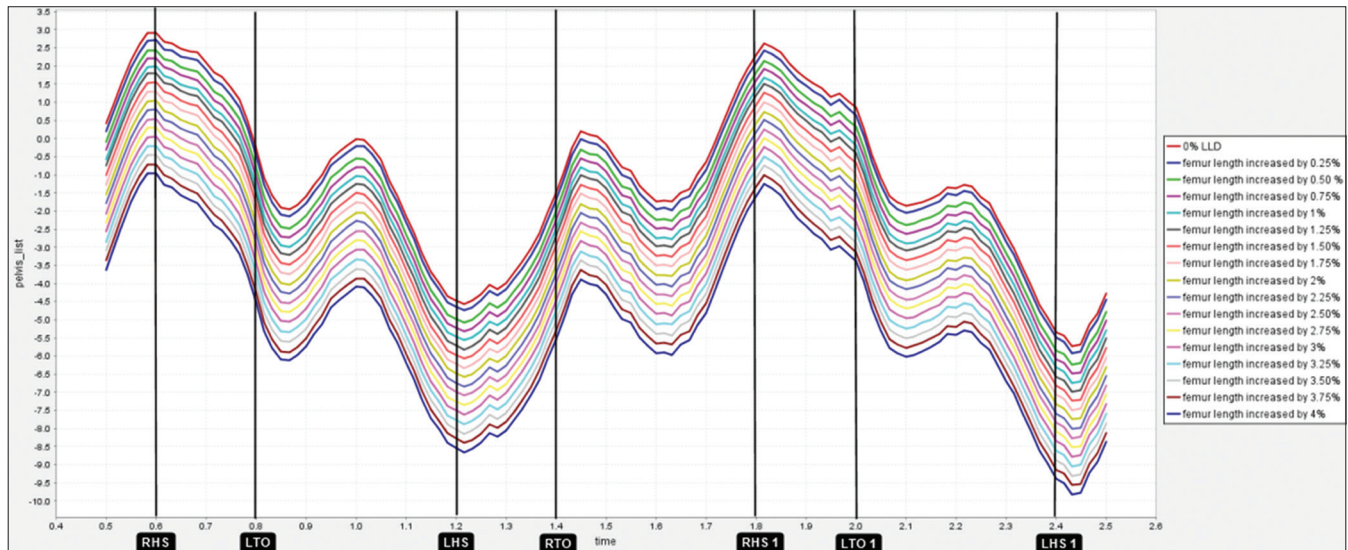
Pelvis list or pelvis obliquity is the movement of the pelvic girdle around the anterior-posterior axis or the rotation that takes place in the frontal plane of motion. As a person begins to walk, at the time when the right leg begins its support phase, the right pelvic girdle hikes-up while the contralateral pelvic girdle drops. The opposite happens when the other leg goes into the support phase where we see a pelvic hike in the ipsilateral side while the pelvis drops on the contra lateral side. This pelvic dance continues throughout the gait cycle to help the transition as the legs alternate from one leg to the other.

Our data show that the LLD interferes with this gait pattern with persistent listing to the contra lateral side of the longer leg. It was observed that as the level of discrepancy increased, the deviation from the normal gait was also increased, however, the pattern remained the same throughout the gait cycle. Our observation was supported by Morscher<sup>[12]</sup> and partially supported by Aiona *et al.*<sup>[2]</sup> who found 54% of their children with persistent pelvis list. Our second finding was that the

Table 3: Effect of FLD level on various gait variables and their P-values

Variable	FLD less than 2%	FLD more than 2%	P-value
Right heel strike	2.1000	-0.0750	0.000*
Left toe off	-1.1900	-3.5650	0.000*
Left heel strike	-5.3400	-7.6300	0.000*
Right toe off	-2.3600	-4.6250	0.000*
Right heel strike 1	1.4750	-0.7050	0.000*
Left toe off 1	-0.0650	-2.4450	0.000*
Left heel strike 1	-6.2000	-8.4750	0.000*

Significant difference at  $P < 0.05$ ; \*means P-value is significant



**Figure 1:** Pelvic list plotted against time for various levels of femur length discrepancy during a gait cycle. Note: RHS stands for right heel strike; LTO stands for left toe off; LHS stands for left heel strike; RTO stands for right toe off. Pelvic list occurs about the x-axis (anterior-posterior axis) of the pelvis with listing to the right being positive (+) and listing to the left being negative (-)

group with FLD with less than 2% was significantly different than that of the group with FLD more than 2% in regard to the variable pelvic list for all gait events.

The pelvic list is accompanied by an ipsilateral lumbar bending causing an increased compressive load to the lumbar discs which may contribute to degenerative changes of the lumbar.<sup>[13]</sup> The pelvic list can further expose the femoral head on the longer side which is believed to be a contributing factor to early osteoarthritis.<sup>[12]</sup>

## CONCLUSION

1. Our data show that the FLD interferes with the ideal gait pattern with persistent listing to the contralateral side of the longer leg
2. Pelvic list was shown to be significantly different between the groups with FLD less than 2% and FLD more than 2% for all the gait events in regard to the variables, namely, right heel strike, left toe off, left heel strike, and right toe off
3. Pelvic list is an important compensatory strategy in FLD, therefore, a person with exaggerated pelvic list should be screened for the condition of LLD (FLD).

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## Research Article

# A comparative study of physical fitness among all India – Interuniversity kho-kho men's team of Mysore University and Davangere University

H. R. Muzeebulla

Department of Physical Education, Bapuji First Grade College, Tumkur, Karnataka, India

### ABSTRACT

The purpose of this study is estimation of kho-kho men's team of all India – Interuniversity of Mysore University and Davangere University male kho-kho players and physical fitness. The present study or subject topic is selected to compare Mysore University and Davangere University kho-kho men's team. The age of the players 18–25 years with the help of expert researcher could have selected on the basis of researcher which could have selected on the basis of coordinative variables, namely, physical fitness differentiation and *t*-test which was applied. The hypothesis was formulated on the basis of assumption of the statistical test which was applied and the physical efficiency index No 3 and 9 scoring for Harword step test to analyze the result to study Mysore University men's team that has more physical fitness and ability than the Davangere university Men's team.

**Keywords:** Achievement, Performance, Physical fitness

### INTRODUCTION

Physical education scope is very wide. For the development of a person, it is possible with physical education and sports department. Physical education research works have been done and is also going on as sports department is wide. Scientifically researches are necessary and promoting the research is very important. A person development will be not only with the education but also with physical education and sports activities. It is only known with the research work. Many physical education research works are done and going on which can be supported. Research means development of educational quality and maintenance in subject to achieve goals in sports department through the detective work. The guidance needed for the development of sports department, technology, scientifically training method, training way, educationally to maintain the quality of physical education, the study of previous subject deeply utilizing it for the development of sports department and contributing it for the society in this way not only old, and the new research made physical education

development authenticity scientific research program are also interesting exciting questionnaire and dangerous facts are involved. Many experts have expressed their own opinions. In research scholar, we can observe.

### Hypotheses

There would be significant difference between the Davanagare University kho-kho men's and Mysore University kho-kho men's and in Mysore University kho-kho players, their level of physical fitness, and better performance, this hypotheses are formulated on the basis of assumption of that in contents of Mysore University kho-kho men players have been accepted to perform at their level best the true contest of Davangere University kho-kho men players physical fitness conditioning, which are less than the Mysore University kho-kho men players.

### METHODOLOGY

A comparative study of physical fitness of Mysore University kho-kho men players and Davangere university players, about physical fitness and the test conducted is measurement of cardiovascular endurance test. An accurate measurement of the heart rate is necessary if results from test are to be meaningful

**Address for correspondence:**

H. R. Muzeebulla,

to have trouble on counting your heart rate. The results will not be accurate for this evaluation, the pulse will be counted for 30 s counts, while remaining seated refrain from talking and unnecessary movement. During periods, when Heart Rates are being counted that these activities can influence results.

when taken both the average 0.6% will be more in Mysore University kho-kho men’s team than in Davangere University kho-kho men’s team. Sportsmen who have good physical fitness, their performance is also good and better.

## CONCLUSION

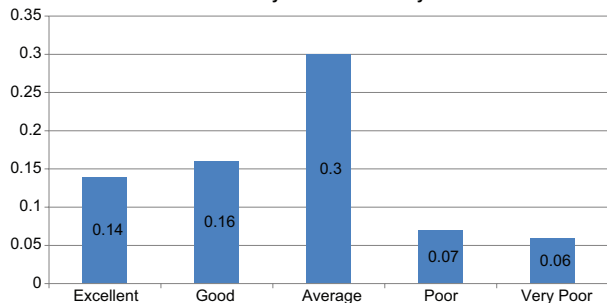
In Mysore University kho-kho men’s team and Davangere University kho-kho men’s team, there is a variation in the motor components. Mysore University kho-kho men’s team has more strength 93% than Davangere University kho-kho men’s team. Davangere University kho-kho men’s team has physical fitness performance 87% that is 0.6% less than the Mysore University kho-kho men’s team. The sports man having good physical fitness have good performance and the sports man having less physical fitness, there will be some difference in performance.

Research in physical education is crucially not limited to an area, it is much widened, by the research in sports department scientifically changes are possible with research work only that helps the players of the country to achieve victory in this way and also see development in training by the research is sports country’s respect and status raises and more medals can be won. Physical education research works have been done and are going on to achieve a good position in sports department. To achieve good position in physical education, sports men should not be limited to only activities but much priority should be given to research.

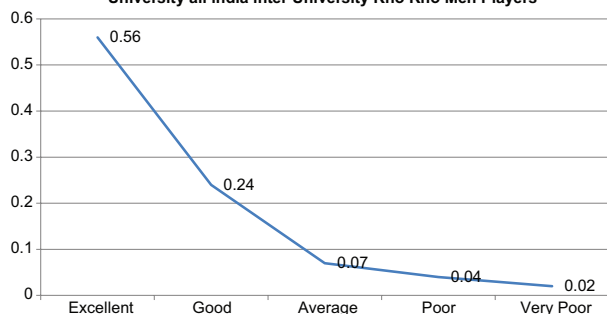
## RESULTS AND DISCUSSION

As we have conducted, a comparative test in all India interuniversity kho-kho players. A sample of 40 male players of age group 18–25 years have taken in Mysore University kho-kho men players and Davangere University kho-kho men players for physical fitness and motor ability test, by doing test, we get speed, strength, flexibility, coordination, endurance, body balance, and ability will be more and if the result of heart rate is less than the expected, then the motor components strength will be less. In Mysore University kho-kho men players, the performance of physical fitness is 93% when compared to Davangere University kho-kho men players,

Classification of Physical Fitness in Davangere University all india inter University Kho Kho Men Players



Classification of Physical Fitness in Mysore University all india inter University Kho Kho Men Players



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## Research Article

# A comparative study of speed and agility among basketball players and handball players of Gulbarga University

**Bennur Vishwanath**

Physical Director, Government First Grade College, Kamalapur, Gulbarga

### ABSTRACT

The purpose of the present study was to find out the speed and agility among the sample for the present study consists of 20 male basketball players and 20 male handball players of Gulbarga University. The subjected was selected randomized method from the age group of 19–23 years of Gulbarga University players. To assess the speed and agility, the 50 m run test and shuttle run test were conducted among basketball players and handball players.

**Keywords:** Speed, Agility, Basketball, Handball

### INTRODUCTION

Basketball is a team sport where one team, usually consisting of five players on each team, plays against each other on a rectangular court. The objective is to get the ball through a hoop mounted high on a backboard on the opponent's side of the court, while preventing the opponent from shooting it into your team's hoop. It is a very popular sports worldwide, played with a round and usually orange (orange-brown) ball that bounces. Basketball players mainly use skills such as dribbling, shooting, running, and jumping. Each made basket is worth two points, while a basket made from beyond the three-point line is worth three points. If a player gets into too much physical contact, they may be given free throws which are worth one point each. The game typically lasts for four quarters and the team with the most points at the end of the four quarters win the game. If the score is tied at the end of the game, there will be something called overtime, which is additional play time to allow one team to win the match.

The game is played between men's teams or between women's teams. Basketball has been played in the Summer Olympic Games since 1936. The shot clock rule started in 1954 for professional basketball. The first basketball game took place in 1892, where the court was half the size of what it is today. In 1891, the game was invented by James Naismith.

#### Address for correspondence:

Bennur Vishwanath,  
E-mail: vabglb@gmail.com

Handball (also known as team handball, European handball, or Olympic handball) is a team sports which two teams of seven players each (six out court players and goalkeeper) pass a ball using their hands with the aim of throwing it into the goal of the other team. A standard match consists of two periods of 30 min, and the team that scores more goals wins.

### Motor Components Required for Basketball Players and Handball Players

1. Speed/quickness, balance, and coordination
2. Motivation and self-confidence, skill, and technique
3. Strength and power, reaction time
4. Analytic and tactical ability
5. Flexibility, agility

Body size and composition, aerobic endurance.

### METHODOLOGY

The purpose of the present study was to find out the speed and agility among male basketball players and male handball players of Gulbarga University.

#### Methodology

The sample for the present study consists of 20 male basketball players and 20 male handball players of Gulbarga University. To assess the speed and agility, the 50 m run test and shuttle run test were conducted among basketball players and handball players.

**Table 1: Mean values of 50 m run between handball players and basketball players**

	Group	N	Mean	SD	SE	t	df	Sig. (two tailed)
50 m	Handball players	20	7.01	0.23	0.07	-1.80	37.00	0.09
	Basketball players	20	7.26	0.44	0.13			

**Table 2: Mean values of shuttle run test between handball and basketball players**

	Group	N	Mean	SD	SE	t	df	Sig. (two tailed)
Shuttle run test	Handball players	20	15.34	0.55	0.17	2.53	38.00	0.02
	Basketball players	20	14.12	1.20	0.37			

## 50 M Run

Sprint or speed tests can be performed over varying distances, depending on the factors being tested and the relevance to the sport.

### Purpose

The aim of this test is to determine acceleration and speed.

### Equipment Required

Measuring tape or marked track, stopwatch, cone markers, flat and clear surface of at least 70 m.

### Procedure

The test involves running a single maximum sprint over 50 m, with the time recorded.

### Results

Two trials are allowed, and the best time is recorded to the nearest two decimal places.

### Agility Shuttle Run Test

This test describes the procedure as used in the President's Challenge Fitness Awards. The variations listed below give other ways to also perform this test.

- Purpose: This is a test of speed and agility, which is important in many sports.
- Equipment required: Wooden blocks, marker cones, measurement tape, stopwatch, non-slip surface.
- Procedure: This test requires the person to run back and forth between two parallel lines as fast as possible. Set up two lines of cones 30 ft apart or use line markings, and place two blocks of wood or a similar object behind one of the lines. Starting at the line opposite the blocks, on the signal "Ready? Go!" The participant runs to the other line, picks up a block, and returns to place it behind the starting line, then returns to pick up the second block, then runs with it back across the line.
- Scoring: Two or more trails may be performed, and the quickest time is recorded. Results are recorded to the nearest tenth of a second.

## RESULTS AND DISCUSSION

The results of the study show that handball is having better speed a compare to basketball players and basketball players are having the better agility compare to handball players.

In Table 1, the mean values of 50 m run of handball players are 7.01 and basketball players are 7.26. The average mean of cricketers in 50 m run is lesser than the basketball players. It was found that handball players are having good speed compare to the basketball players. Hence, it is also concluded that is required in handball players compare to basketball and handball players which are having better speed than basketball players. Speed plays an important role in handball and basketball to exhibit the high level of performance.

In Table 2, the mean values in shuttle run test of handball players are 15.34 and basketball players are 14.12. The basketball players are having better agility compare to handball players.

## CONCLUSION

1. It is concluded that handball players are having better speed than basketball players.
2. It is concluded that basketball players are having better agility than handball players.
3. Conditioning exercises play a major role for improvement of speed among basketball and handball players.

## RECOMMENDATIONS

1. Similar studies can be conducted on other events and among females.
2. This study also helps the physical educators and coaches to improve their training regime to excel in basketball and handball players.

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## Research Article

# Packet hiding methods to prevent selective jamming attacks in wireless networks

Shaik Mohammad Ali

M. Tech (CSE)

### ABSTRACT

The open nature of wireless medium leaves an intentional interference attack, typically referred to as jamming. The attackers are well known about of the protocol information and also about network secrets. The jamming can interrupt packet transmission and also can attack packets in wireless networks. The network performance will be degraded by jamming the transmission of packets in the network. Hence, there is a need of mechanisms to protect data against jamming attacks. Here, we address the problem of jamming attacks, selectively targeting the messages during transmission period. To protect data against jamming attacks, we consider the schemes, namely, strong hiding commitment schemes, cryptographic puzzles hiding schemes, and all-or-nothing transformation hiding schemes. These schemes can be effectively used for protecting the packets while transmitting in networks.

### INTRODUCTION

In the daily life functioning of people and organizations, the wireless sensor networks are significant aspect, and availability faults become less tolerable. Because of the open environment of the wireless standard, there were numerous security problems. Anyone who is having knowledge about the facts of the network secrets information and the implementation particulars of the protocols can jam the messages which are being transmitting. Network performance is degraded just by jamming in wireless transmissions. Jamming is the term where the attacker corrupts transmitting messages as a result of causing packet collisions at receivers.

Jamming attacks were taken into consideration under the external risk model, where the jammer is not at all present inside the network. In this external risk model, jamming strategies might be the nonstop or random transmission of the high-power interference signals. Hence, attacker should send the transmission signals, but this transmitting signals having several disadvantages. In this project, we focus on the problem of jamming under an internal risk model, here, we consider an adversary who is well known about the network secrets information and the implementation particulars of the

protocols at layers in the networks. In the wireless networks transmission, these attacks are concentrated like, where the attacker selectively targeting packets of very importance by sharing his understanding on the implementation information of the network protocols at respective layers. Here, cryptographic primitives such as strong hiding commitment scheme (SHCS), cryptographic puzzle hiding scheme, all-or-nothing transformation are used for preventing attacks within wireless transmission medium and such the inside understanding of the attacker is decreased.

### LITERATURE SURVEY

In the network environment, most of time there is a probability of attacks. The majority of the time there is no assurance about the packets which will be easily transferred in the network. In turn, it affects network performance degrade. To solve the difficulty facing the performance of network and traffic of the network, we implement a data hiding method with the intention of sending data securely in the network. Using the cryptographic methods, we can prevent the packet modifications and packet droppings, attacks of jamming are hard to discover them. They have been proven to actualize significant denial-of-service (DOS) attacks in opposition to networks. Jamming is usually the idea of which has been used, once the attacker disrupts the particular reception regarding the messages simply by transmitting a continuous jamming signal

Address for correspondence:  
Shaik Mohammad Ali,  
E-mail: [smdali6677@gmail.com](mailto:smdali6677@gmail.com)



or many short jamming pulses. Previously levels, jamming attacks have been considered below a great external risk model, in which the jammer is not present within the network.

The networks which were infrastructure less are MANETS. Computers and laptops are no need to follow any fixed infrastructure to utilize the network services. The absence of the dedicated link between the wireless nodes leaves the communication area under the threat. Every node can access wireless anonymously to the wireless node at any time. If a dedicated link is captured by the adversary node means, then the communication through the link can be used for jamming. The adversary nodes can immediately access and control the information once they capture the link and can perform jamming attacks. When the node acquires the link, the node records the data, manipulates it, and can send the equivalent packet frequently and to the destination node. If the adversary node performs jamming against any particular data, that is, targeting on the important data, then it is “selective jamming.” Thus, appropriate highly protection aspects require to protect the data from adversary and to ensure secured communication in the network.

Here, the main issues are as follows:

- a. No secret transmission
- b. Jamming attacks occurs
- c. No proper selective jamming

### Packet Structure of Wireless Network

Packet is such defined as a unit of data. To enhance communication performance between two network devices, every message sent and that they were usually separated in the form of packets through the hardware and software. Using the protocols, normal packets are created in some normal packet format. Format of the packet having the subsequent fields, initial one embody a header, second is that the message data present in the body (also called the payload), and in general, third one may be a footer (also called the trailer). The header content of a packet contains the packet destination (the destination address) and also it indicates the length of the message data. Payload is additionally known as the body or data of a packet. This is often the particular data that the packet was delivered to the destination. If a packet is fixed length, then generally the payload could also be padded with blank data to create it the proper size. The footer content of a packet contains knowledge that can signify the end of a packet, like a particular sequence of the bits called as a magic number. Individually, the packet header and packet footer will have error checking data.

The initial message is reassembled by the receiving device. This was done by reassembling the individual packets into the initial message, and by stripping off header and footer and concatenating packets within the correct sequence order.

### Jamming Attacks

Jamming attack can cause the collision in networks transmission medium and also a jamming node is such that where the node can perform various actions in the normal flow of data transmission. It will be acting as an original sender behavior. Hence, jammer can with no trouble recover or modify that original transmission data. There are different types of jamming method which are available in the network models.

- a. Constant jammer will send the jamming indicator of certain period at a regular time
- b. Deceptive jammers will send regularly to inject packet not including space of time between transmissions
- c. Random jammer sends jamming warning sign of certain extent at random preferred period of time. It is more powerful jamming which is done efficiently.

## SYSTEM ANALYSIS

### Existing System

Jamming attacks were tough to find and had several security threats. They have been proven to actualize significant DOS attacks in opposition to networks. Jamming is usually the idea of which has been used, formerly, the attacker disrupts the particular reception regarding the messages simply either by transmitting a non-stop jamming signal or numerous short jamming pulses. Jamming attacks are considered below a great external risk model, in which the jammer is not present within the network. During this internal risk model, jamming ways will be either the repeated or random transmitting of high-power interfering signals.

### Disadvantages of Existing System

In this internal risk model, jamming behavior comprises the repeatedly jamming signal or many short jamming pulses. However, sending signals using an “always-on” plan have quite a few disadvantages.

- First, the adversary needs to expend an quantity of force toward on the way to jam frequency bands of required
- Second, the continual presence of unusually more interference levels makes this kind of attacks simple to detect
- Packet was delayed to reach to reach destination
- Packet dropouts due to collisions between neighboring nodes.

### Proposed System

In this project, we are focusing on the problem of jamming attacks over an inside risk model. We are having trouble to cause a refined adversary who knows the network secrets and implementation details of the communication network protocols in the any layers in the communication network stack.

The adversary reveals internal facts for introducing jamming attacks selectively within which particular messages are

targeted which were “more essential.” As an instance, the jammer will target the messages transmitting at the respective layer, as he can make jamming activity.

To show the jamming attacks selectively, the adversary should be able to implement a “jam” approach earlier and before transmitting the information. Such strategy will be actually by jamming the packets by means of protocol semantics.

### Advantages of Proposed System

- Selective jamming attacks are prevented by methods used and implemented three schemes that will ensure security for data transmitting on fly, where data are hidden and hence jammer cannot see the data transmitting
- Packets will be transmitted without any delay to the destination
- Packet collisions are not occurred by the security given through the methods introduced.

## FEASIBILITY STUDY

Feasibility analysis decreases the development risks. The important areas taken into consideration in feasibility analysis are as follows.

The feasibility study issues concerning the concerns created to check whether or not the system is appropriate are developed all told terms. Once an inspiration to develop software is hints the question that arises 1<sup>st</sup> can pertain to the feasibility aspects. It involves developing and understanding of the chosen program. It calls for call on the info sources, study approaches, and instruments accessible. The info is tabulated, analyzed and thereby numerous interpretations are created finally primarily based on the analysis. There are completely different aspects within the feasibility study.

1. Economical feasibility
2. Technical feasibility
3. Operational feasibility.

### Economical Feasibility

A cost-profit analysis is created up for the project. The most of the part in economic feasibility is extra cash to not be spent. Value the advantages within the system are reduced manual cost to an excellent extent reduced typical examination conduction and reduced stationary buying value.

### Technical Feasibility

The new system java software package and feasibility file support. The planned systems are going to be enforced in java. All the desired hardware and software package are accessible with the organization. Therefore, the project is often developed with the exiting software package. Hence, the project is technically possible. Since java is often utilized in any environment, it is considerably comfortable. The Net Beans

tool which is greatly used for development and execution of complete project and it is technically available and supported to my project.

### Operational Feasibility

The project is very user interactive application and network primarily based. Thus, it is extremely operational. It is very easy to control and even a novice person will use this system terribly simply. Terribly factor is not any coaching is required for the user. No difficult command set is to be remembered or memorized. The system is totally operationally possible.

## IMPLEMENTATION

### Java Technology

The inventors are java needed to style a language that might offer answer to a number of the issues encountered in modern programming. They needed the language to be reliable, moveable, and distributed however also easy, compact, and interactive. A Sun Microsystems formally describes java with following attributes:

- Compile and interpreter
- Platform independent and moveable
- Object oriented
- Distributed
- Familiar, simple, and little
- Multithreaded and interactive
- High performance
- Dynamic and extensible.

Although the on top of seems to be an inventory of buzzwords, they apply describe the complete potential of language. These options have created java the primary application language of the planet wide internet. Java will become the primer language for all-purpose complete applications.

## CONCLUSION

When the attacker is present inside the network, the transmitting messages in wireless transmission medium can be attacked effortlessly. The attackers are well known about the protocol information and also about network secrets. Hence, the jammer can attack packets which are being transmitted on fly. To provide better security to the data that is being in transmission, we implemented the three hiding schemes such as SHCS, cryptographic puzzle hiding scheme (CPHS), and all-or-nothing transformation hiding schemes (AONTHS). In the SHCS, the data are hidden and sent to destination using symmetric cryptography, where a jammer cannot see the data transmitting in the wireless transmission medium. In the CPHS, the receiver who wants to see the message should solve the puzzle within in specified time given and after successful solving the puzzle will result the respective

message. In the AONTHS, message is preprocessed that before the transmission, where attacker cannot attack because attacker cannot understand the data and receiver should do inverse transformation. With these schemes, the messages are being transmitting in networks which can be protected from attackers successfully.

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## Research Article

# Efficient manifold ranking: An efficient scalable graph-based ranking model for content-based image retrieval

Shaik Mohammad Ali

M. Tech (CSE)

### ABSTRACT

Graph-based ranking models have been widely applied in information retrieval area. In this paper, we focus on a well-known graph-based model – the ranking on data manifold model or manifold ranking (MR). Particularly, it has been successfully applied to content-based image retrieval, because of its outstanding ability to discover underlying geometrical structure of the given image database. However, MR is computationally very expensive, which significantly limits its applicability to large databases, especially for the cases that the queries are out of the database (new samples). We propose a novel scalable graph-based ranking model called efficient MR, trying to address the shortcomings of MR from two main perspectives: Scalable graph construction and efficient ranking computation. The Admin have control to add, delete, and modify the image database, and therefore, the user will search the image that needs to be accessed and later the graph is generated based on user search. Experimental results show that the proposed technique has high accuracy than other conventional methods for generating the graph.

**Keywords:** Manifold ranking, Efficient manifold ranking

### INTRODUCTION

In today's world, digital imaging was a great invention within the 20th century. Since digital cameras became popular, a large amount of digital images emerged in the late of the 20th century. The way to manage the huge amount of images and find desired images among them became an urgent issue during the same period. Techniques of retrieving a desired image are generally categorized into two basic classes. One is based on text-based key words to retrieve desired images in the image database. The other one based on image-based queries to retrieve desired images in the image database which is usually named as content-based image retrieval (CBIR) technique.

The graph-based ranking models are being used in information retrieval area. This paper mainly focused on the problem of applying a novel and efficient graph-based model for content-based image retrieval (CBIR). Traditional image retrieval systems are based on keyword search, such as Bing and Google image search. In these systems, a user keyword (query) is

matched with the context around an image including the title, manual annotation, and web document. These systems do not utilize information from images. However, these systems suffer many problems, such as shortage of the text information and inconsistency of the meaning of the text and image. Content-based image retrieval is a considerable choice to overcome these difficulties. CBIR has drawn a great attention in the past two decades.

CBIR methods are viable solutions to find desired images from digital image libraries. In a basic CBIR system, all digital images in a library are represented by their visual features (e.g., visual contents of images). Typical visual features include colors, shapes, edges, and textures to represent an image from different visual perspectives. Initially, these visual features are extracted from each image and stored in a feature database corresponding to the digital image library to facilitate the future use. When a query image is submitted to the system, visual features of the query image are first extracted. A matching technique is then utilized to compare the similarity between visual features of the query image and visual features of all digital images in the image database. Only those images having higher similarity scores are returned to the user as the retrieval results.

**Address for correspondence:**  
Shaik Mohammad Ali,  
E-mail: [smdali6677@gmail.com](mailto:smdali6677@gmail.com)

However, as the ranking of retrievals is calculated based on selected image features, the retrieval accuracy could also be unsatisfactory due to the semantic gap between low-level visual features and high-level semantic concepts. This semantic gap exists because images of similar semantic content may be scattered far away from each other in the feature space, while images of dissimilar semantic content may share similar low-level features. For example, given a query image with a black horse in the front view, an image with a white horse in a side view is considered similar to the query image from the view point of the semantic concept. However, the front view of a black horse looks very different from the side view of a white horse, so are their visual features (i.e., their visual features are different).

## PROPOSED SYSTEM

The proposed mechanism is an extension of manifold ranking (MR). In this paper, the original MR is extended and proposed an efficient model to achieve the shortcomings of MR from two perspectives: The first is scalable graph construction; and the second is efficient computation, especially for out-of-sample retrieval. Specifically, we build an anchor graph on the database instead of the traditional  $k$ -nearest neighbor graph, and design a new form of adjacency matrix utilized to speed up the ranking computation. The model has two separate stages: An offline stage for building (or learning) the ranking model and an online stage for handling a new query. With this model, can handle a database with 1 million images and do the online retrieval in a short time. The high-level block diagram of a basic CBIR system is shown in Figure 1.

Complexity to the date size. Note that we do not have to update the anchors frequently, as informative anchors for a large database are relatively stable (e.g., the cluster centers) even if a few new samples are added.

### Design of Adjacency Matrix

In this paper, a new approach presented to design an adjacency matrix  $W$  which is big advantage to handle some high dimensional data. The weight matrix  $Z \in R^{d \times n}$  can be seen as a  $d$  dimensional representation of the data  $X \in R^{m \times n}$ ,  $d$  is the number of anchor points. That is to say, data points can be represented in the new space, no matter what the original features are.

Then, with the inner product as the metric to measure the adjacent weight between data points, the adjacency matrix to be a low-rank form is designed.

### Efficient Ranking Model

In this efficient ranking model, the shortcomings of MR model by constructing a scalable graph and efficient ranking

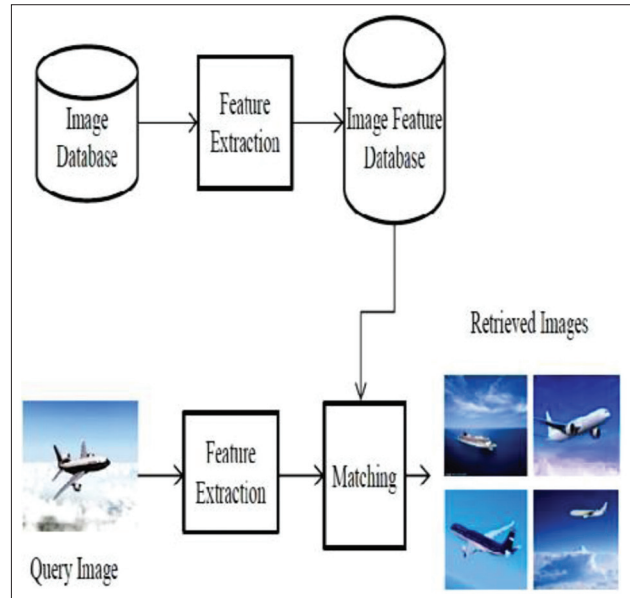


Figure 1: Block diagram of basic CBIR system

computations are addressed. The process of scalable graph construction and ranking computation is as follows.

### Scalable Graph Construction

In this scalable graph construction to handle huge databases, we want the graph construction cost to be sub-linear with the graph size. That means, for each data point; we cannot search the whole database as  $k$ -NN strategy does. To achieve this requirement, an anchor graph has been constructed and proposed a new design of adjacency matrix  $W$ .

### Anchor Graph Construction

Anchor graph is a low-rank approximation of neighborhood graph (such as  $k$ -NN), where the similarity between data points is measured by a small number of anchor points. In this paper,  $k$ -means algorithm has been used and selected the centers as anchors. The main advantage of building an anchor graph is separating the graph construction into two parts – anchor selection and graph construction. Each data sample is independent to the other samples but related to the anchors only. The construction is always efficient since it has linear.

Which means that if two data points are correlative ( $W_{ij} > 0$ ), they share at least one common anchor point, otherwise  $W_{ij} = 0$ . By sharing the same anchors, data points have similar semantic concepts in a high probability as our consideration. Thus, our design is helpful to explore the semantic relationships in the data.

### Efficient Computation

After graph construction, the main computational cost for MR is the matrix inversion whose complexity is  $O(n^3)$ . Hence, the data size  $n$  cannot be too large. Although we can use the iteration algorithm, it is still inefficient for large-scale cases.

During the computation process, the adjacency matrix  $W$  does not used. Hence, the matrix  $W$  is not saved in memory, but save matrix  $Z$  instead.

### Efficient Ranking for CBIR

In this part, efficient ranking applied to pure content-based image retrieval have been summarized. For more information, the data features are extended as follows.

Step 1: Extract the low-level features of images in the database, and use them as coordinates of data points in the graph.

Step 2: Select representative points as anchors and construct the weight matrix  $Z$  with a small neighborhood size  $s$ . Anchors are selected offline and does not affect the online process.

Step 3: When the user specifying or uploading an image as a query, get or extract its low-level features, update the weight matrix  $Z$ .

Step 4: At last, images with highest ranking scores are considered as the most relevant and return to the user.

### Complexity Analysis

- In this section, the complexity analysis of efficient ranking is represented; in this, both computation cost and storage cost of efficient ranking are included.
- In this efficient ranking, an anchor graph has been generated, that is, for each data sample, the relationships to its  $s$ -nearest anchors are calculated. The computation cost is  $O(nd \log s)$ . The k-means are used to select the anchors and need a cost of  $O(Tdn)$ , where  $T$  is the iteration number. However, this selection step can be done offline and unnecessarily updated frequently. At the same time, the sparse matrix  $Z \in Rd \times n$  with a storage cost  $O(sn)$  has been saved.
- In the ranking computation stage, complexity is  $O(dn + d3)$ .

## EXPERIMENTAL WORK AND RESULTS

The proposed system is implemented using JSP, HTML languages as frontend and database MySQL is used as backend to store the data of images. In this system, there are two login windows, which are represented as Admin login window and User login window. In Admin login window, the Admin can login and add, delete, and modify the data that are to be accessed by the user. In User login window, the user can login and access the data. The proposed system Admin login window is shown in Figure 2. In this window, the Admin can login by providing username and password to access the database. The login window is represented in Figure 3 as follows.

After logging the Admin has features like Admin can add images of different types, view all images in the database, view all image rankings, view all image details, view all searching history by users, and also view list of users accessing the database.

Figure 2: The window in which the Admin can add the images to the database.

Figure 4 represents the window in which the Admin can view the list of images in the image database.

Figure 5 represents the window which can be accessed by Admin to view the rank of the image in the databases which are searched by the user.

Figure 2: Image adding window

Figure 3: Admin login window

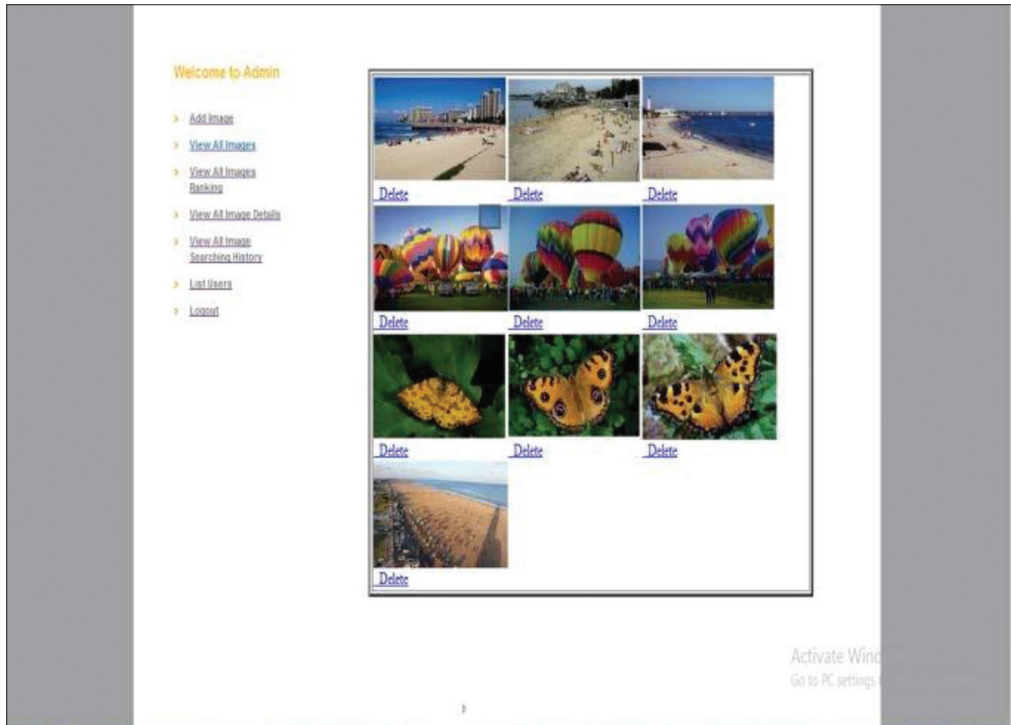


Figure 4: Window to view images in the database

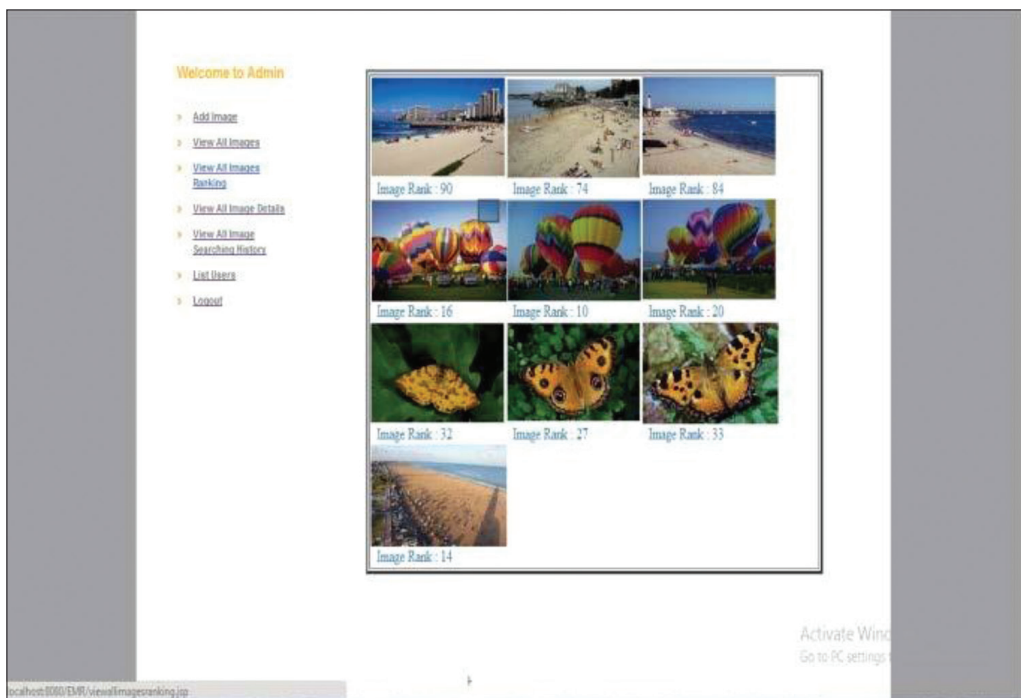


Figure 5: Window to view rank of the image

Figure 6 represents the window that can be accessed by the Admin to edit or to view the complete description of the image such as image type, image description, image rank, and image points.

Figure 7 represents the search results after performing the point based search by the user. The user insert the points that are given to the image, if the points match with the image,

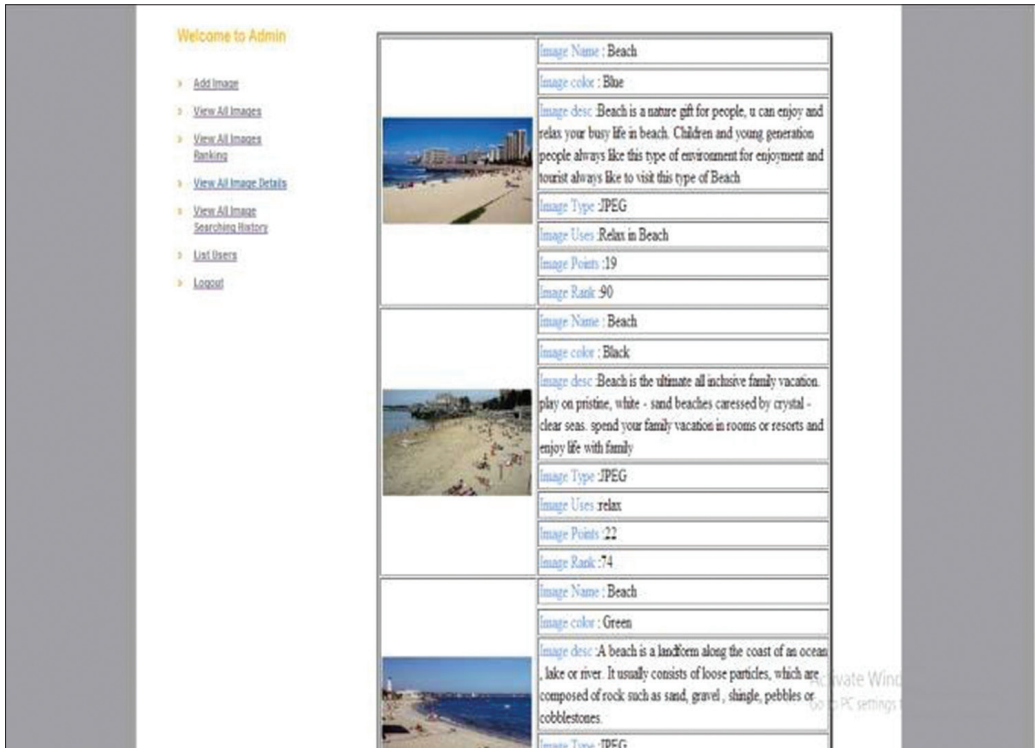


Figure 6: Window to view complete description of images

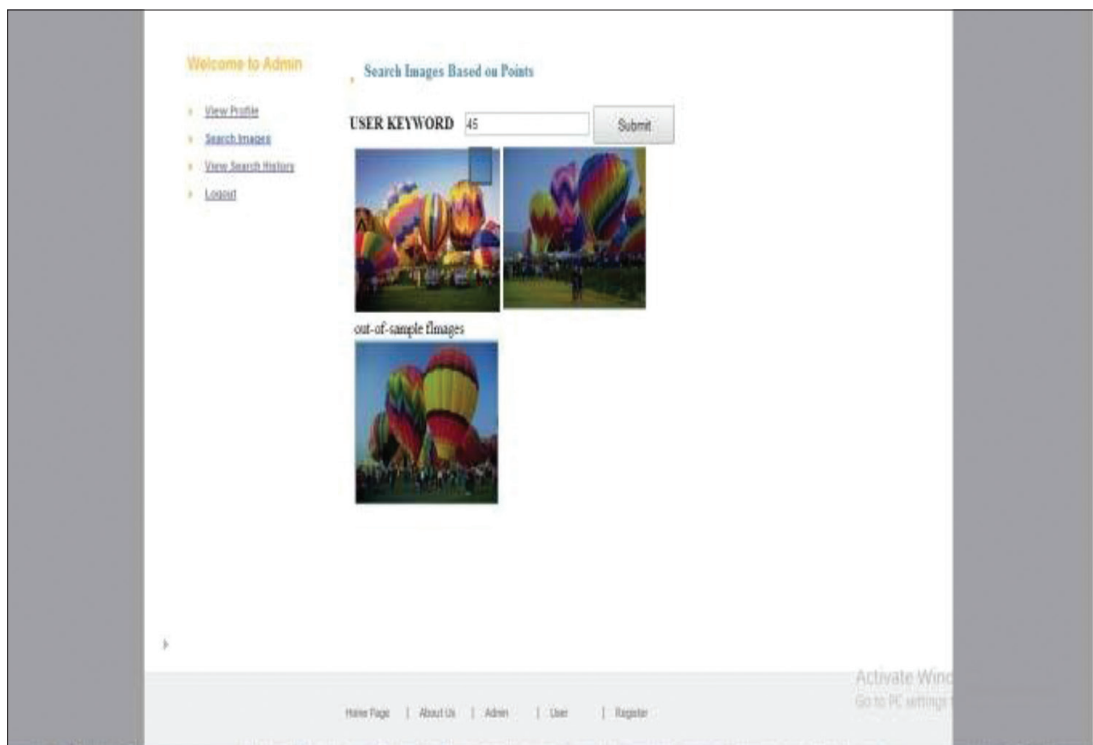


Figure 7: Search results after performing point search

then the respective image with points can be shown to the user otherwise it shows null to the user.

Figure 8 represents the search results after performing the content-based search by the user. The user insert the query



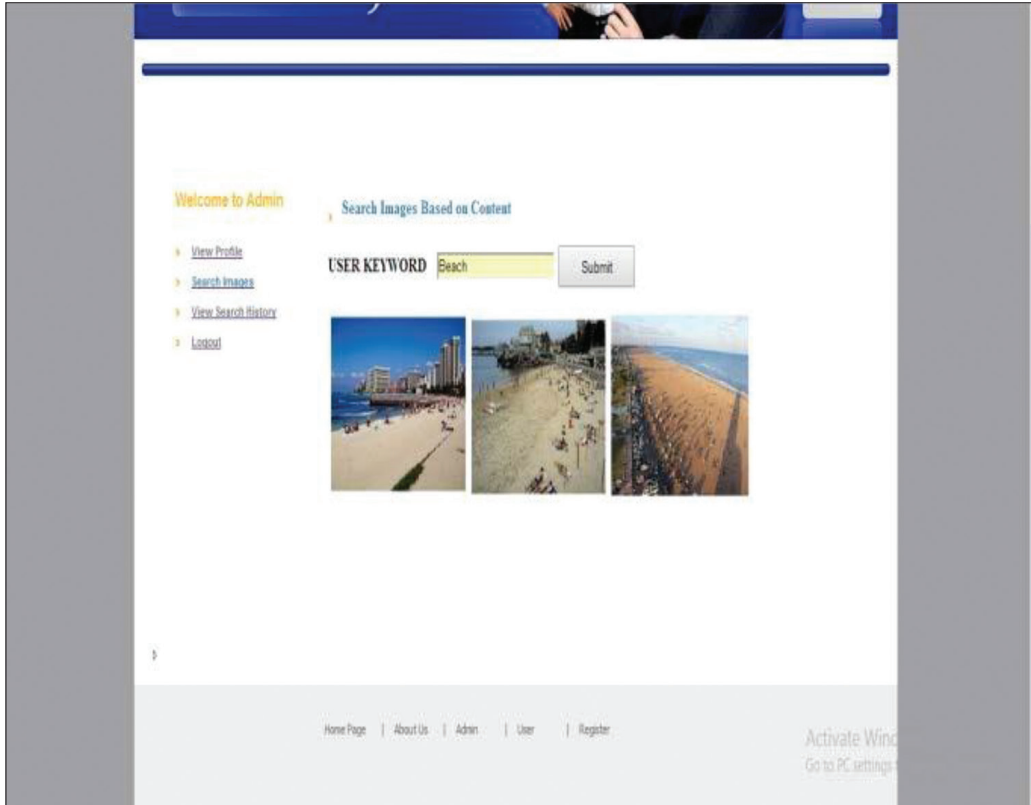


Figure 8: Search results after performing content-based search

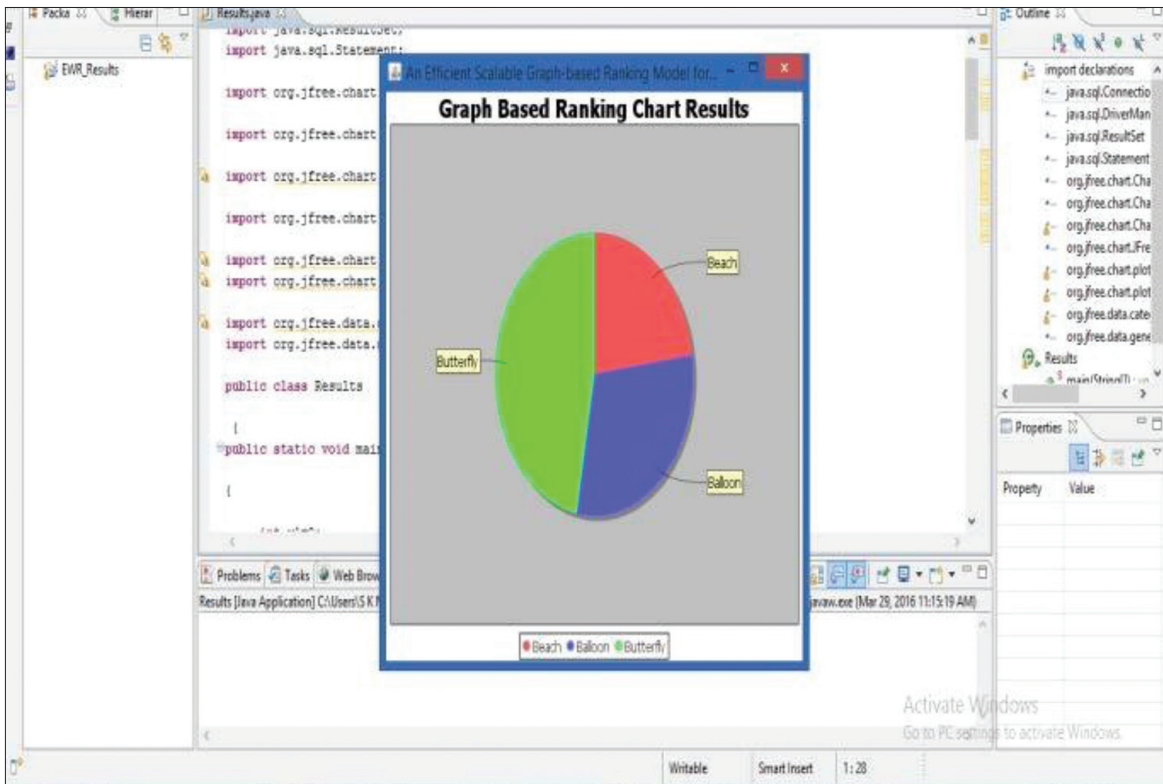


Figure 9: Graph ranking chart for search results

like “Beach” then search result with query will be shown to user.

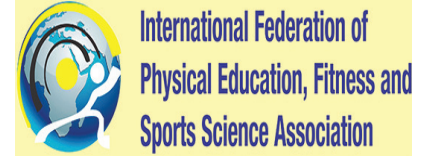
Figure 9 represents the generated graph after performing the search by the user. This graph can be viewed by the Admin to know the user interest.

## CONCLUSION

In this paper, an efficient scalable ranking model to handle the large-scale database effectively when compared to original MR model has been proposed. Efficient scalable graph-based ranking model to a CBIR application based on a real-world image database has been applied. By implementing this system, it is easy to manage huge database and generate graph related to image searched by the user effectively. Efficient scalable graph-based ranking model tries to overcome the disadvantages of MR by generating effective scalable graph and also reduces the computational time. This mechanism is feasible to large-scale image retrieval systems and also reduces the storage space.

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## Research Article

# A study on effect of yoga and behavior therapy on mental health problems among adolescents

Nalluri Srinivasa Rao

Department of Physical Education and Sports Sciences, P. B. Siddhartha College of Arts and Science, Vijayawada

### ABSTRACT

The intention of the present study to make out the effectiveness of yoga asana module and behavior therapy on mental health problems such as emotional and behavioral problems among adolescents. For the present study employed descriptive and pre-test-post-test design. The purposive sample consisted of 69 (Boys = 35, Girls = 34) who are studying 10<sup>th</sup> class in V.P.S Public School, Vijayawada, Krishna District. Youth Self Report (YSR 11–18 years) developed by Achenbach, (2001) was used for the study. The data were obtained and analyzed by means of *t*-test and paired sample *t*-test. The results observed a significant difference between pre-test and post-test measures of anxiety-Depression, Attention Deficit Hyperactive Disorder (ADHD) and conduct problems such as aggression and rule-breaking behavior on the application of yoga asana module and behavior therapy as an intervention for mental health problems such as emotional and behavioral problems among adolescents.

### INTRODUCTION

Adolescents are the future citizens of a country and it is imperative to systematically address their needs (Manpower Profile, 1996). The Indian Constitution (1950) asserted that all boys and girls up to the age of fourteen must be in schools. During this period, adolescents need special care as they undergo a complex process of emotional, physical and social changes. At times, failure to adjust with these changes leads to mental health problems. Both girls and boys are susceptible to suffer from these problems but, for adolescent girls, the problem gets compounded due to societal factors. Unfortunately, these needs of adolescents have not been addressed by the health system.

Behavior therapy is the use of empirically demonstrated behavior change techniques to increase or decrease the frequency of behaviors, such as altering an individual's behaviors and reactions to stimuli through positive and negative reinforcement of adaptive behavior and/or the reduction of behavior through its extinction, punishment, and/or satiation.

Yoga therapy is an alternative therapy that shows promise as an intervention for a variety of social, emotional, behavioral, and academic difficulties (Nardo and Reynolds, 2002). Yoga has an important role to play in the treatment of emotional and behavioral problems. Yoga techniques such as Pawanmuktassna, Suryanamaskar or Sun Salutation, Anulom-Vilom Pranayama, and Shavasana affects body, internal organs, endocrine glands, brain, mind, and other factors concerning body – mind complex. With a regular Yoga practice, adolescents with emotional and behavioral problems can develop a greater body awareness, emotional balance and concentration – increasing their capacity for schoolwork and creative play. This can also, in turn, aid their self-esteem.

### Objectives of the Study

The objectives of the study are as follows:

- I. To observe the mental health problems such as emotional and behavioral problems among adolescent high school students.
- II. To find out the significant difference between emotional and behavioral problems among adolescent high school students regards to gender.
- III. To find out the effectiveness of Yoga Asana Module and behavior therapy for coping or reducing emotional and behavioral problems among adolescent high school students.

#### Address for correspondence:

Nalluri Srinivasa Rao,

E-mail: dr.nallurisrinivasrao@gmail.com

### Sample

The purposive sample consisted of 69 adolescents (Boys = 35; Girls = 34) and who are studying 10<sup>th</sup> class in V. P. S. Public School, Vijayawada, Krishna District of Andhra Pradesh.

### Tools

Youth Self-Report (YSR) developed by Achenbach (2001) was used. This tool assesses emotional and behavioral problems of early adolescents (11–18 years). The YSR syndrome scales are anxious-depressed, withdrawn-depressed, somatic complaints, social problems, thought problems, attention problems, rule breaking behavior, and aggressive problems. There are 112 items in this self-report measure.

### Demographical Variables

Variables included gender. It consists of boys and girls

### Design of the Study

This study followed quantitative research approach and makes use of descriptive and pre-test-post-test design techniques to attain its intentions.

### Procedure

The present study consisted of three phases.

In Phase I, permission was obtained from the schools. After seeking permission from the concerned Head Master of P.L.N. Z.P. high school, the students were informed and explained about the purpose of the study. The researcher gave instructions to them about filling of the questionnaire. They were asked to read the instructions carefully and give their authentic responses after reading each of the items and select responses as “Zero” indicated as “not true,” “1” indicated as “somewhat,” and “2” indicated as “very true.” Student was informed to respond only to one option to every item. They are also told to answers all the items without fail. They were also informed that the responses will be kept highly confidential and used for research purposes only. The instrument was administered. Wherever doubts were raised, the researcher explained to the sample.

In Phase II, based on the findings of Phase I data, a psychological intervention was designed which included Yoga and Behavior Therapy for a period of 15 weeks. Behavior therapy was administered on the experimental group in individual and group sessions. Individual session were given for seven sessions, each session comprised 30 min over a span of 15 weeks during morning time.

This session aimed at identifying and building on their strengths, cope with daily problems, and control their attention and aggression. It was also aimed to handle the disruptive behaviors and promote change. Support was extended in self-monitoring one’s own behavior and giving self-praise

or rewards for acting in a desired way, such as controlling sustaining attention for longer period by focusing on a task. Hence, the individual session was conducted to increase the frequency of desirable behavior. A token or point system was helpful for keeping a record of the good behavior. In addition, books and pens were distributed as a token of appreciation for desirable behavior to adolescents.

Behavior therapy for group was also conducted for the experimental group. The group had to take 29 sessions for 15 weeks. Each session took 50 min as this consisted of a group.

Yoga therapy was administered on the experimental group. In Yoga, Pawanmuktasna, Stretching asanas, Suryanamaskar or Sun Salutation, Anulom-Vilom Pranayama with a posture of Padmasana (a type of sitting posture), Tadasana, Natarajasana, Vrukshasana, Trataka Kaiya and Shavasana was employed to the experimental group in 15 weeks. Each session took 45 min. These sessions were conducted in the evening hours.

In Phase III, testing of the effectiveness of yoga asana module and behavior therapy intervention was done on the experimental group. Soon after the completion of intervention of 9 weeks duration post-test on Emotional and Behavioral Problems or Youth Self-Report (11–18 years) was conducted.

### Statistical Analysis

After scoring, the collected responses were tabulated, analyzed and interpreted using SPSS (Windows-16) by means of Percentages, Mean, Standard Deviation, *t*-test and Paired Sample *t*-test.

## RESULTS AND DISCUSSION

Table 1, results show that significant differences between gender with anxiety- depression in pre-test and no significant difference between gender with anxiety-depression in post-test.

In pre-test, the domain of anxiety- depression, girls mean scores ( $m = 4.95$ ,  $std = 3.06$ ) is higher when compared to mean score ( $m = 3.33$ ,  $std. = 1.03$ ) of boys, *t*-value is  $t = 2.14$  which is significant, ( $P < 0.05$ ).

In post-test, the domain of anxiety-depression, boys mean score ( $m = 11.56$ ,  $std. = 1.98$ ) is higher when compared to mean score ( $m = 10.43$ ,  $std. = 3.01$ ) of girls, *t*-value ( $t = 1.36$ ) is not significant, ( $P > 0.01$ ).

Table 2, results show that no significant differences between gender with Attention Deficit Hyperactivity Disorder (ADHD) in pre-test and post-test.

In pre-test, the domain of Attention Deficit Hyperactivity Disorder (ADHD), boys mean scores ( $m = 13.50$ ,  $std = 2.81$ ) is

**Table 1: Results on mean difference between gender of anxiety – Depression in pre-test and post-test**

Variables	Gender		n		Mean		SD		t-value	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Anxiety-depression	Boys	Boys	35	34	11.56	3.33	1.03	1.98	2.14*	1.36
	Girls	Girls	35	34	10.43	4.95	3.06	3.01		

\* $P < 0.05$ . Significant level.

**Table 2: Results on mean difference between gender of thought and attention (ADHD) in pre-test and post-test**

Variables	Gender		n		Mean		Std. Deviation		t-value	
	Pre test	Post test	Pre test	Post test	Pre test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Thought and Attention (ADHD)	Boys	Boys	35	34	13.50	4.00	2.81	2.17	1.33	1.36
	Girls	Girls	35	34	12.19	7.00	3.25	4.82		

**Table 3: Results on mean difference between genders of conduct problems in pre-test and post-test**

Variables	Gender		n		Mean		Std. Deviation		t-value	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Conduct problems	Boys	Boys	35	34	12.72	3.89	1.41	1.183	3.04**	2.07*
	Girls	Girls	35	34	13.95	4.62	1.12	1.02		

\* $P < 0.05$ . Significant level, \*\* $P < 0.01$ . Significant level.

**Table 4: Results on significant difference between pretest-posttest on anxiety- depression**

Variables	Mean		SD		t-value
	Pre-test	Post-test	Pre-test	Post-test	
Anxiety-depression	10.95	4.21	2.62	2.46	10.62**

\*\* $P < 0.01$ . Significant level.

**Table 5: Results on significant difference between pre-test-post-test on thought and attention (ADHD)**

Variables	Mean		SD		t-value
	Pre-test	Post-test	Pre-test	Post-test	
Thought and Attention (ADHD)	12.79	5.62	3.09	4.08	9.73**

\*\* $P < 0.01$ . Significant level.

**Table 6: Results on significant difference between pre-test-post-test on Rule-breaking and aggressive behavior (Conduct problems)**

Variables	Mean		SD		t-value
	Pre-test	Post-test	Pre-test	Post-test	
Rule-breaking and aggressive behavior (Conduct problems)	13.38	4.28	1.39	1.15	37.44**

\*\* $P < 0.01$ . Significant level

higher when compared to mean score ( $m = 12.19$ , std. = 3.25) of girls,  $t$ -value is  $t = 1.33$  which is not significant ( $P > 0.01$ ).

In post-test, the domain of Attention Deficit Hyperactivity Disorder (ADHD), girls mean scores ( $m = 7.00$ , std. = 4.82) are higher when compared to followed by mean score ( $m = 4.00$ , std. = 2.17) of boys,  $t$ -value is  $t = 1.36$  which is not significant ( $P > 0.01$ ).

Table 3, results show that significant differences between gender with conduct problems in pre-test and post-test.

In pre-test, the domain of conduct problems, girls mean scores ( $m = 13.95$ , std = 1.12) are higher when compared to mean score ( $m = 12.72$ , std. = 1.41) of boys,  $t$ -value ( $t = 3.04$ ) is highly significant ( $P < 0.01$ ).

In post-test, the domain of conduct problems, girls mean scores ( $m = 4.61$ , std. = 1.02) are higher when compared to followed by mean score ( $m = 3.89$ , std. = 1.18) of boys,  $t$ -value ( $t = 2.07$ ) which is significant ( $P < 0.05$ ).

Table 4, results show that significant differences between pre-test and post-test in anxiety –depression among adolescent students. In the domain of anxiety-depression, mean scores ( $m = 10.95$ , std. = 2.62) of pre-test are higher when compared to mean score ( $m = 4.21$ , std. = 2.46) of post-test,  $t$ -value ( $t = 10.62$ ) which is highly significant ( $P < 0.01$ ).

Table 5, results show that significant differences between pre-test and post-test in Attention Deficit Hyperactivity Disorder (ADHD) among adolescent students. In the domain of Attention Deficit Hyperactivity Disorder (ADHD), mean

scores ( $m = 12.79$ ,  $std. = 3.09$ ) of pre-test are higher when compared to mean score ( $m = 5.62$ ,  $std. = 4.08$ ) of post-test,  $t$ -value ( $t = 9.73$ ) is highly significant ( $P < 0.01$ ).

Table 6, results show that significant differences between pre-test and posttest in conduct problems among adolescent students. In the domain of Conduct problems, mean scores ( $m = 13.38$ ,  $std. = 1.39$ ) of pre-test are higher when compared to mean score ( $m = 4.28$ ,  $std. = 1.15$ ) of post-test,  $t$ -value ( $t = 37.44$ ) is highly significant, ( $P < 0.01$ ).

## DISCUSSION

The present study results show that in anxiety–depression, there are significant differences between gender in pre-test and no significant differences between genders with anxiety–depression in post-test among the experimental group. There are no significant differences between gender with thought and attention (ADHD) in pre-test and post-test. In conduct problem results show that there are significant differences between gender with rule-breaking and aggressive behavior (conduct problems) in pre-test and post-test. The results observed that significant difference between pre-test and post-test in anxiety–depression, thought and attention (ADHD) and rule-breaking and aggressive behavior (conduct problems) among adolescent students.

The above results showed that interventions such as behavior therapy and yoga module are effective on anxiety–depression, thought and attention (ADHD) and rule-breaking and aggressive behavior (conduct problems) for managing anxiety–depression ADHD and conduct problems among adolescent students.

## CONCLUSIONS

The present study aimed to identify the effectiveness of yoga asana module and behavior therapy on mental health problems such as emotional and behavioral problems among adolescents. The results showed that yoga asana module and behavior therapy effectively worked on anxiety–depression, ADHD and conduct problems for managing anxiety–depression, ADHD and conduct problems such as aggressive behavior and rule-breaking behavior among adolescent students.

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## Research Article

# A study on resting metabolic rate, total daily energy expenditure, and physical activity level of female college students

D. Ravi Kumar<sup>1</sup>, M. V. L. Surya Kumari<sup>2</sup>, N. S. Dilip<sup>3</sup>, N. Bala Krishna<sup>4</sup>

<sup>1</sup>Research Scholar, Jawaharlal Nehru Technological University, Telangana, India, <sup>2</sup>Head, Department of Physical Education, G. Narayanamma Institute of Technology and Science (for Women), Hyderabad, Telangana, India, <sup>3</sup>Professor, JNTUH, Hyderabad, <sup>4</sup>Statistician, Apollo Health and Research Education Foundation, Hyderabad, Telangana, India

### ABSTRACT

This study was carried out on 60 female under graduate students aged between 18 and 20 years from a reputed Educational Institute in Hyderabad, to assess their resting metabolic rate (RMR), total daily energy expenditure (TDEE), and physical activity level (PAL). The anthropometric measures such as height, weight, body mass index (BMI), and body surface area (BSA) were measured using standard procedures. The body fat percentage, visceral fat, and RMR were measured using Karada scanner (Omron). The TDEE was estimated by time allocation pattern method. The PAL was estimated by taking the ratio between TDEE and 24 h RMR. The results of the study show that the mean BMI of the subjects was found to be in normal weight category ( $0.21.5 \pm 4.82$ ). and mean fat percent was  $29.2\% \pm 5.40$ . The mean RMR was  $1292 \pm 187$  Kcal/day and the mean TDEE was  $2169 \pm 251$  Kcal/day. The mean PAL value was 1.70 which indicates moderately active group based on WHO norms, but 58.3% subjects were in sedentary physical activity level group PAL between (1.48 and 1.69). The RMR and PAL were showing significant negative correlations with BMI, BSA, and positively correlated with LBM. From this study, it can be concluded that these female subjects had higher range of body fat percentage and 58.3% of the subjects were found to be sedentary physical activity level. Both RMR and PAL highly negatively correlated with BMI, BSA. Such studies would help to estimate energy needs of female college students based on their RMR and physical activity level to attain desirable body weight and body composition.

**Keywords:** RMR, TDEE, PAL, Females

### INTRODUCTION

A proper nutrition forms the foundation for optimum work performance. To a certain extent we are product of what we eat. The WHO recommended that use of energy expenditure rather than energy intake to estimate energy requirement of a population.<sup>[21]</sup> Any imbalance between energy intake and expenditure leads to malnutrition (Under and overweight). The resting metabolic rate (RMR) and physical activity are major components of energy expenditure. The high prevalence of physical inactivity in India is a growing challenge to public health.<sup>[12]</sup> The ability to assess energy expenditure (EE)

and estimate physical activity Level (PAL) in free-living individuals are extremely important in the global context of non-communicable diseases including malnutrition, over nutrition (obesity), and diabetes.<sup>[2,9]</sup> In the Indian context very limited studies are available on resting metabolic rate (RMR), total daily energy expenditure (TDEE), and physical activity level (PAL) of female college students. Therefore, this study was taken up to study the RMR, DEE, and physical activity levels of college going female students.

### METHODS

To study the resting metabolic rate (RMR), total daily energy expenditure TDEE0 and physical activity level (PAL) of female college students, 60 female students pursuing their undergraduation course aged between 18 and 220 years of age

#### Address for correspondence:

M. V. L. Surya Kumari,

E-mail: mvl Suryakumari@yahoo.com

were randomly selected from a reputed Educational Institute in Hyderabad. Prior consent was taken from the head of the institute and study subjects after explaining them about the aim of the study and its benefits along with brief study protocol. The anthropometric measurements such as height, weight, and BMI were recorded using standard procedures. The body fat percentage was assessed by bioelectrical impedance method by using fat analyzer (Omron). The resting heart rate was recorded by pulse oxymeter. The resting metabolic rate was recorded from Karada scanner (Omron).

The total daily energy expenditure was estimated by time allocation pattern method suggested by Satyanarayana *et al.*<sup>[5]</sup> and Ramana *et al.*<sup>[18,9]</sup> accounting for both occupational and non-occupational hours of the subjects. The time allocation pattern was recorded by standardized 24 h recall method which was done by physical activity dairies and interviewing the subjects. This method would account for various day-to-day activities performed in sitting, standing, and walking with different intensities (low, moderate, or heavy) apart from any sports training or fitness/recreation activities. The energy expenditure of these activities was estimated from the energy cost estimates given for various daily activities by Indian council of Medical research ICMR.<sup>[10]</sup> From the information obtained by time allocation pattern (time spent and posture during the activity and brief description of the activity to identify the intensity of the activity), the average total daily energy expenditure was estimated by computing energy expenditure and time spent for each activity in a day. He TDEE expressed as the multiples of BMR are referred to as physical activity levels (PALs) and calculated by dividing TEE by BMR. The expression of energy expenditure (or requirements) of adults as PALs provides a convenient way of controlling for age, sex, weight, and body composition and for expressing the energy needs of a wide range of people in shorthand form.<sup>[6]</sup>

## RESULTS

The results of the study are presented in the below given Tables 1-3. Tables 1 and 2 show that the study subjects were in normal nutritional status based on mean BMI of  $21.5 \pm 4.82$  and the mean fat percentage was found to be  $29.2 \pm 5.40$  was on the higher side for their age but in the acceptable range when compared with the body composition norms, the mean resting metabolic rate (RMR) of these female students was  $1292 \pm 187$  and when expressed per unit body weight it was  $24.1 \pm 2.02$ .

Table 4 shows the time spent pattern of the female college students based on 24 h recall method. It shows the occupational (Academic work) and non-occupational (other than college hours) activities performed in four basic postures accounted as lying (Sleep/nap/lying) as Lo, S1 indicates (sitting/ sitting and doing work), St1 and st2 (standing/standing and doing different types of work), W1 and w2 (for slow Walking/ walking with load/climbing upstairs, etc.), and time spent for any sports or exercise or recreation as sports/exercise time. The data show that the study subjects spent around 720 in 12 h in sitting and sitting activities. This indicates their sedentary behavior pattern. The mean time spent for walking and walking activities was 48 min and for sports or exercise time was 42 min by these subjects. The energy expenditure was estimated for these activities based on ICMR guidelines is given in Table 6. The mean total daily energy expenditure (TDEE) of the college female's was  $2169 \pm 251$  Kcal/day and  $38.1 \pm 6.00$  Kcal/b.wt. The mean physical activity level (PAL) was 1.70 that indicates moderate level physical activity level as given by the WHO. The next table indicates that 35 out 60 subjects were in sedentary physical activity group based on norms given by the WHO.

Table 7 shows the correlation coefficients of RMR and physical activity with anthropometry and body composition parameters.

**Table 1: Physical characteristics of the study subjects**

Group	N	Age (years)	Height (Meters)	Weight (KG)	BMI (KG/M <sup>2</sup> )	BSA (SQ.M.)
Female college students	60	18.6±1.07	1.58±0.05	54.4±12.63	21.5±4.82	1.5±0.18

Values are expressed as Mean, ± SD.

**Table 2: Body composition profile of the subjects**

Group	N	FAT (%)	LBM (KG)	Fat (KG)	LBM%	V.F
Female college students	60	29.2±5.40	37.6±7.33	16.7±6.59	70.7±5.40	3.0±3.15

Values are expressed as Mean, ± SD.

**Table 3: Resting metabolic rate (RMR) of the subjects**

Group	N	RMR (kcal/day)	RMR/body weight (kcal/kg)	RMR/LBM (kcal/kg)	LBM
Female college students	60	1292±187	24.1±2.02	34.4±2.26	

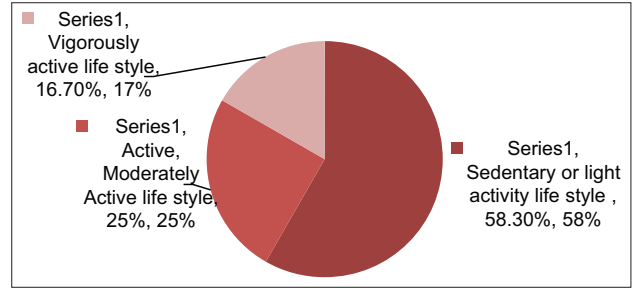
Values are expressed as Mean, ± SD.



**Table 4: Physical activity pattern of the subjects**

Group	N	LO TIME (min)	LO (Kcal)	S1 TIME (min)	S1 EE (kcal)	ST1+ST2 TIME (min)	ST1+ST2 EE (kcal)	W1+W2 TIME (min)	W1+W2 EE(KCAL)	SPORTS/ EXERCISE TIME	Sports/Exercise EE (kcal)
Female college students	60	539.0±75.80	480.3±77.18	719.8±85.29	1079.6±127.95	89.9±73.63	217.4±183.36	48.2±33.31	139.2±95.36	42.3±47.59	252.4±295.88

L0: Sleep/lying, S1: Sitting and sitting activities, st1 and st2: Standing and standing activities, w1 and w2: Walking and walking activities, EE: Energy expenditure



**Table 5: Total daily energy expenditure (TDEE) and physical activity level (PAL) of the subjects**

Group	N	TDEE (kcal/day)	TDEE/WEIGHT (kcal/kg)	PAL (TDEE/RMR)
Female college students	60	2169±251	38.1±6.00	1.70±0.11

**Table 6: Classification of subjects into Physical Activity groups based on the WHO norms**

Activity	PAL Norms	N (out of 60)
Sedentary or light activity Lifestyle	1.48–1.69	35
Vigorously active Lifestyle	2–2.40	10

**Table 7: Correlations between resting metabolic rate (RMR) and other variables**

Weight	BMI	BSA	LBM KG
Pearson Correlation	1.000	0.950	0.931
Sig. (2-tailed)	0.000	0.000	0.000

Both were having significant negative correlation with BMI, BSA, fat percent, and positive correlation with LBM.

**Correlations between Physical Activity Level (PAL) and Other Variables**

	Pearson Correlation	Sig. (two-tailed)
Weight	-0.657	0.000
BMI	-0.642	0.000
BSA	-0.601	0.000
FAT%	-0.639	0.000
LBM	0.639	0.000

## DISCUSSION

This study was carried out to understand the physical activity levels of female college students and also to estimate their resting metabolic rate and total daily energy expenditure as such data on Indian Female College students is scanty. The energy intake should

be proportional to their energy expenditure to maintain constant body weight. The major components of energy expenditure RMR and physical activity, it is necessary to estimate energy expenditure of physical activity and RMR to arrive at the energy allowance recommendations. The increased levels of physical activity have been a global challenge especially among youth due to changed lifestyle patterns with the advent of technology. The present day higher education students have been focusing more on academics to improve their knowledge and skill to equip them to survive in the competition to get a good placement or admission to pursue their higher education. May be to a certain extent this can be attributed to the low physical activity levels of the students in addition to other social, environmental factors.<sup>[1]</sup> The WHO report shows that increased rates of obesity and other non-communicable diseases, poor work capacity are manifested by increased levels of physical inactivity and poor dietary patterns.<sup>[7,14,21,21]</sup> Although the present study population had normal nutritional status based on mean BMI, the fat percentage is onto the higher side (though in the acceptable range 0 as compared with the norms. The RMR and TDEE of this group were closely similar to the recommendations given by ICMR for moderately active women<sup>[10]</sup> and also studies carried out on female college students by some studies.<sup>[2,17]</sup> The highly significant negative correlation of BMI, fat percent, BSA with RMR and PAL and positive correlation with LBM were also found in the literature. The major percentage of study subjects (58.3%) with low physical activity levels among college students are in line with the few research studies.<sup>[2-8,16]</sup>

## CONCLUSION

The estimated mean total daily energy expenditure was closely similar to energy allowance recommended by ICMR for moderately active women. The mean PAL value indicates the group is moderately active. However, it was observed that 58.3% of the study subjects were found to be sedentary physical activity level based on the WHO norms that can be attributed to higher weight, BMI, Fat % as these parameters were significantly correlated with physical activity level. Such studies would help to estimate energy needs of female college students based on their RMR and physical activity level. It is suggested to create awareness among these students to attain desirable body weight, body composition through regular physical activity along with balanced caloric intake that would help them to lead physically very active lifestyle and good quality of life.

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## Research Article

# A study on socioeconomic status of female junior athletes and badminton players of Telangana state

N. Padma, P. Ramesh Reddy

Physical Director TSWRDC (w), Department of Physical Education, Kakatiya Institute of Technology and Science for Women, Mancherla, Telangana, India

### ABSTRACT

The purpose of the study was to find out the effect of socioeconomic status of female athletes and badminton players of Telangana state. One hundred were athletes and 100 badminton players. They are participated at state level championship. The socioeconomic status questionnaire prepared and validated by Kuppuswamy was used for the purpose of data collection to find out the significant effect. Of socioeconomic status of athletes and badminton players. Mean, standard deviation  $t$ -value, and correlation were computed result of the study positive effect of the study indicated of socioeconomic status of the female athletes and badminton players of Telangana state. Significance of difference was also observed in high and low socioeconomic status between athletes and badminton players.

**Keywords:** Athletes badminton state level, Socioeconomic status

## INTRODUCTION

### Socioeconomic Status

Socioeconomic status is the social standing or class of an individual or group. It is often measured as a combination of education, income, and occupation.

Social economic theories may differ from conventional beliefs about economics. Traditional schools of thought often assume that actors are self-interested and make rational decisions. Social economics also referred to as socioeconomics, is concerned with the relationship between social and economic factors within society. These factors influence how a particular group or socioeconomic class behave within society, including their actions as consumers. Different socioeconomic classes may have different priorities regarding how they direct their funds.

Certain goods or services may be considered unavailable to specific classes based on their own perceived ability to afford them and their income. These goods or services can include access to more advanced or complete medical care, educational

opportunities, and the ability to buy food that meets specific nutritional guidelines.

### Statement of the Problem

The purpose of the present study was "A study on Socioeconomic status of Female Junior Athletes and Badminton players of Telangana State."

### Objectives of the Study

The objective of the study was to find out the socioeconomic status of female junior athletes and badminton players of Telangana state.

### Hypotheses of the Study

It was hypothesized that there would be no significant difference between parents occupation of athletes and badminton players.

## METHODOLOGY

### Selection of Subjects

To achieve the purpose of the study, 200 female players out of which 100 athletes and 100 badminton players from various districts of Telangana state those who have participated at state level competition aged under 17 years were selected as subjects.

### Address for correspondence:

N. Padma,  
E-mail: padmapotharaveni@gmail.com

### Instrumentation

The socioeconomic status questionnaire prepared and validated by Kuppuswamy’s scale was used for the purpose of data collection during state level championship of athletics and badminton.

The questionnaire is reliable and valid instrument to determine the socioeconomic status for the present investigation. In this study, the investigator has adopted Kuppuswamy’s scale was used to assess the socioeconomic status of the students this scale measure in the three variables education, occupation, and income.

Each these three variables is measured by means of a weighted scale. It consists of 24 component subdivisions.

The investigator has met all the subjects at tournaments of state championship. Investigator gave very clear instructions regarding the method of answering the questionnaire. All the questionnaires were administered by the investigator in fact to face relationship with the subjects. The subjects were asked to tick the statements giving personal information on the front page and then to answer questions. All the questions were in simple English enabling the students to read and understand and respond to the questions.

### Statistical Procedure

The test of significance or hypothesis testing always calls for some kind of statistical technique to be used there are different ways and techniques in which data can be treated and analyzed statistically. In the present study, mean, standard deviation, *t*-test, and correlation were used to compare the data.

## RESULTS

To find out the significant effect of socioeconomic status of female junior athletes and badminton players of Telangana state. Means, standard deviation, *t*-value, and correlation were computed from the collected data and data pertaining to this are presented in Table 1.

### Discussion on Hypothesis

It was hypothesized that there would be no significant difference between parents occupation of athletes and badminton players.

The parents occupation of 100 athletes mean value is 5.17 and standard deviation is 1.491 and similarly 100 badminton players have mean that is 6.23 and standard deviation that is 1.852 [Table 2].

The calculated *t*-value is 4.458 which is greater than the table value of 1.96 at 0.05 level of significance. Hence, the formulated hypothesis is rejected and concluded that there is a significant difference between parents occupation of athletes and badminton players.

**Table 1: t-test for occupation of athletes and badminton descriptive statistics**

Occupation score	<i>n</i>	Mean	SD
Athletics	100	5.17	1.491
Badminton	100	6.23	1.852

**Table 2: Independent sample test**

Occupation score	<i>t</i> -test for equality of means	
Equal variances assumed	<i>t</i>	df
	4.458	198
Equal variances not assumed	4.458	

Significant at 0.05 level

**Table 3: Correlations (occupation) descriptive statistics**

Occupation score	Mean	SD	<i>n</i>
A occupation	5.17	1.491	100
B occupation	6.23	1.852	100

**Table 4: Correlation between the occupation of the parents of athletes and badminton players**

Correlations	A occupation	B occupation
Pearson		
A occupation correlation	1	-0.018
Sig. (two tailed)		0.859
<i>n</i>	100	100
Pearson		
B occupation correlation	-0.018	1
Sig. (two tailed)	0.859	
<i>n</i>	100	100

From Table 3, it can be observed that the parents occupation of 100 athletes mean value is 5.17 and standard deviation is 1.491 and similarly 100 badminton players mean value is 6.23 and standard deviation is 1.852, which shows that the parent of the badminton players is positioned in better occupations when compared with parents of athletes.

The correlation between the occupation of the parents of athletes and badminton players is -0.018 which is a negative correlation [Table 4]. Hence, it clearly indicates that the parents of badminton players are highly positioned in their respective occupation when compared with the parents of athletes.

## CONCLUSIONS

From the results of the study, the research scholar arrived at the following conclusions. The occupations of parents of

badminton players are significantly high when compared with the parents of athletes.

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## Research Article

# Effect of circuit training for the development of speed among kabaddi players of Osmania University, Hyderabad

Jagan Mohan Sidda

Associate Professor and Head, Department of Physical Education, Govt. Degree College, Khairtabad, Hyderabad, Telangana, India

### ABSTRACT

The purpose of the present study was to find out the effect of circuit training for the development of speed among kabaddi players of Osmania University. The sample for the present study consists of 12 male kabaddi players of Osmania University. The single-group design experimental group was used in the study. Circuit training was given to experimental group on alternate days, that is, three sessions per week pre-test and post-test were conducted in 50 m run to measure the speed among experimental group/this study shows that due to the circuit training, there is an improvement of experimental group in speed/to run faster, the circuit training helps in improving the stride length, leg power which helps in improving the speed among the kabaddi players.

**Keywords:** Circuit training, Kabaddi players, Speed, Stride length

## INTRODUCTION

### Circuit Training

It is a form of body conditioning or resistance training using high-intensity aerobics. It targets strength building or muscular endurance. An exercise "circuit" is one completion of all prescribed exercises in the program. When one circuit is complete, one begins the first exercise again for the next circuit. Conventionally, the time between exercises in circuit training is short, often with rapid movement to the next exercise. The program was developed by Morgan and Adamson in 1957 at the University of Leeds in England.

A circuit should work each section of the body individually. Typical activities include:

- Upper body: Bench dips, back extensions, medicine ball chest pass, bench lift, inclined press up
- Core and trunk: Sit ups (lower abdominal), stomach crunch (upper abdominal), back extension chest raise
- Lower body: Squat jumps, step ups, shuttle runs, hopping shuttles, bench squat

- Total body: Burpees, treadmills, skipping.

### Previous Studies

Ab Raoof *et al.* (2017) investigated the influence of circuit training on agility among college students. Thirty male college students ( $n = 30$ ) were randomly selected as subjects and their age ranged between 18 and 22 years. The 45 selected subjects were randomly assigned into two equal groups such as circuit training group (CTG) and control group (CG) with 15 subjects each ( $n = 15$ ). The experimental group underwent their respective experimental treatment for 8 weeks 3 days per week and a session on each day. The CG was not undergone any specific training apart from their regular activities. Agility was taken as dependent variable for this study and it was measured by shuttle run. The collected data were analyzed using analysis of covariance (ANCOVA). The result revealed that the CTG produced significant improvement ( $P \leq 0.05$ ) on agility as compare to the control group.

## METHODS

The sample for the present study consists of 12 male kabaddi players of Osmania University. The single-group design experimental group was used in the study. Circuit training was given to the experimental group on alternate days, that is,

**Address for correspondence:**  
Jagan Mohan Sidda,  
E-mail: jmsidda@gmail.com

three sessions per week pre-test and post-test were conducted in 50 m run to measure the speed among the experimental group. This study shows that due to the circuit training, there is an improvement of the experimental group in speed. To run faster, the circuit training helps in improving the stride length, leg power which helps in improving the speed among the kabaddi players.

Training schedule of circuit training among kabaddi players.

Days	Exercises	Repetitions and Sets
Tuesday	Circuit training with continuous method pushups, sit ups, half squats jumps, dumb bell exercises, back arches, half squat with medicine ball, etc.	Continuous method 3–4 sets (no recovery) Each exercise 30 sec followed by another exercises immediately
Thursday	Circuit training with interval method sit ups, shuttle runs, back press with weights, bridge exercises, half squat with medicine ball, pushups, sit ups, etc.	Interval method (partial recovery) 30 s exercises 30 s rest
Saturday	Circuit training with repetition method heel raising, front press with weight, dumb bell side ward bend, burpees	Repetition method 3–4 sets (full recovery)

## RESULTS

This result of the study shows that due to the circuit training, there is an improvement of the experimental group in the speed.

### Circuit Experimental Group on 50 M run (Paired Sample Statistics)

Kabaddi players	Mean	n	Std. deviation	Std. error mean	t	Sig. (two tailed)
Pre_test	7.1400	12	.48109	0.8783	12.125	0.000
Post_test	6.7333	12	.48162	0.8793		

The experimental group of 50 m run men is 7.14 in pre-test and 6.73 in post-test. The experimental group mean in post-test in 30 M run is decreased from 7.14 to 6.73. There is an improvement of 0.41 from pre-test to post. Due to circuit training, the experimental group has improved a lot.

## CONCLUSION

A large part of the strength required can be attained from circuit training. A range of press ups, abdominal curls, triceps dips, sit ups, etc., will provide a good base of strength and speed. Building good core stability and strength are very important as it helps you keep your posture correct and your stride length long when you get tired. Circuit training plays an important role to develop the physical qualities among kabaddi players.

### Recommendations

Similar studies can be conducted on other sports and games. The circuit training program is useful for developing the motor quality of the sportspersons in all sports and games.

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## Research Article

# Comparison of explosive power among volleyball players and basketball players of S.K. University, Anantapuramu, Andhra Pradesh State

M. Venkatesulu<sup>1</sup>, B. Jessie<sup>2</sup>

<sup>1</sup>PhD Research Scholar (Part Time), Department of Physical Education, S.K. University, Anantapuramu, Andhra Pradesh, India, <sup>2</sup>Assistant Director and Secretary, Sports Board, S.K. University, Anantapuramu, Andhra Pradesh, India

### ABSTRACT

The purpose of the present study was to comparison of explosive power among volleyball players and basketball players of S.K. University, Anantapuramu in Andhra Pradesh state. The sample for the present study consists of 20 male volleyball and 20 male basketball players of S.K. University. To assess the explosive power, standing broad jump test will be administered for volleyball players and basketball players. The results of the study show that volleyball players are having more explosive power compare to basketball players. This type of study is useful to compare the motor qualities among different sportspersons.

**Keywords:** Basketball, Explosive power, Motor qualities, Volleyball

### INTRODUCTION

The research supports the idea that explosive exercises build athletic power, but is more effective in sports such as volleyball and basketball. The rate of force development is at the maximum for any type of muscle action is explosive power. In activities requiring high acceleration and output, explosive power training is necessary for maximum development. Some examples of these activities would include soccer, hurdling, and football. This type of training is effective in enhancing athletic performance. Athletic movements need to be performed at high speeds. The muscles have to be developed and trained outside of the sport to do this. The types of exercises used in explosive power training are determined by the type of sport that is being trained for. For example, for a basketball player trying to improve his jump shot would have a training program that would include weighted vertical jumps. Explosive power exercises should be taught and supervised by fitness professionals to reduce the risk of injury. They should also be done in conjunction with a regular workout program to ensure that the athlete is balanced in all exercise areas.

Rani *et al.* (2013) studied on different motor abilities among university level volleyball and basketball male players of Guru Nanak Dev University, Amritsar, and Lovely Professional University, Phagwara, Punjab. The main aim of the study was the comparison between volleyball and basketball players with different motor abilities. The purpose of the study was to compare arm strength and leg strength of volleyball and basketball players. In the present study, investigator has taken a total of 30 samples. For analysis and interpretation of data, a comparative analysis of the selected variable was statistically analyzed by “*t*” test. The data of both groups were calculated separately for both the variables. Different types of descriptive statistic such as mean and standard deviation were computed to describe each variable statistically. The level of significance was set at 0.05. To know the difference in the selected variables, the individual “*t*” test was used. It was found that volleyball and basketball players do not have significant difference between the variables; arm strength and leg strength.

### METHODOLOGY

The purpose of the present study to comparison of explosive power among volleyball players and basketball players of S.K. University, Anantapuramu, Andhra Pradesh state. The sample for the present study consists of 20 male volleyball and 20 male basketball players of S.K. University. To assess the explosive

#### Address for correspondence:

M. Venkatesulu,

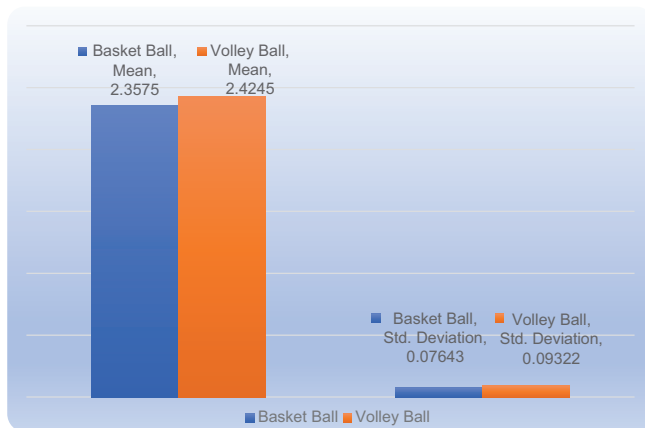
E-mail: venkatesulu.mood@gmail.com



**Table 1: Mean values and independent samples test of standing broad jump between basketball players and volleyball**

Test	Group players	n	Mean	SD	t	Sig.(two tailed)
Standing broad jump	Basketball	20	2.3575	07643	-2.486	0.017
	Volleyball	20	2.4245	09322		

\*Significant at 0.05 level



power, standing broad jump test will be administered for volleyball players and basketball players. The following test is administered.

### Standing Broad Jump Test

#### Purpose

The purpose of the study was to measure the explosive power of the legs.

#### Equipment required

tape measure to measure distance jumped, non-slip floor for takeoff, and soft landing area preferred.

#### Procedure

The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. Three attempts are allowed.

#### Scoring

The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped, the best of three attempts.

## RESULTS AND DISCUSSION

The results of the study show that volleyball players are having more explosive power compare to basketball players.

In Table 1, the mean values of basketball players are 2.3575 in standing broad jump test and volleyball mean values are 2.4245. Hence, volleyball players are having better mean values compare to basketball players.

## CONCLUSION

Volleyball players are having better explosive power compare to basketball players. This study also helps the physical educators and coaches to improve their training regime to excel in basketball and volleyball.

### Recommendations

It is recommended that motor qualities development coaching must be given by coaches to promote speed, endurance, strength, agility, etc., among the basketball and handball players.

Similar studies can be conducted among female players and in other sports and games. This study is also useful to develop the speed among basketball and volleyball players.

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## Research Article

# Comparison of explosive power among sprinters and long jumpers of S.K. University, Anantapuramu, Andhra Pradesh State

Mahboob Basha<sup>1</sup>, B. Jessie<sup>2</sup>

<sup>1</sup>PhD Research Scholar (Part Time), Department of Physical Education, S.K. University, Anantapuramu, Andhra Pradesh, India, <sup>2</sup>Assistant Director and Secretary, Sports Board, S.K. University, Anantapuramu, Andhra Pradesh, India

### ABSTRACT

Explosiveness is the ability to express a higher level of strength in a shortest period. The purpose of the present study was to comparison of explosive power among sprinters and long Jumpers of S.K. University, Anantapuramu in A.P. State. The sample for the present study consists of 20 male sprinters and 20 male long jumpers of S.K. University. To assess the explosive power standing broad jump test will be administered for sprinters and long jumpers. The results of the study shows that long jumpers are having more explosive power compare to sprinters. This type of study is useful to compare the motor qualities among different sports persons players.

**Keywords:** Explosive power, Motor qualities, Long jumpers, Sprinters

### INTRODUCTION

Explosiveness is the ability to express a higher level of strength in a shortest period. Sprinting is one of the popular events in track and field. 100 m and 400 m, etc., are some of the events which demands supreme efforts, excellent motor fitness, great strength, and speed. The sprinters of these events use blocks to start because of its mechanical advantages. Proper starting is one of the most important fundamentals of good sprinting and often races are decided by inches made or lost on at the start. Strength is a conditional ability, that is, it depends largely on the energy liberation processes in the muscles. Long jumpers also required good explosive power to jump more distance.

Tiwari *et al.* (2012) studied to “compare the explosive strength and maximum leg strength between 100 m and 400 m sprinters.” Forty female Athletes from Punjab, India

(20 from 100 m and 20 from 400 m) who have participated in All India Inter-University athletics Championship were selected as subjects. The age of the subjects was ranged from 18 to 24 years. It was hypothesized that there would not be a significant difference in explosive strength and maximum leg strength between 100 m and 400 m sprinters. Their maximum leg strength was measured by leg dynamometer in kg and explosive strength performance was recorded by standing broad jump in meters, respectively. The data collected on explosive strength and maximum leg strength were analyzed by independent “*t*” test. The level of significance for testing the hypothesis was set at 0.05 level of confidence.

### Findings

The results have shown that the sprinters participated in 100 m and 400 m did not differ significantly in the explosive strength and maximum leg strength. The mean values of explosive strength for 100 and 400 m sprinters were 2.049 m and 2.025 m, respectively, and the mean values of maximum leg strength for 100 and 400 m sprinters were 133.2 kg and 133.05 kg, respectively. The calculated *t*-value for explosive strength was 1.142 which showed no significant difference (*t*<sub>cal</sub> = 1.142).

#### Address for correspondence:

Mahboob Basha,

E-mail: skmahaboob35@gmail.com

**Table 1: Mean values and independent samples test of standing broad jump between sprinters and long jumpers**

Test	Group-players	n	Mean	SD	t	Sig. (2-tailed)
Standing broad jump	Sprinters	20	2.3690	0.07433	-4.512	0.000
	Long jumpers	20	2.4830	08511		

\*Significant at 0.05 level

## METHODOLOGY

The purpose of the present study was to comparison of explosive power among sprinters and long jumpers of S.K. University, Anantapuramu in A.P. State. The sample for the present Study consists of 20 male sprinters and 20 male long jumpers of S.K. University. To assess the explosive power standing broad jump test will be administered for sprinters and long jumpers.

The following test is administered.

### Standing Broad Jump Test

#### Purpose

The purpose of the study was to measure the explosive power of the legs.

#### Equipment required

Tape measure to measure distance jumped, non-slip floor for takeoff, and soft landing area preferred.

#### Procedure

The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. Three attempts are allowed.

#### Scoring

The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped, the best of three attempts.

## RESULTS AND DISCUSSION

The results of the study shows that long jumpers are having more explosive power compare to sprinters.

In Table 1, the mean values of sprinters are 2.3690 in standing broad jump test and long jumpers mean values is 2.4830. Hence, long jumpers are having better mean values compare to sprinters.

## CONCLUSION

It is concluded that long jumpers are having better explosive power compare to sprinters. This study also helps the physical educators and coaches to improve their training regime to excel in athletics.

### Recommendations

It is recommended that motor qualities development coaching must be given by coaches to promote speed, endurance, strength, agility, etc., among the athletes. Similar studies can be conducted among female players and in other sports and games. This study also useful to develop the explosive power among athletes.

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## Research Article

# Effect of hill running for the development of aerobic endurance among hockey players of Nalgonda District in Telangana State

Syed Irfan Ali

Physical Education Teacher, The Nalgonda Public School, Nalgonda, Telangana, India

### ABSTRACT

The purpose of the study is to find out the effect of hill running for the development of aerobic endurance among hockey players of Nalgonda district in Telangana state. The study is delimited to the male hockey players of Nalgonda district between the age groups of 20 and 22 years. The sample for the present study consists of 20 male hockey players of Nalgonda district out of which 10 are experimental group and 10 are controlled group. Hill running was given to the experimental group on alternate days for 6 weeks along with general training of hockey and the control group was given the general training of hockey. Pre-test and post-test were conducted for 12 min Cooper test to assess the aerobic endurance of both the groups. This study shows that the experimental group has got rapid improvement of aerobic endurance compare to the control group due to hill running. It is concluded that due to hill running, there is an improvement of aerobic endurance. It is recommended that the coaches must include the hill running training program for sportspersons to develop the aerobic endurance.

**Keywords:** Aerobic endurance, Hill running, Hockey players, etc.

### INTRODUCTION

Hill running is full blown leg workout perfect for hockey players. Hill running stress the body of the hockey player to get adapt for difficult situations. Running up hill builds power in the legs. Hill workout build strength, speed, endurance, and VO2 max in hockey players.

Kumar (2015) studied about the effect of hill running for the development of aerobic endurance among sepak takraw players of Hyderabad district in Telangana. The significance of this study is to find out the effect of hill running for the development of aerobic endurance among sepak takraw players of Hyderabad district which will be helpful to coaches and trainers to develop the endurance ability. The objective of the study was to determine the effects of the hill running for the development of endurance ability among sepak takraw players. The sample for the present study consists of 20 male sepak

takraw players out of which 10 are experimental group and 10 are controlled group. Hill running training such as short hills, medium hills, long hills, and mixed hills running were given to the experimental group on alternate days for 8 weeks along with general training of sepak takraw and the control group was given the general training of sepak takraw. Pre-test and post-test were conducted for 12 min Cooper test to assess the aerobic endurance of both the groups. This study shows that the experimental group has got rapid improvement due to hill running compare to the control group. It was concluded that due to hill running, there is an improvement of aerobic endurance. It was recommended that the coaches must include the hill running programs to athletes for the development of endurance.

### METHODOLOGY

The purpose of the study is to find out the effect of hill running for the development of aerobic endurance among hockey players of Nalgonda district in Telangana state. The study is delimited to the male hockey players of Nalgonda district between the age groups of 20 and 22 years. The sample for the present study consists of 20 male hockey players of Nalgonda

#### Address for correspondence:

Syed Irfan Ali,

E-mail: syedirfanali232@gmail.com

**Table 1: The statistical analysis of effect of hill running training hockey players in pre- and post-test in 12 min Cooper test**

S. No.	Subject	n	Experimental		Control		t-value	Df	Sig. (two tailed)
			Mean	SD	Mean	SD			
1	Pre-test	10	1818.50	185.82	1814.50	224.77	-4.609	18	0.000
2	Post-test	10	2009.66	214.84	1778.16	205.31	2.279	18	0.030

district out of which 10 are experimental group and 10 are controlled group. Hill running was given to the experimental group on alternate days for 6 weeks along with general training of hockey and the control group was given the general training of hockey. Pre-test and post-test were conducted for 12 min Cooper test to assess the aerobic endurance of both the groups.

## RESULTS AND DISCUSSION

In pre-test, the experimental group mean value is 1818.50, SD value is 185.82, and the control group mean value is 1814.50 and SD value is 224.77. In post-test, the experimental group mean value is 2009.66, SD value is 214.84 and the control group mean value is 1778.16 and SD value is 205.31.

Hence, there is a significance mean difference between the experimental and control groups in post-test. Cooper 12 m run test.

This study shows that the experimental group has got rapid improvement of aerobic endurance compare to the control group due to hill running. It is concluded that due to hill running, there is an improvement of aerobic endurance. It is recommended that the coaches must include the hill running training program for sportspersons to develop the aerobic endurance

## CONCLUSION

It was clearly found that there is a significant difference on effect of hill running training program between pre-test and post-test of the experimental group of hockey players in relation to the 12 min run or walk Cooper test.

## Recommendations

- Similar studies can be conducted on female hockey players and other sportspersons. The study helps the physical educationist and coaches for selecting the sportspersons
- The study also helps the physical educationists and coaches understanding the knowledge and performance of the players
- The study also helps players and coaches to selecting the games and sports depending on the performance
- The study may be conducted on other related variables and skills.

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## Research Article

# Impact of technology in sports and games

Roshini Kamisetty

Institute of Aeronautical Engineering, Dundigal, Hyderabad, Telangana, India

## INTRODUCTION

The world of sport is continually changing over the years, and the use of technology is just one of those areas that have made an impact on many sports in the modern day. See the annual sports technology awards for the latest technology ideas in the world of sport. One criticism of the use of technology is that it can slow down the speed of the game, but, on the other hand, for many people, it makes watching it more enjoyable to see the correct decisions being made.

### Assisting the Umpires/Referees

Most professional sports in the United States have long used instant replay and other high-tech aids to help referees make the right call. Gridiron has used video replay systems to check referees' calls for many years. Basketball referees use replay systems to make sure players are shooting within the time allotted by the shot clock. In international cricket, the third umpire has been used, one sitting off the ground with access to TV replays of certain situations (such as disputed catches and boundaries) to advise the central umpires. The umpires out on the field are in communication through wireless technology with the other umpire. The third umpire is also asked to adjudicate on run out decisions, which he makes without consultation with the two central umpires. One sport that has resisted the use of high-tech assistance until very recently is soccer/football. Replays could be used to decide off-side decisions, whether a ball passes over the goal line and clarifies penalty decisions.

### Hawk-eye Technology

Hawk-eye is the name of a computer and camera system which traces a ball's trajectory. It is being used in international cricket and tennis, and many other sports are also looking at making use of this technology. The system is also being trialed in soccer as part of the goal-line assessment.

The Premier League of Football in the UK has agreed to the introduction of goal-line sensors after being given approval by football's rule-makers. The system being developed by the UK company Hawk-Eye, would give a definitive decision on whether the ball had crossed the line. The Hawk-Eye uses a camera taking 600 frames a second on the goal line, with the information is analyzed by computer and sent to the referee's headset or a device on his wrist. In 2015, Hawk-Eye technology was also used by rugby officials at the 2015 Rugby World Cup, to improve decision-making by the television match official (TMO) and also assist with player safety. In this case, it is enhanced video review, rather than the ball tracking technology as used in other sports.

### Sport Specific

- **Tennis** – It is now standard at the major tennis tournaments for a line review system to be in place, with players given power to review contentious line calls. It is powered by the Hawk-Eye ball tracking system. See more about Hawk-Eye for tennis.
- **Soccer/Football** – Soccer is looking at joining the 21<sup>st</sup> century, looking at various technologies for the goal line to determine if the pass passes over the line or not. See more about football/soccer technology
- **Basketball** – The NBA uses replay vision to review “last touch” decisions in the final 2 min of games and also to determine whether players release the ball before the shot clock expires.
- **Cricket** – Technology in cricket has been driven by advances in the TV coverage. Things that were once extra information provided by the TV networks are now being incorporated into the decision referral system (DRS), such as Hawk-Eye and hotspot, and maybe even the old favorite snicko. See more about cricket technology.
- **Aussie Rules Football** – Umpire review system has also been implemented in AFL, with an off-field umpire in certain circumstances adjudicating on whether the ball passes over the goal line or is touched, using video evidence through multiple camera angles. See more about technology in AFL.

#### Address for correspondence:

Roshini Kamisetty,  
E-mail:

- **Baseball** – In 2014, a challenge system was put in place for the MLB to use replays to challenge certain umpiring decisions. See more about technology in baseball.
- **Rugby Union** – In 2015, Hawk-Eye technology was used by rugby officials at the 2015 Rugby World Cup. The video review technology with synchronized camera views was used to improve decision-making by the television match official (TMO) and also used by medical staff to assist with player safety by identifying possible concussion instances and behind play incidents.
- **Rugby League** – The NRL was an early implementer of using the video referee to help adjudicate questionable tries.
- Analysis of sport performance and enabling coaches to greatly improve the quality of feedback to players/athletes
- Increase accuracy in time measurements of sport performance
- Enabling referees, umpires, and sport officials to make better decisions on rule infringements
- Improvements in the design of sport equipment and apparel
- Providing spectators with better viewing of sport performance

## CONCLUSIONS

Advances in technology have had a profound impact on sport including:

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## Research Article

# Selected physical fitness components of female boxers, fencers, and taekwondo – A comparative study

J. S. Soodan<sup>1</sup>, Tarsem Sharma<sup>2</sup>

<sup>1</sup>Physical Director, GDC Kathua, HED, UT of Jammu and Kashmir, India, <sup>2</sup>Cricket PET, Youth Services and Sports, Jammu and Kashmir, India

### ABSTRACT

The fitness components are qualities that athletes must develop to physically prepare for sport competition. Most of the skill performances and execution of techniques in the sports such as boxing, fencing, and taekwondo were based on the basic fitness components. The purpose of the study was to determine the existence of statistically significant difference on selected fitness components (speed and endurance) among boxers, fencers, and taekwondo. For this purpose, 90 sportsmen (30 boxers, 30 fencers, and 30 taekwondo) were selected. Their age ranged between 18 and 23 years. The selected variables were assessed using 50 m dash and Harvard step test. The data were analyzed by applying ANOVA and Scheffe's *post hoc* test. The result showed that there was significant difference in all the selected physical fitness components among boxers, fencers, and taekwondo. The boxers showed a better capability in speed, while the taekwondo was better in endurance and fencers with better speed.

**Keywords:** Boxers, Fencers, Taekwondo speed and endurance

### INTRODUCTION

A basic definition of physical fitness is “the ability to complete daily tasks with energy, reduce health risks due to inactivity, and be able to participate in a variety of physical activities.” The five fitness components that are deemed health-related are cardio, strength, endurance, flexibility, and body composition. In addition, speed, agility, power, balance, and coordination have been identified as performance related. All of these qualities exist to some degree in most sports, but developing certain combinations are important in any given sport. While definitions are assigned to qualities that represent what “fitness” is, it can be operationalized in different ways for each sport. In other words, fitness for one sport is somewhat different for another.

In today society, sports and physical fitness play an important role in physical well-being. In this material world, man does not get enough time for doing physical activity. Spectral concept of

health emphasizes that the health of an individual is not static it is a dynamic phenomenon and a process of continuous change. The physical dimension of health is probably the easiest to understand. The state of physical health implies the notion of perfect functioning of the body.

They are the building blocks of exercise and physical activity. Sports training programs are designed to build these components in the proper proportions that match the requirements of each sport. Nowadays, physical activities have a great role in maintaining better health. Meanwhile, better health is only possible through doing some sort of physical activities. In this point of view, the combative sports such as boxing, wrestling, and judo are the good source of developing physical fitness and mental fitness. Comparing of selected physical fitness, components of male boxers, wrestlers, and judokas would reveal that significant difference exists as their physical fitness developed through participation in respective sports.

### PROCEDURE AND METHODOLOGY

For the study, a total of 90 females (30 boxers, 30 fencers, and 30 taekwondo) were selected. The age ranged between 18 and

#### Address for correspondence:

J. S. Soodan,

E-mail: drsoodan@gmail.com



23 years. The following variables were selected for the study 50 m and Harvard step test. Statistical technique the data were analyzed by applying ANOVA. The level of significance was fixed at 0.05 level. Scheffe’s *post hoc* test was employed where “F” ratio found significant. Results of the data on selected fitness components were analyzed and tabulated in Table and Figure 1 through 3. The mean values on speed and endurance of boxers, fencers, and taekwondo are given in Table 1.

The data on selected fitness components were analyzed for statistically significant difference among boxers, fencers, and taekwondo using analysis of variance and it is given in Table 2.

There is a statistically significant difference on all the fitness components (speed and endurance) confined to this study, as the obtained F ratio was found to be greater than the required Table 3 value of 3.10 at 0.05 level of confidence.

Since, significant difference exists, the *post hoc* test was applied to find out the paired mean difference among boxers, fencers, and taekwondo on each of the fitness components selected in this study. Reveals that boxers demonstrated significantly better speed performance compared to fencers and taekwondo,

**Table 1: Mean scores on selected physical fitness components of boxers, fencers, and taekwondo**

Variables	Boxers	Fencers	Taekwondo
Speed	6.6796	7.127	7.0353
Endurance	68.1796	78.0866	74.836

**Table 2: ANOVA on selected physical fitness components variables of female boxers, fencers, and taekwondo**

Variable	Source of variance	Sum of square	Df	Mean square	F value
Speed	Between	3.3509	2	1.6754	11.8991
	Within	12.2530	87	0.1408	
Endurance	Between	1530.4725	2	765.2362	18.08347
	Within	3691.5089	87	42.4311	

\*Significant at F 0.05 level

**Table 3: Scheffe’s *post hoc* test on selected physical fitness components of female boxers, fencers, and taekwondo**

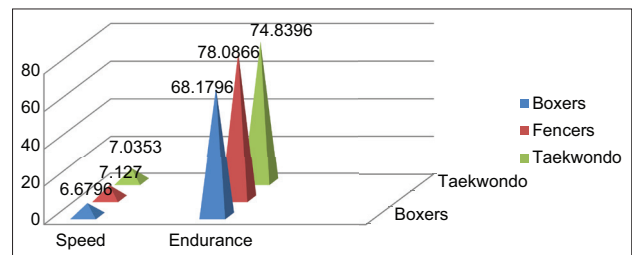
Variables	Boxers	Fencers	Taekwondo	MD	CD
Speed		7.127		0.4474*	0.23
	6.6796		7.0353	0.3557*	0.23
		7.127	7.0353	0.0917*	0.23
Endurance	68.1796	78.0866		9.907*	7.01
	68.1796		74.8396	6.66	7.01
		78.0866	74.8396	3.247	7.01

in case of speed fencers have notably better than boxers and wrestlers. Taekwondo has considerably superior endurance capacity than boxers.

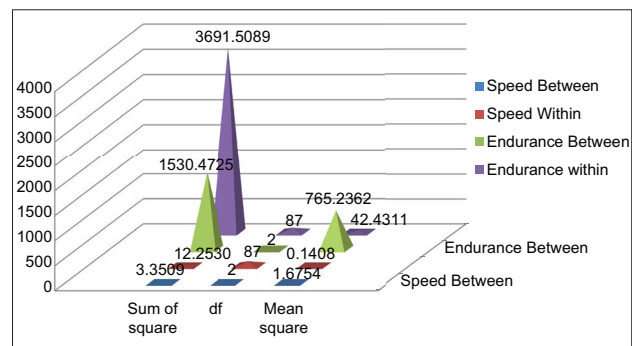
## DISCUSSION

In the present study, boxers demonstrated significantly better speed performance compared to fencers and taekwondo, in case of speed fencers have notably better than boxers and taekwondo. Taekwondo has considerably superior endurance capacity than boxers.

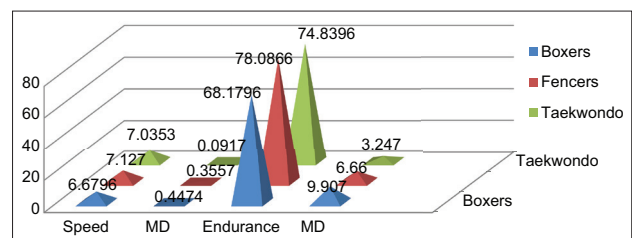
Earlier studies of Jagiełło, Kalina, and Tkaczuk (2001; 2004) well documented the development of the motor capacity. It is worth to emphasize one more issue by comparing the sportsmen of 48 | International Journal of Physical Education, Fitness and Sports | Vol. 2. No.4 | December 2013 | ISSN 2277-5447 different sports. Only few studies made a comparison



**Figure 1:** Mean scores on selected physical fitness components of female boxers, fencers, and taekwondo



**Figure 2:** ANOVA on selected physical fitness components variables of female boxers, fencers, and taekwondo



**Figure 3:** Scheffe’s *post hoc* test on selected physical fitness components variables of female boxers, fencers, and taekwondo

between different sports and revealed differences on fitness characteristics along the participation of different sports (Daniels and Thornton, 1990; Reynes and Lorant, 2004), where Gernigon and Le Bars (2000) stressed the compatibility of a competitive context and task orientation in such studies. Consequently, future studies might take a closer look at the relationship between the characteristics of participants and the chosen sport.

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## Research Article

# Effect of circuit training for development of speed among hockey players of Hyderabad district

G. Akhila

Assistant Professor, Department of Physical Education, College of Veterinary Science, Shri P. V. Narasimha Rao Telangana Veterinary University, Rajendra Nagar, Hyderabad, Telangana, India

### ABSTRACT

The purpose of the present study was to find out the effect of Circuit Training for the development of among Hockey Players of Hyderabad District. The sample for the present study consists of 60 Male Hockey Players of Hyderabad District between the age group of 18 and 22 years, out of which 30 are experimental group and 30 are controlled group. Circuit training was given to experimental group on alternate days, that is, three sessions per week and controlled group were given the general training for 12 weeks. Pre-test and post-test were conducted in 50 M run to measure the speed among experimental group and controlled group. This study shows that due to the circuit training there is an improvement of experimental group in speed and controlled group is decreased in speed.

**Keywords:** Circuit training, Hockey players, Speed

### INTRODUCTION

Exercise training increases motor skills in human. In this regard, it is crucial to set up proper training programs consistent with motor needs and physiological properties of every sport. Jumping speed and power are invariably considered as significant factors in performing many sport skills. Sport experts suggest that weight training and plyometric workout are two training methods that improve athletes' power and skills. From among modern training methods, greater attention has paid to muscular fitness exercises.

G. N. Kiran and Dr. R. Srinivasa (2016) studied about the effectiveness of circuit training on speed, power, and endurance of secondary school hockey players. For this purpose, thirty secondary school Hockey players in the age group of 14–16 years were selected as subjects. The selected subjects were divided into two equal groups, in which, Group-I: Circuit Training Group (CTG) ( $n = 15$ ) underwent circuit training and Group-II: Control Group (CG) ( $n = 15$ ) acted as control which did not participate any training but allowed to take part

in their regular Hockey training and playing game. The training program was carried out for this study was 5 days per week for 12 weeks. Before and after the training period the subjects were tested for speed, power, and cardiovascular endurance. These were assessed by administering 50 m run, Standing Broad Jump, and Cooper's 9 min Run/Walk, respectively. The statistical tool used for the present study was "t" test. After applying the "t" test, it was found that there was significant improvement in the selected motor fitness variables such as speed, explosive power, and cardio respiratory endurance in circuit training group (CTG) when compared with control group.

### Purpose of Research

The purpose of the present study was to find out the effect of circuit training for the development of among Hockey Players of Hyderabad District.

### METHODOLOGY

The sample for the present study consists of 60 male hockey player of Hyderabad district between the age group of 18 and 22 years out of which 30 are experimental group and 30 are controlled group. Circuit training was given to experimental group on alternate days, that is, three sessions per week and

#### Address for correspondence:

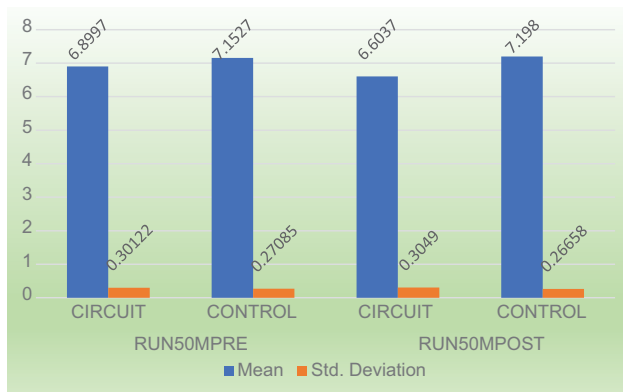
G. Akhila  
E-mail:

**Table 1: Group statistics of circuit training and control group of hockey players**

	Group	n	Mean	SF	SEM
Run 50 M pre	Circuit	30	6.8997	0.30122	0.05500
	Control	30	7.1527	0.27085	0.04945
Run 50 M post	Circuit	30	6.6037	0.30490	0.05567
	Control	30	7.1980	0.26658	0.04867

<i>t</i> -test for equality of means							
	t	df	Sig. (2-tailed)	Mean difference	Lower	SEM Upper	95% confidence interval of the difference
							Lower Upper
Run 50 M pre	-3.421	58	0.001	-0.25300	0.07396		-0.40104 -0.10496
Run 50 M post	-8.038	58	0.000	-0.59433	0.07394		-0.74235 -0.44632



controlled group were given the general training for 12 weeks. Pre-test and post-test were conducted in 50 m run to measure the speed among experimental group and controlled group.

**Showing the Sample of the Study**

Category of the subjects	Number of subjects
Experimental group	30
Control group	30
Hockey players	60

**Research Instruments**

Circuit training is developed by the Scientist Morgan R.E. and Adamson G.T. at University of Leeds in the year 1957. This is resistance to develop the motor abilities such as strength, speed, and endurance. Circuit training is an exercise “circuit” which consists of prescribed exercises which includes for the upper body, lower back, abdomen, and lower body. It can be done with own body weight and using the resistance exercises such as Barbells and Medicine Balls. Circuit training was given to experimental group on alternate days, that is, three sessions per week and controlled group were given the general training for 12 weeks.

**Type of Exercises**

**Upper-body**

Pull Ups, Military Press, Push Ups, Back Press, Biceps Curl, Bent Over Rowing, Up Right Rowing, Wrist Curl.

**Core and trunk**

Good morning Exercise, Sit-ups, V Sit ups, and Bridge.

**Lower-body**

Half Squats, Jumping with Squats, Jumps A Stride, Shuttle Running, and Jumping on Spot.

**Total-body**

All body exercise, Surya Namaskars, and Skipping.

**Data Collection**

To measure the Speed 50 m run test is conducted.

**50 m Run**

**Purpose**

The aim of this test is to determine the speed. Pre-test and post-test were conducted in 50 M Run among experimental group and controlled group.

**Research Results**

This study shows that due to the Circuit training there is an improvement of experimental group in speed and controlled group is decreased in speed among Hockey Players [Table 1].

**Recommendations for Further Research**

It is concluded that the physical fitness is a prime asset and players must possess strength, endurance, speed, good reflexes, ability, suppleness, and controlled weight, all these attributes can be acquired only by constant year round practice. This study shows that due to the circuit training there is an improvement of experimental group in speed and controlled group is decreased in speed.

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## Research Article

# A comparative study on sports infrastructure facilities available in the affiliated colleges of University of Mysore and Kuvempu University

K. Mallikarjuna Swamy<sup>1</sup>, Keshava Murthy<sup>2</sup>

<sup>1</sup>Research Scholar, Mangalore University, Konaje, Mangalore, Karnataka, India, <sup>2</sup>Research Guide, Mangalore University, Konaje, Mangalore, Karnataka, India

### ABSTRACT

This study on available sports infrastructure facilities in the affiliated colleges of University of Mysore and Kuvempu University. The purpose of this study is to examine the various types of sport infrastructure facilities available in the department of physical education and sports of affiliated colleges and its influence to bring the laurel to the concerned universities in the South-Zone and All Indian university level of competition. Using percentile analyses, an assortment of sport infrastructure surveys with an overall sample size of  $n = 5$  (colleges in each University), compel the data concerning with the departments Physical Education of Mysore and Kuvempu University. The results hint at that different sports facilities in department of physical education and sports in the colleges comes under Mysore and Kuvempu University of Karnataka state, colleges that are having fitness centers, indoor facility, outdoor facility, training, coaching camps, implementation of modern technology, class rooms, and other outdoor facilities has to be improved and some facilities have to provide to develop for the increase their level of achievements in the colleges, which are affiliated under Mysore and Kuvempu Universities.

### INTRODUCTION

The availability of adequate sports facilities throughout the country is basic to the development and broad-basing of Sports. In addition to the Union and State Governments, the sustained involvement of other agencies, including the Panchayat Raj Institutions, Local Bodies, Educational Institutions, Sports Federations/Associations. Clubs and Industrial undertakings will be enlisted in the creation, utilization, and proper maintenance of the sports infrastructure is very essential to the keep top priority of the country in the line of sports achievers at world sports.

While existing play fields and sports stadium, both in provincial and metropolitan regions, will be kept up for sports purposes, the presentation of reasonable enactment might be considered for giving open regions to encourage games and sports. Steps would be taken to develop ease practical and climate well-disposed plans in such manner, so greatest profit could be inferred through

generally low degrees of speculation. Endeavors will likewise be made to ideally use the accessible infrastructure and manpower and exceptional coaching camps are coordinated, during the get-away to give concentrate for preparing the skilled games, even as they seek after their scholarly work.

### Hypothesis of the Research

It was hypothesized that the colleges are affiliated to Mysore and Kuvempu University have adequate amount of sports infrastructure in the department of physical education and sports.

It was hypothesized that due course of available sports infrastructure in the colleges and they trained the sportspersons, that benefits were taken by the universities for achieving in the South-Zone and All India Inter-University competition.

### Objectives of the Study

The objectives are as follows:

1. To have a depth study of the sports infrastructure facilities available in colleges, it influence for the promotion and development of physical education and sports in the Mysore and Kuvempu Universities.

#### Address for correspondence:

K. Mallikarjuna Swamy,

E-mail: mallikarjunaswamy907@gmail.com

2. To measure the sports infrastructure facilities available in the different top achieved colleges in the inter-collegiate competitions of Mysore and Kuvempu Universities.

## METHODOLOGY

The methodology and procedure of the research study are used for the purposes which underlines the goals which are to be achieved. The hypothesis of the research is to know sports infrastructure facilities in the colleges under Mysore and Kuvempu Universities. The study was conducted through survey by preparing questionnaire to obtain the existing facilities on sports infrastructure in the top achieved colleges of concerned universities. With the help of self-prepared questionnaire, data were collected from the concerned colleges of Mysore and Kuvempu universities. Necessary statistical application was adopted to find the exact results and data tables, graphs were shown were ever necessary arises.

### Selection of the Sample

The purpose of the study was to find out the sports facilities of colleges Under Mysore and Kuvempu Universities. Researcher has selected top sports achieved five colleges from each University to find out the sports infrastructure facilities in the department of physical education and sports.

### Collection of the Data

Based on the questionnaire using for data collection from the top sports achieved colleges in the inter-collegiate competitions of Mysore and Kuvempu Universities, discussed and opinion were collected from the expertise personalities in the field of sports and physical education before finalized the questionnaire.

### Analysis and Interpretation of the Study

The analysis of data collected through the administration of the questionnaire has been presented in this chapter. To survey the sports infrastructure and facilities in degree colleges of Kuvempu University of Karnataka state percentage were used. The questionnaire comprised eight statements. Researcher received five questionnaires duly filled from the physical education directors of the degree colleges. The present chapter represents table of findings with the help of statistical analysis which are presented along with their explanations thereby. Tables which need to elaborate the understanding of processed data are presented by necessary figures. This chapter also includes the discussion of illustration [Figures 1 and 2].

### Sports Infrastructure Facilities

Table 1 shows that 80% of colleges under Mysore University have fitness center and 60% colleges under Kuvempu University having fitness centers. 80% of colleges under

Mysore University and 60% colleges of Kuvempu University having indoor facility, 80% of colleges under Mysore university, and 80% colleges of Kuvempu University having outdoor facility, and 80% colleges under Mysore university, and 40% colleges under Kuvempu University having training and coaching facility, and 20% of colleges under Mysore University, and 00% of colleges Under Kuvempu University having technology enabled class rooms.

When comparing with sports facilities under Mysore University having good and well equipped fitness centers, indoor facility, training, coaching facility, technology, and class room facilities than the colleges under Kuvempu University. When comparing with outdoor facility Mysore University having better facilities rather than Kuvempu university, Hence, results shows that, in South-Zone and All India Inter-University competition, Mysore University secure more number of medals and they are produced better sports personality rather than Kuvempu University due to good available infrastructure facilities in the colleges and their physical education department provided well and advanced training and coaching in the competitive manner so that result we can found in the national level competitions. This might be the reason each and every affiliated colleges must have the sports infrastructure facilities to contribute lot for the universities in the field of competitive sports rather than expected the better sports infrastructure facilities in the concerned universities, because universities were conduct training or coaching camps during the time of sending the teams for the inter-university competition otherwise, it will not at all available to use by the public or eligible sports persons throughout the year.

From Table 2, it is shows that, percentage value of 80 in hockey, Kabaddi, Cricket, Football, Kho-Kho, Ball badminton, Volleyball, Basketball, Handball, Tennis, and Throw ball colleges under Mysore University, 60% in Kabaddi and Cricket 40% in football and basketball, 80% in Kho-Kho, Ball badminton Volleyball Handball and throw ball of colleges under Kuvempu University.

It clearly indicate that, maximum outdoor sports facilities having by the University of Mysore, but Kho-Kho, Ball Badminton, Volleyball, Hand ball, and Throw ball faculties are available equally by Kuvempu University, so both the Universities are performed better achievement in the outdoor competitive event in the All India Inter-University competition.

When comparing with softball facilities colleges under Mysore University have very less facility compare to colleges under Kuvempu University. When compare with Netball game facility the colleges under Mysore and Kuvempu University having very less and equal percentage. From many years, sport persons are representing the respective university to participate in the South-Zone and All India Inter University competition in Mysore and Kuvempu Universities they are having better sports

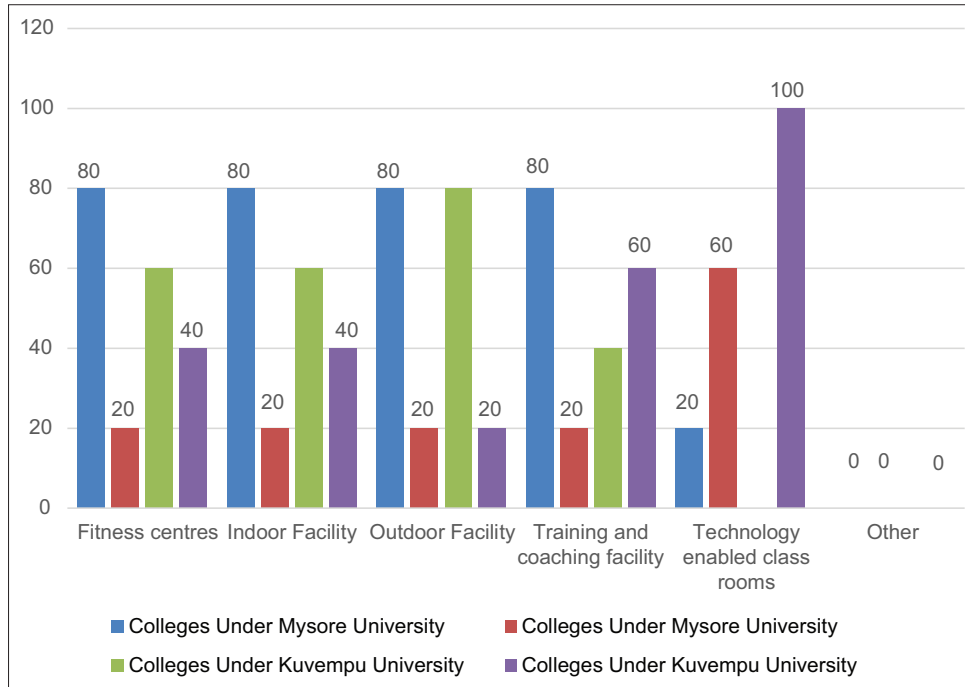


Figure 1: The details of sports facilities of colleges under Mysore and Kuvempu University

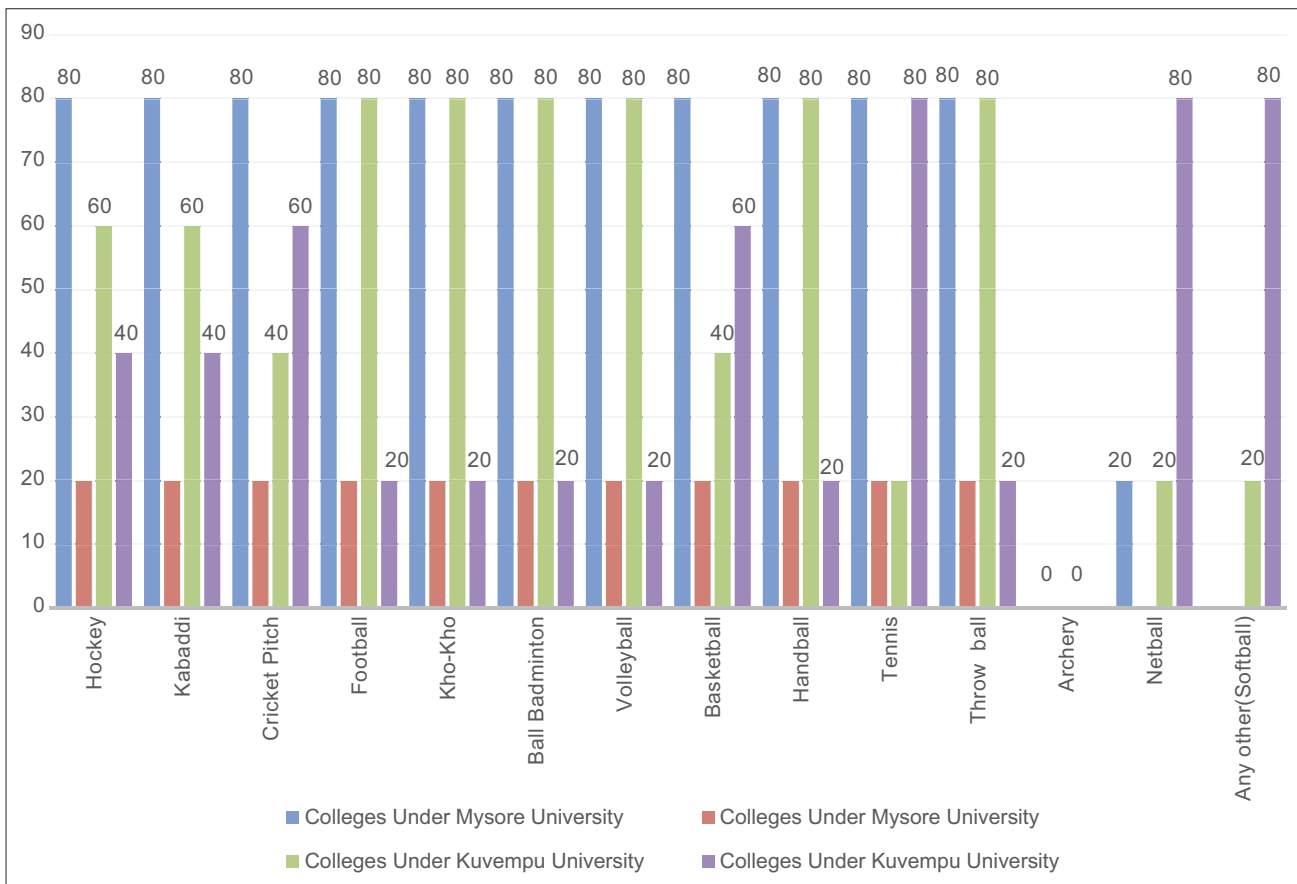


Figure 2: The details of outdoor games facilities available in the colleges under Mysore and Kuvempu University



**Table 1: The details of sports facilities available in Mysore and Kuvempu Universities**

Facilities	Colleges Under Mysore University				Colleges Under Kuvempu University			
	Yes		No		Yes		No	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Fitness centers	4	80	1	20	3	60	2	40
Indoor Facility	4	80	1	20	3	60	2	40
Outdoor Facility	4	80	1	20	4	80	1	20
Training and coaching facility	4	80	1	20	2	40	2	40
Technology enabled class rooms	1	20	3	60	0	00	4	80
Other								

**Table 2: Detailed information about outdoor sports facilities available in the colleges of Mysore and Kuvempu Universities**

Facilities	Colleges Under Mysore University				Colleges Under Kuvempu University			
	Yes		No		Yes		No	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Hockey	4	80	1	20	0	00	5	100
Kabaddi	4	80	1	20	3	60	2	40
Cricket Pitch	4	80	1	20	3	60	2	40
Football	4	80	1	20	2	40	3	60
Kho-Kho	4	80	1	20	4	80	1	20
Ball Badminton	4	80	1	20	4	80	1	20
Volleyball	4	80	1	20	4	80	1	20
Basketball	4	80	1	20	2	40	3	60
Handball	4	80	1	20	4	80	1	20
Tennis	4	80	1	20	1	20	4	80
Throw ball	4	80	1	20	4	80	1	20
Archery		00	5	100	0	00	5	100
Netball	1	20	4	80	1	20	4	80
Any other (Softball)					1	20	4	80

infrastructure facilities in the colleges, researcher clearly stress over that, those colleges having better sports infrastructure they can possible to uplift the sports persons present and future in the National and Inter-National competition for the concerned universities. It mandatory that, even though universities were established the infrastructure sports facilities will not use by the sports persons throughout the year in a systematic and planned manner, it may cause lack of maintenance and it is very difficult to maintain the ground as well as equipment and also financial burdens for the concerned university.

## SUMMARY, CONCLUSION, AND RECOMMENDATION

### Summary and Conclusion

Education, in the expansive sense, implies preparation forever; it focuses on all round improvement of people. Hence,

education is worried about creating ideal natural wellbeing and emotional vitality, for example, social cognizance, securing of information, healthy mentality, moral, and profound characteristics.

Physical education is also considered a process by which, individual is shaped to fit into the society to maintain and advance the social order. It is a system designed to make an individual rational, mature, and a knowledgeable human being. Physical education is the modification of behavior of an individual for the better adjustment in the society and for making a useful and worthwhile citizen. The pragmatic view of physical education highlights learning by doing and learning through physical movement.

From many years, sport persons are representing the respective university to participate in the South-Zone and All India Inter

University competition in Mysore and Kuvempu Universities they are having better sports infrastructure facilities in the colleges, researcher clearly stress over that, those colleges having better sports infrastructure they can possible to uplift the sports persons present and future in the National and Inter-National competition for the concerned universities. It mandatory that, even though universities were established the infrastructure sports facilities will not use by the sports persons throughout the year in a systematic and planned manner, it may cause lack of maintenance and it is very difficult to maintain the ground as well as equipment and also financial burdens for the concerned university.

Researcher included to complete this study is based on Indoor and outdoor facilities available in the colleges of Mysore and Kuvempu Universities and it impact on the South-Zone and All India Inter-University competitions.

Based on the conclusions of this study, the following recommendations have been made.

### **Recommendation of this Study**

1. The result of the present study may be considered as a review for further study in the area of sports infrastructure and outdoor facilities.

2. Similar study may be conducted in other professional courses in the field of physical Education and sports.
3. This study may recommend for all the colleges can generate resource and develop infrastructure
4. This type of study can be implement to carry over to state and states

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## **IFPEFSSA Virtual Awards- 20<sup>th</sup> December 2020**

1. Dr. Lordinio A. Vergara, DPd – Philippines - Physical Education and Sports Science at International Level
2. Dr. Garry Kuan – Malaysia- Exercise and Sports Science at International Level
3. Dr. Marisa Poomiphak Na Nongkhai – Thailand – Physical Education and Sports Science at International Level
4. Dr. Gurdeep Singh – India - International Sports Leadership Award
5. Dr. Gaganendu Dash – India - International Sports Administrator Award
6. Dr. Bhaskar D. Salvi-India - International Academic Leadership Award
7. Prof. K. Chandrasekaran – India - International Research Excellence Award
8. Dr. Rakesh Malik – India - International Sports Administrator Award
9. Dr. M.S. PASODI – India - International Academic Leadership Award
10. Dr. Shafiqoddin Sharfoddin Shaikh - India - International Academic

### **Leadership Award**

11. Y. Emmanuel Shashi Kumar – India - International Sports Leadership Award
12. Dr. S. Jayaraman – India - International Research Excellence Award
13. Dr. Ghansham K. Dhokrat- India - International Academic

### **Leadership Award**

14. Dr. Nita Bandyopadhyay – India - International Academic Excellence Award
15. Dr. Thingnam Nandalal Singh- India - International Academic Excellence Award
16. Ashok Kumar - India - International Sports Leadership Award
17. E. Chiranjeevi – India - International Sports Leadership Award
18. Dr. Ashwani Kumar – India - International Young Researcher Award
19. Dr.M. Madhavi – India- International Academic Excellence Award



Shri Y. Emmanuel Shashi Kumar, Chairman, Indian Federation of Computer Science in Sports Receiving the -IFPEFSSA AWARD – 2020 IN THE CATEGORY OF International Sports Leadership Award

# Online Webinars

**PROMOTED BY: INTERNATIONAL FEDERATION OF PHYSICAL EDUCATION,  
FITNESS AND SPORTS SCIENCE ASSOCIATION**

- 1) International webinar on Physical Education organized by ELMS Sports, Reliance Foundation and International Federation of Physical Education, Fitness and Sports Science Association on 5<sup>th</sup> July 2020.**
- 2) International webinar on Role of Sports Psychology on Performance of Players in challenging Environment and International Federation of Physical Education, Fitness and Sports Science Association on 12<sup>th</sup> July 2020.**
- 3) International webinar on Latest Trends in Physical Education Organized by Bharatiya Vidyalaya, Amravathi and International Federation of Physical Education, Fitness and Sports Science Association on 15<sup>th</sup> July 2020.**
- 4) International webinar on Trends and issues in Physical Education Organized by College of Human Kinetics, Polytechnic University of Philippines and International Federation of Physical Education, Fitness and Sports Science Association on 18<sup>th</sup> July 2020.**
- 5) International webinar on Latest Trends in Sports Coaching Organized by Sports Science Faculty, Yogyakarta State University, Indonesia and International Federation of Physical Education, Fitness and Sports Science Association on 19<sup>th</sup> July 2020.**
- 6) International webinar on High Level Sports Performance – Target Olympic Podium Organized by Sports Development Authority of Tamil Nadu and International Federation of Physical Education, Fitness and Sports Science Association on 22<sup>nd</sup> July 2020.**
- 7) International webinar on physical, psychological and spiritual discipline -A Key Well Being in New Normal organized by lingaraj college and International Federation of Physical Education, Fitness and Sports Science Association on 25<sup>th</sup> July 2020.**
- 8) World Webinar on Sports Science and Sports Medicine supported by International Federation of Physical Education, Fitness and Sports Science Association on 26<sup>th</sup> and 27<sup>th</sup> July 2020.**
- 9) International webinar on latest trends in Athletics organized by Indian Federation of Computer Science in Sports and International Federation of Physical Education, Fitness and Sports Science Association on 2<sup>nd</sup> August 2020.**